Three Essays on Financial Innovation

Boris Vallée

HEC PARIS

Apprendre à oser

GREGHEC

Laboratoire CNRS - UMR 2959

ECOLE DES HAUTES ETUDES COMMERCIALES DE PARIS

Ecole Doctorale « Sciences du Management/GODI » - ED 533

Gestion Organisation Décision Information

"Three Essays on Financial Innovation."

THESE

présentée et soutenue publiquement le 25 juin 2014

en vue de l'obtention du

DOCTORAT EN SCIENCES DE GESTION

Par

Boris VALLEE

JURY

Président du Jury :	**Monsieur Marcin KACPERCZYK** Professeur Imperial College, Londres – UK
Directeur de Recherche :	**Monsieur Ulrich HEGE** Professeur HEC Paris – France
Co-Directeur de Recherche :	**Monsieur Christophe PERIGNON** Professeur Associé, HDR HEC Paris – France
Rapporteurs :	**Monsieur Jean-Charles ROCHET** Professeur Université de Zurich – Suisse **Madame Paola Sapienza** Professeur Kellogg School of Management, Northwestern University, Illinois – USA
Suffragants :	**Monsieur Laurent CALVET** Professeur HEC Paris – France **Monsieur Guillaume PLANTIN** Professeur Université de Toulouse Capitole 1– France **Monsieur David THESMAR** Professeur, HDR HEC Paris – France

Ecole des Hautes Etudes Commerciales

Three Essays on Financial Innovation

Ph.D. dissertation submitted by:

Boris Vallée

Committee Members:

Advisors:

Laurent Calvet

Ulrich Hege, Research Director

Christophe Pérignon, Co-Director

David Thesmar

External Members:

Marcin Kacperczyk (Imperial College)

Guillaume Plantin (Toulouse School of Economics)

Jean-Charles Rochet (University of Zurich)

Paola Sapienza (Northwestern University)

To Anna

Acknowledgements

It is not so much our friends' help that helps us as the confident knowledge that they will help us. (Epicurus)

Writing this dissertation has been a tremendous educational experience and a rewarding chapter in my professional development. This success would by no mean have been possible without the help and support of all the people around me during these five years, both in my professional and personal sphere. Now is the time to thank them!

First let me thank the members of my committee, who greatly contributed to the success of this dissertation. I am forever endebted to Ulrich Hege for his attentive guidance and encouragements, and for advising me to do a Ph.D. in the first place. I am deeply thankful to David Thesmar, who was always available and helped me raise the bar every time we met. I warmly thank Laurent Calvet for his help and advice, and look forward to working on our future common project. Last but not least, I am grateful to Christophe Pérignon for educating me about how the academic world works.

I am thankful to Marcin Kasperczyk, Guillaume Plantin, Jean-Charles Rochet and Paola Sapienza for accepting to take part in my dissertation committee. I look forward to hearing their feedback and hope to continue having fruitful exchanges with them in the future. I am grateful to all the members of the Finance department at HEC Paris for their generous feedback (with a special thank you to Thierry Foucault and Johan Hombert), and to Josh Rauh and Manju Puri for welcoming me at Northwestern University and Duke University. I enjoyed the companionship of my fellow Ph.D. candidates along the five years in HEC: Michael, Hedi, Olivier, Jerome, Jean-Noel, Adrien and Alina, to name only a few. I will miss our tiny office and discussions! I also thank the HEC Foundation for funding my scholarship, Lexifi and Jean-Marc Eber for his interest in my research, and Europlace and IFSID for their research grant.

I also want to warmly thank Claire Célérier, my friend and co-author, for our productive collaboration that played a key role in the success of my PhD. Two papers so far and counting!

My most sincere gratitude goes to my family, who instilled in me a love of knowledge and a penchant for analytical thought: my parents Anne-Marie and Serge, my sister Axelle, and my brother Gildas. I also thank my friends, who sometimes teased me, often helped me, and always encouraged me: Antoine, Clément, Fabrice, Francois, Julien, Vanessa and Vince, to name only a few.

I dedicate this thesis to Anna, who brought a superior meaning to my visiting scholarship in Chicago, and to all the efforts made in general.

Thank you everyone!

Introduction

I cannot understand why people are frightened of new ideas. I'm frightened of the old ones. [John Cage, Composer]

Innovation is the introduction and development of new ideas, devices or methods. As in other fields, innovation in finance has been questioned on whether it represents progress. Warren Buffet, in the Berkshire Hathaway annual report for 2002, famously declared: "Derivatives are financial weapons of mass destruction." Analyzing both the motives and effects of financial innovation is key for gaining a better understanding of its role in our society, and whether financial innovation can help improving welfare (Allen (2011)).

Financial innovation has been a fundamental companion of economic development over the centuries, under many different forms. The introduction of new payment methods (from the invention of coins in the seventh century BC, to mobile phone payment in the 21st century), new asset classes (from stocks to cat bonds or Exchange Traded Funds), new services (from the deposit bank in the 16th century to online banking and crowdfunding), new processes (credit scoring, asset structuring and pricing), or new players (Venture Capital, Shadow banks, Hedge Funds) have fundamentally changed the role and the scope of the finance sector. These innovations have therefore had a profound impact on our economies and societies. The invention of currency, for instance, led to the development of cities and the division of labor in the Mesopotamia of the 7th century before JC. In 13th century China, economy and war funding was eased by the invention of paper money, or banknotes. The invention of banks allowed the development of

Florence and Genova during the 17th century. More recently, micro-credit, invented by Peace Nobel Laureate Mohammed Yunus, has made it possible for millions of people to borrow and develop an economic activity.

Despite these examples, the strict identification of financial innovation presents a challenge, as patents are almost non-existent in an industry that works on an intangible good: money. It is difficult to measure to what extent a new type of contract or idea corresponds to a breakthrough or merely represents a marginal change. Despite this challenge, academics have pointed to an acceleration of financial innovation in the last decades and have subsequently sought to understand its impact. Tufano (2003) identifies the introduction of 1,836 distinct financial assets from 1980 to 2001. These introductions have come with a general suspicion towards financial innovation since the 2008 financial crisis. Innovative financial instruments such as Credit Default Swaps or mortgages securitization have indeed been pointed out as one of the main drivers of the crisis. More generally, the utility of financial innovation is being questioned, as illustrated by Paul Volcker's famous quote in 2009: "The only thing useful banks have invented in 20 years is the ATM."

Empirically Investigating Financial Innovation

My dissertation studies recent episodes of financial innovation, with the ambition of understanding their motives and effects. This research thread has led me to go beyond the methods and insights of a single subfield of finance, and to relate methods of corporate finance and banking with other fields including household finance, public finance, political economy, and industrial organization. Generally, no readily available datasets existed that allowed me to analyze the considered innovative financial products, so in each chapter the research design involves the construction of new datasets and of original variables measuring the scope and use of innovation.

Financial Complexity

A frequently debated consequence of financial innovation is the increasing complexity of financial instruments. Financial complexity may be used as a strategic tool by firms to increase search costs (Carlin (2009)), or to intentionally reset investors' learning (Carlin and Manso (2011)). This chapter, entitled *What Drives Financial Complexity? A Look into the Retail Market for Structured Products*, empirically investigates these theoretical insights on financial complexity in a competitive environment. Claire Célérier and I focus on the highly innovative retail market for structured products. We perform a lexicographic analysis of the term sheets of 55,000 retail structured products issued in Europe since 2002 and construct three indexes measuring complexity. These measures allow us to observe that financial complexity has been steadily increasing, even during and after the recent financial crisis. We show that financial complexity is most prominently used by banks with the least sophisticated client base, and provide empirical evidence that intermediaries strategically use complexity to mitigate competitive pressure. First, complex products exhibit higher mark-ups and lower ex post performance than simpler products. Second, using issuance level data spanning 15 countries over the 2002-2010 period, we find that financial complexity increases when competition intensifies.

Innovative Borrowing Instruments in Public Finance

In 2001, to comply with Eurozone requirements, Greece entered into an OTC cross-currency swap transaction to hide a significant amount of its debt. In the chapter entitled *Political Incentives and Financial Innovation: The Strategic Use of Toxic Loans by Local Authorities*, Christophe Pérignon and I evidence the use of another form of hidden public debt by local governments: toxic loans. Using proprietary data, we show that politicians strategically use these products to increase chances of being re-elected. Consistent with greater incentives to hide the actual cost of debt, toxic loans are utilized at a significantly higher frequency within highly indebted local governments. Incumbent politicians from politically contested areas are also more likely to turn to toxic loans. Using a difference-in-differences methodology, we show that politicians time the election cycle by implementing more transactions immediately before an election than after. Politicians are also found to exhibit herding behavior in this process. Our findings for the market of municipal financial products offer an example of a strategic use of financial innovation.

Financial Institutions and Contingent Capital

As part of the debate on bank leverage, Bolton and Samama (2012) propose an innovative solution to decrease financial distress costs associated with high leverage of financial institutions: Contingent Capital with an Option to Convert. In a third chapter entitled *Call Me Maybe? The Effects of Exercising Contingent Capital*, I study the market reaction and economic performance following the exercise of comparable contingent capital options embedded in bank capital instruments. During the financial crisis, European banks massively triggered option features of hybrid bonds they had issued in response to regulatory capital requirements in order to reduce their debt burden. This episode constitutes the first "real-world" experiment of the use of contingent capital features. I find that these trigger events are positively received by credit markets, while stockholders discriminate according to the type of resulting debt relief and the financial institution leverage. Moreover, I document that banks that obtain regulatory debt relief by using the embedded trigger option exhibit higher economic performance than similar banks that do not. These findings point to the possible constructive role of innovative debt instruments as an effective solution to the dilemma of bank capital regulation.

Introduction (En Français)

Chapitre I

La complexité des produits financiers offerts aux ménages a augmenté de façon spectaculaire au cours des vingt dernières années. Des produits innovants ont été développés pour l'actif et le passif -par exemple les fonds communs de placement, les cartes de crédit et les prêts immobilier, bien que la sophistication financière des ménages reste faible (Lusardi and Tufano (2009b), Lusardi et al. (2010)). Y a-t-il une tendance actuelle à l'augmentation de la complexité financière des produits de détail? Le cas échéant, quelles sont les raisons de cette augmentation?

Pour répondre à ces questions, nous nous concentrons sur un marché spécifique qui a connu une forte croissance dans la dernière décennie: le marché des produits structurés pour particuliers. Nous développons un indice de la complexité de ces produits, que nous appliquons à une base de données couvrant 55.000 produits structurés pour particuliers vendus en Europe. A l'aide de cet indice, nous observons que la complexité financière a augmenté au fil du temps. Nous étudions plusieurs explications d'un point de vue de la demande pour ce fait stylisé: une évolution des besoins et des préférences, une tendance à un plus grand partage des risques au sein des marchés financiers, et un motif de "lotterie". Nos observations ne corroborent que peu ces explications. Nous nous concentrons donc sur des explications du côté de l'offre, en particulier sur l'utilisation stratégique de la complexité qui a été récemment étudiée théoriquement (par exemple, Carlin (2009) et Carlin and Manso (2011)) et en organisation industrielle (Ellison (2005) et Gabaix and Laibson (2006)). Nous trouvons des preuves cohérentes avec les prédictions théoriques des modèles supposant une intention d'augmentation des coûts de recherche ou de discrimination par les prix. Tout d'abord, nous montrons que la complexité élevée des produits est associée à une plus grande rentabilité pour les banques, et des performances plus faibles pour les investisseurs. Deuxièmement, en utilisant des données d'émissions couvrant 15 pays sur la période 2002-2010, nous constatons que la complexité des produits financiers augmente lorsque la concurrence s'intensifie. Notre papier fournit le premier test empirique de la relation positive entre concurrence accrue et complexité croissante sur les marchés financiers, qui a été identifiée dans la littérature théorique (Carlin (2009)).

Le premier objectif de cette étude est de mesurer l'augmentation de la complexité financière aussi précisément que possible. Nous observons une tendance à l'augmentation de la complexité financière en examinant les prospectus de tous les produits structurés pour particuliers émis en Europe depuis 2002 à l'aide d'une analyse textuelle. Nous constatons que cette tendance haussière se poursuit même après la crise financière. Mesurer la complexité des produits d'une manière précise et pertinente sur le marché très diversifié des produits structurés pour particuliers représente le premier défi de notre analyse empirique. Pour ce faire, nous développons un algorithme qui balaie pour chaque produit la description du calcul des flux, et identifie les caractéristiques de ces formules. Nous définissons le niveau de complexité d'un produit donné comme le nombre des caractéristiques définissant cette formule. La logique de notre approche est que plus une formule comprend de caractéristiques distinctes, plus elle est difficile à comprendre et à comparer pour l'investisseur. Nous utilisons aussi le nombre de caractères utilisés dans la description de la formule des flux, ainsi que le nombre de scénarios possibles, comme des tests de robustesse de notre mesure de complexité. L'observation de la hausse de la complexité au fil du temps est commune à ces trois mesures de complexité.

Le deuxième objectif de l'étude est d'explorer les explications possibles de cette complexité croissante dans le marché des produits structurés pour particuliers. Nous commençons par explorer les raisons du côté de la demande. Tout d'abord, nous envisageons que cette hausse puisse provenir de l'évolution des préférences ou des besoins des consommateurs. Cependant, nous constatons qu'aucune des nombreuses variables et des contrôles que nous utilisons dans notre analyse ne détecte de changements dans la composition du marché des produits structurés. Deuxièmement, nous analysons si la hausse de la complexité financière peut être liée à l'augmentation de la complétude du marché ou à un meilleur partage des risques. Cependant, cette hypothèse devrait impliquer que la complexité est plus répandue parmi les produits pour investisseurs avertis et fortunés, qui devraient obtenir le plus grand avantage de ces opportunités. Cependant, nos données indiquent le contraire: les institutions qui ciblent les clients moins sophistiqués, comme les caisses d'épargne, offrent des produits plus complexes. En outre, certaines caractéristiques spécifiques - par exemple, la monétisation d'un plafond sur la hausse de l'indice sous-jacent - et la monétisation de la possibilité de subir une perte si l'indice sous-jacent tombe en dessous d'un certain seuil - sont plus fréquents lorsque la volatilité implicite est élevée, ce qui est difficile à expliquer par des facteurs de demande. En effet, l'aversion au risque des investisseurs est plus faible lors des périodes de crise.

Par conséquent, dans notre tentative de compréhension de la hausse de la complexité, nous nous tournons vers des hypothèses d'utilisation stratégique de celle-ci. Nous testons en particulier deux hypothèses découlant directement de prédictions théoriques: la rentabilité des produits complexes doit être relativement élevée et la complexité devrait augmenter lorsque la concurrence s'intensifie. Nous établissons d'abord une relation entre la complexité financière et la rentabilité des produits. Nous calculons la marge réalisée pour un sous-ensemble homogène en terme d'actif sous-jacent de produits structurés pour particuliers, à l'aide d'une méthodologie Least Square Monte Carlo. Nous contrastons ensuite le niveau de rentabilité avec celui de complexité du produit. Nous constatons que plus un produit est complexe, plus il est rentable. Basé sur la performance réalisée de 48 % des produits qui sont arrives a terme, nous montrons également que plus un produit est complexe, plus sa performance finale est faible. Deuxièmement, nous étudions empiriquement l'effet d'un choc de concurrence sur la complexité financière. Nous utilisons une méthodologie de différence de différences afin d'évaluer l'impact de l'entrée des Exchange Traded Funds (ETF) sur la complexité des produits structures pour particuliers. Ce choc a été utilisé par Sun (2014) aux États-Unis pour étudier l'impact de la concurrence sur les frais des fonds de placement communs. L'entrée des ETF représente en effet une augmentation de la concurrence pour les produits structurés pour particuliers, car ils représentent un substitut possible à ces produits. Nous constatons que le même distributeur propose des produits plus complexes dans les pays où les ETF ont été introduits que dans les pays où ils n'ont pas été introduits. Nous évaluons également l'impact du nombre de concurrents dans le marché des produits structurés pour particuliers sur la complexité moyenne, explorant ainsi une autre dimension de concurrence. Nous montrons que la complexité moyenne de l'offre de produits du même distributeur est plus élevée dans les marchés où le nombre de concurrents a augmenté. Ce résultat est robuste au contrôle par le niveau de rentabilité du secteur financier au niveau national.

Pour notre étude, nous utilisons une nouvelle base de données qui contient des informations détaillées sur tous les produits structurés pour particuliers qui ont été vendus en Europe de 2002 à 2011. Cette base de données présente des caractéristiques clés qui facilitent l'analyse textuelle, ainsi que la stratégie d'identification propre à une étude d'organisation industrielle empirique. Elle couvre 17 pays, 9 ans de données et plus de 400 concurrents. Pour chaque émission, une description détaillée de la formule de calcul de performance, de nombreuses autres informations sur le produit et son distributeur, ainsi que le volume vendu, sont disponibles.

En termes d'implications règlementaires, notre travail souligne la nécessité d'évaluer la complexité des produits indépendamment de leur risque. Une étape supplémentaire pourrait être d'imposer un plafond sur la complexité, ou de favoriser la standardisation des produits financiers pour particuliers afin de limiter la dynamique de complexification que nous observons. Ces mesures supposent pour le régulateur de développer et d'utiliser une mesure globale et homogène de la complexité des produits.

Chapitre II

L'innovation financière vise à améliorer le partage des risques en parvenant à la complétude des marchés financiers. Cependant, les innovations financières peuvent être utilisées à d'autres fins, notamment par les politiciens soucieux de leurs propres intérêts. Ainsi, en 2001, afin de se conformer aux exigences de la zone euro, la Grèce a mis en place une transaction de swap de devises de gré à gré avec Goldman Sachs dans le but de cacher une part importante de sa dette. Aux États-Unis, les municipalités utilisent régulièrement une forme de remboursement anticipé qui leur fournit une amélioration budgétaire à court terme, mais à un coût total élevé ((Ang et al., 2013)).

L'innovation financière facilite-t-elle les stratégies personnelles des politiciens aux frais du contribuable? Pour répondre à cette question, nous étudions l'utilisation de produits financiers innovants par les collectivités locales. Nous nous concentrons sur un type de prêt structurés, surnommés emprunts toxiques par la presse en raison de leur profil à haut risque ((Erel et al., 2013). Nous émettons l'hypothèse que ces produits sont utilisés comme leviers de stratégies délibérées de la part des élus. Comme les utilisateurs de prêts immobiliers complexes étudiés par Amromin et al. (2013), les politiciens exploitent-ils délibérément certaines caractéristiques de ces prêts à leur propre avantage, malgré les risques à long terme encourus?

Pour tester empiriquement cette hypothèse, nous exploitons une base de données unique qui inclut les portefeuilles d'emprunts toxiques de près de 3000 collectivités locales françaises. En utilisant des analyses transversales et une méthodologie de différence des différences, nous montrons que les politiciens utilisent ces produits plus fréquemment et dans une large mesure lorsque leurs incitations pour cacher le coût de la dette est élevé, lorsque ils sont les élus d'une zone sujette à l'alternance, et lorsque leur confrères mettent en œuvre des opérations similaires.

Au cours de la récente crise financière, du fait de la hausse de la volatilité, les frais d'intérêt des utilisateurs de prêts toxiques ont atteint des niveaux très élevés. Un exemple intéressant est la ville de Saint-Etienne, qui poursuit actuellement en justice ses banques pour avoir vendu des produits financiers accusés d'être trop risqué. En 2010, le taux d'intérêt annuel facturé sur l'un de ses principaux prêts a augmenté de 4 % à 24 %, car il était indexé sur le taux de change livre / franc suisse (Business Week, 2010). Les moins-values latentes totales de Saint-Etienne sur les emprunts toxiques ont atteint 120 millions d'euros en 2009, soit presque le niveau de la dette nominale de cette ville : 125 millions d'euros (Cour des comptes, 2011).

Bien que très répandu, le phénomène des prêts toxiques reste peu étudié académiquement.[1] Cette absence de recherche sur le sujet résulte principalement d'un manque de données utilisables. Nous nous appuyons sur deux ensembles de données inédits qui se complètent mutuellement. Le premier jeu de données contient le portefeuille complet de la dette pour un échantillon d'environ 300 grandes collectivités locales françaises à fin 2007 pour chaque instrument de la dette. Il contient le montant nominal, la maturité, le taux du coupon moyen, le type de produit, de l'indice financier, et le prêteur identité. Le deuxième ensemble de données comprend toutes les opérations d'emprunts structurées faites par Dexia, la banque leader sur le marché français pour les prêts aux collectivités locales, entre 2000 et 2009. Cette base de données fournit des informations au niveau du prêt, y compris la valeur latente de la transaction, et la date de la transaction. Cette dernière variable est cruciale pour notre stratégie d'identification. Contrairement aux états financiers des gouvernements locaux qui ne distinguent pas entre prêts structurés et prêt classique, ces bases de données fournissent des informations détaillées sur les types de prêts qui sont utilisés par chaque administration locale.

Nous apportons la preuve empirique de l'utilisation stratégique de prêts toxiques par les décideurs publics. Nous commençons par montrer que les prêts structurés représentent plus de 20% de l'ensemble des encours de dette. Plus de 72% des gouvernements locaux de notre premier échantillon utilisent des prêts structurés. Parmi ces prêts structurés, 40% sont toxiques. Une analyse transversale de nos données montre que les élus des

[1] Capriglione (2014) étudie l'utilisation des instruments dérivés par les gouvernements locaux italiens.

gouvernements locaux en difficulté financière sont nettement plus enclins à se tourner vers ce type de prêt, attestant de leur incitation élevée à cacher le coût réel de la dette contractée. En effet, les gouvernements locaux du quartile supérieur du point de vue de l'endettement sont deux fois plus susceptibles d'avoir des prêts toxiques par rapport à ceux du quartile inférieur. Nous constatons également que les politiciens élus dans les zones à alternance fréquente sont plus enclins à utiliser les prêts toxiques, ce qui suggère une motivation de leur part à obtenir des économies à court terme pour se faire réélire.

Nous exploitons également la dimension temporelle de nos données. Nous identifions un groupe de traitement dont l'élection coïncide avec la période de notre l'échantillon, par opposition à un groupe de contrôle qui n'a pas d'élections pour cette période (par exemple, les régions, dont le calendrier électoral diffère, et les aéroports, les ports, et les hôpitaux, qui n'ont jamais d'élections). En utilisant une méthodologie de différence des différences sur ces deux groupes, nous constatons que le calendrier des élections joue un rôle important: pour le groupe ayant une élection, les transactions sont plus fréquentes peu avant les élections que peu après. L'utilisation d'emprunts toxiques s'appuie également sur un comportement grégaire : les politiciens sont plus susceptibles de contracter des emprunts toxiques si leurs voisins l'ont fait récemment. Ce comportement grégaire réduit le risque de réputation, tout en augmentant la probabilité d'un sauvetage collectif en cas de scenario négatif.

Chapitre III

Le levier excessif des institutions financières a été un catalyseur important de la récente crise financière, ce qui a conduit les régulateurs et les politiciens à blâmer les règles de capital règlementaire comme responsables du niveau d'endettement atteint par les grandes institutions financières en amont de la crise. Le débat sur la réglementation des fonds propres des banques, cependant, a révélé un dilemme fondamental. Comme préconisé par les régulateurs (Rapport de la Commission indépendante des banques dirigé par Sir John Vickers (2013)) et universitaires (Admati et al. (2011)), une augmentation significative du montant de capital requis pour les banques représente la réponse logique au risque de faillite financière devenu manifeste dans les années 2007 - 2009, et aidera à éviter de futurs sauvetages bancaires par les gouvernements. L'application de ces règlements plus contraignants, cependant, est susceptible d'avoir des effets réels indésirables tels que la contraction du crédit, car les investisseurs sont réticents à fournir aux banques ces fonds propres supplémentaires (Jiménez et al. (2013)). Cette réticence est partagée par les leaders de l'industrie bancaire (Ackermann (2010)). Par conséquent, les instruments de capital contingent, qui combinent les avantages de la dette et des capitaux propres, et représentent une solution possible à ce dilemme, semblent être une voie prometteuse (Flannery (2005); Brunnermeier et al. (2009); Kashyap et al. (2008), French et al. (2010)). En principe, la réduction de la dette et l'amélioration de capitalisation peuvent également être obtenus par des restructurations de la dette *a posteriori*, par exemple à l'aide d'échanges de dettes en actions. Les instruments de capital contingent peuvent, cependant, être plus efficace pour éviter le couteux renflouement des banques par les Etats, ainsi qu'aider à résoudre les problèmes de surendettement (Duffie (2010)) sans encourir de risque de défaut ou de l'échec d'un plan de restructuration de la dette. La substitution d'une partie du capital règlementaire traditionnel en instrument de capital contingent pourrait permettre aux banques d'améliorer leur résilience en limitant les surcoûts liés à l'émission de capital supplémentaires.[2]

Le but de cet article est d'évaluer l'efficacité des instruments de capital contingent pour résoudre les situations de détresse financière des institutions financières. Plus précisément, cet article répond aux questions suivantes: lorsque la décision d'exercice du capital contingent est laissée à l'émetteur, celui-ci l'utilise-t-il cet outil adéquatement, c'est- à -dire en période de stress? Comment les créanciers et actionnaires réagissent-ils à ces exercices? Quel est l'impact des exercices d'instrument de capital contingent

[2]La littérature fournit plusieurs exemples de déviation de Modigliani-Miller tels que: les couts de garantie d'opération par les banques, la sous-évaluation des actions émises en raison de l'asymétrie de l'information, et la réaction négative du cours des actions à l'annonce d'une nouvelle émission. Pour plus de détails, voir Eckbo et al. (2007).

sur la performance économique des institutions financières? La littérature sur l'analyse théorique des instruments de capital contingent est actuellement en plein essor, avec un volet important sur les incitations d'exercice et leurs effets (Sundaresan and Wang (2013), Pennacchi et al. (2011), Martynova and Perotti (2012), Zeng (2012), Flannery (2010)). Cependant, il n'existe aucune étude empirique sur ce sujet à ma connaissance.

Pour répondre à ces questions, cet article s'appuie sur l'émission d'obligations hybrides de première génération en Europe et l'utilisation massive de leurs possibilités d'exercice par les institutions financières européennes pendant la crise financière récente. Les instruments de capital contingent sont des hybrides entre dette et fonds propres: ils sont émis sous forme d'obligations, avec paiements de coupons et échéance stipulée, mais comportent des clauses qui permettent leur conversion discrétionnaire ou automatique pendant les périodes de stress en instruments de capital à maturité illimitée. Le capital contingent est moins cher que le capital traditionnel en raison du bouclier fiscal qu'il procure, et parce qu'il permet de lever des fonds propres que lorsque cela est nécessaire. Ces instruments limitent donc les coûts associés à l'émission d'actions à certains états de la nature (Bolton and Samama (2012)). Les obligations dites "hybrides" sont la première génération d'instruments de fonds propres conditionnels, et sont connus comme des "Trust Preferred Securities" (TPS) aux États-Unis.

La première contribution de cet article est de montrer que les banques européennes ont massivement utilisés les possibilités d'exercice de leurs obligations hybrides au cours de la période 2009 - 2012, à l'aide de deux mécanismes: l'extension de leur maturité, et des offres publiques de rachat a des niveaux inferieur au pair. De nombreux émetteurs ont étendu la maturité de leurs obligations hybrides, en ne procédant pas à leur rappel lors de leur première date de remboursement possible. Dans mes données, je trouve que les banques européennes n'ont pas rappelé à la première date de call un total de 200 milliards d'euros d'obligations hybrides. Ce montant représente 30 pour cent des obligations hybrides en circulation sur la période, ou 11 % du capital total des banques européennes. Les institutions financières avec les ratios de capital les plus bas, qui sont donc les plus susceptibles de souffrir d'une contrainte sur leur capital réglementaire, sont plus enclines à cette action. Cette constatation minimise la crainte que le caractère discrétionnaire des exercices puisse conduire à des comportements de *risk-shifting*, puisque que les institutions financières ne renoncent pas à la réduction de leur dette comme cela serait le cas si cette hypothèse s'avérait valide.

Parmi les émetteurs qui étendent la maturité de leurs obligations hybrides, certains lancent simultanément une offre publique d'achat sur celles-ci. L'offre d'achat est généralement mise en œuvre avec une décote importante, inhérente au changement de maturité du titre super-subordonné. Ces actions combinées permettent à l'institution financière d'obtenir la décote comme injection de capital Core Tier 1, car elle correspond à une plus-value.[3] Les investisseurs ont apporte plus de 87 milliards d'euros d'obligations hybrides à ces offres de rachat sur la période, qui ont permis aux banques d'obtenir 22 milliards d'euros de plus-value, et donc d'injection de capital Core Tier 1.

La deuxième contribution du papier correspond à l'étude de la réaction des investisseurs aux exercices de la contingence. Ces évènements sont accueillis favorablement par les créanciers, alors que la réaction des actionnaires est plus mitigée. La réaction du marché est plus prononcée pour les extensions de maturité couplées avec des offres de rachat, ce qui est cohérent avec leur effet sur le Core Tier 1, un indicateur clé pour le régulateur pendant la crise. En outre, les offres d'échange en actions, qui réduisent le plus l'endettement, sont reçus positivement à la fois par les créanciers et les actionnaires.

La troisième contribution du chapitre consiste à fournir des preuves empiriques des effets économiques positifs et persistants pour les banques de l'exercice du capital contingent. Les institutions financières qui obtiennent un allégement permanent de leur dette par ce moyen obtiennent un rendement sur actifs plus élevés, et cette amélioration relative est proportionnelle à l'augmentation des fonds propres Core Tier 1 lors de l'opération. Cet effet est robuste au contrôle des renflouements des Etats, ainsi que des augmentations de capital. De plus, l'activité de prêt demeure plus soutenue pour ces institutions.

[3]Le Core Tier 1, ou Common Equity Tier 1, représente la plus haute qualité de capital, et n'inclut pas le goodwill et les instruments hybrides.

Les extensions de maturité, couplées avec des offres de rachat ont des effets économiques similaires à l'exercice des instruments de capital contingent actuellement émis : *Obligations Write-Off* et *CoCos*: un gain en capital immédiat, combiné dans certains cas à une émission d'actions. Puisque les régulateurs et les analystes financiers se concentrent sur le capital réglementaire, l'impact des allégements de la dette sur les ratios de fonds propres réglementaires est essentiel pour l'émetteur. Le caractère discrétionnaire des exercices étudiés dans ce chapitre les rend encore plus comparable à la forme de capital contingent proposé par Bolton and Samama (2012), *Capital contingent avec option de conversion.* [4] Par conséquent, mes résultats illustrent comment des produits innovants au passif peuvent aider *ex ante* à diminuer les coûts de détresse financière associés à un fort effet de levier.

[4] Ces instruments sont des obligations convertibles en actions, où la possibilité de convertir appartient à l'émetteur.

Contents

1 What Drives Financial Complexity? 5

1.1 Introduction . . . 7

1.2 The Retail Market for Structured Products . . . 11

1.2.1 Background . . . 11

1.2.2 Data . . . 13

1.3 Measuring Financial Complexity . . . 15

1.3.1 Classifying Payoffs . . . 15

1.3.2 Results . . . 16

1.3.3 Robustness Checks . . . 17

1.4 Demand-Side Explanations of Financial Complexity . . . 18

1.4.1 Catering to Changing Needs and Preferences . . . 18

1.4.2 Risk Sharing and Increasing Completeness . . . 19

1.4.3 Gambling Products . . . 20

1.5 The Strategic Use of Financial Complexity . . . 21

1.5.1 Theoretical Considerations . . . 21

1.5.2 Financial Complexity and Product Profitability . . . 23

1.5.3 Complexity and Competition: The impact of ETF entry on complexity . . . 27

1.5.4 Complexity and Competition: Number of Competitors in the Retail Market for Structured Products . . . 29

1.6 Conclusion . . . 31

1.7 Figures and Tables . . . 33

2 Political Incentives and Financial Innovation 49

2.1 Introduction . . . 51

2.2 The Toxic Loan Market . . . 54

2.2.1 Common Characteristics of Structured Loans . . . 54

2.2.2 Which Structured Loans Are Toxic? . . . 55

2.2.3 Example of a Toxic Loan . . . 56

2.2.4 Local Government Rationale . . . 56

2.2.5 Post-crisis developments . . . 57

2.3 Data . . . 57

2.3.1 Local Government-Level Data from a Leading Consulting Firm (Dataset A) . . . 57

2.3.2 Bank-Level Data on Structured Transactions from Dexia (Dataset B) . . . 59

2.4 Empirical Analysis . . . 60

2.4.1 Incentives to Hide the Cost of Debt . . . 60

2.4.2 Political Cycle . . . 63

2.4.3 Herding . . . 65

2.4.4 Political Affiliation and Fiscal Policy . . . 67

2.4.5 Alternative Motive: Hedging . . . 67

2.5 Conclusion . . . 68

2.6 Figures and Tables . . . 70

3 Call Me Maybe? 80

3.1 Introduction . . . 82

3.2 Background and Debt Relief Mechanisms . . . 86

3.2.1 The European Hybrid Bond Market in the Run-up to the Crisis . 86

3.2.2 The Contingent Nature and Regulatory Treatment of Hybrid Bonds 88

3.2.3 Contingent Debt Relief Events 89
3.3 Data 90
3.4 Contingent Debt Relief Use 91
3.5 Market Reaction to Contingent Debt Relief Events 93
3.5.1 Hypotheses 93
3.5.2 Event Study 95
3.6 Economic Effects of Contingent Debt Relief 99
3.6.1 Impact on Economic Performance 99
3.6.2 Inspecting the Transmission Mechanism 100
3.7 Discussion 101
3.7.1 Alternative Hypotheses 101
3.7.2 Comparison with Second-Generation Contingent Capital Instruments 104
3.7.3 Comparing Europe and the United States 105
3.8 Conclusion 105
3.9 Figures and Tables 107

4 Conclusion **122**

5 Appendices **123**

Appendix A Chapter 1 124
Appendix A.1Typology of Retail Structured Products 124
Appendix A.2- Figures. 126
Appendix A.3- Tables 127
Appendix A.4- Theoretical Framework (Model) 132
Appendix B Chapter 2 135
Appendix B.1Types of Structured Debt Products and Risk Classification . . . 135
Appendix B.2Tables. 138
Appendix C Chapter 3 140

Chapter 1

What Drives Financial Complexity?

A Look into the Retail Market for Structured Products

Joint work with Claire Célérier (University of Zürich)

KISS: Keep It Simple, Stupid.

[US Navy Motto in the 1960s]

1.1 Introduction

Abundant anecdotal evidence suggests that the complexity of household financial products has dramatically increased over the last twenty years. Innovative products have been introduced continuously on the asset and liability sides -for example for mutual funds, credit cards, and mortgages -while financial literacy and sophistication seem to remain low (Lusardi and Tufano (2009b), Lusardi et al. (2010)). Is there an actual trend towards increasing financial complexity in retail products? If so, what drives this increase?

To answer these questions, we focus on a specific market that has been experiencing sustained growth and innovation in the last decade: the retail market for structured products. We first develop an index of product complexity, which we apply to a comprehensive dataset of 55,000 retail structured products sold in Europe. We observe through this index that financial complexity has been increasing over time. We consider several demand-side explanations for this stylized fact: catering to changing needs and preferences, a trend to more risk sharing and better market completeness, and a gambling motive. Observations from our data do not corroborate the first three explanations. We therefore focus on supply side based explanations, specifically on the strategic use of complexity that has been stipulated in various theoretical contributions in finance (e.g., Carlin (2009) and Carlin and Manso (2011)) and in industrial organization (Ellison (2005) and Gabaix and Laibson (2006)). We find evidence consistent with the theoretical explanations that emphasize motives such as increasing search costs or price discrimination. First, we document that product complexity is associated with higher product profitability for banks and lower performance for investors. Second, using issuance level data spanning 15 countries over the period 2002-2010, we find that product financial complexity increases when competition intensifies. Our paper provides the first empirical test of the positive relationship between heightened competition and increasing financial complexity, which has been postulated in the theoretical literature (Carlin (2009)).

The first objective of this paper is to measure the possible increase in financial complexity as accurately as possible. We document a trend of increasing financial complexity by examining the product term sheets of all the retail structured products issued in Europe since 2002 through a lexicographic analysis. We find that this trend continues even after the financial crisis. A major empirical challenge of our analysis lies in measuring product complexity in an accurate and relevant way in the highly diverse market of retail structured products. To do so, we develop an algorithm that precisely strips and identifies each feature embedded in the payoff formula of all the past and currently existing structured products in the retail market. We define the complexity level of a given product as its total number of features. The rationale of our approach is that the more features a product has, the more complex it is for the investor to understand and compare. We also use the number of characters used in the pay-off formula description, as well as the number of potential scenarios, as robustness checks for our measure of complexity. The finding of increasing financial complexity over time is robust to any of these complexity measures.

The second objective of the paper is to explore possible explanations for this increasing complexity in the retail market for structured products. We begin by investigating demand side explanations. First, we examine whether this observation results from catering to changing preferences or consumer needs. However, we find that none of the many variables and controls we use detects any time trends or shifts in the composition of the market for structured products. Second, we analyze whether rising financial complexity is linked to increasing market completeness or better risk sharing opportunities. However, this hypothesis should imply that complexity is more prevalent among products for sophisticated and affluent investors, who should obtain the largest benefit from such opportunities. However, our data indicate the opposite: institutions that target unsophisticated clients, such as savings banks, offer relatively more complex products. Additionally, specific product features - e.g., monetizing a cap on the rise of the underlying index above a certain threshold - and more surprisingly monetizing the possibility to take a loss if the underlying index drops below a certain threshold - are more frequent when implied volatility is high, potentially driving up the average product complexity during these periods.

Therefore, in our attempt to understand the origins of increasing complexity, we turn to arguments explaining the use of financial complexity as a strategic tool to mitigate competitive pressure. Based on ample theoretical literature, we test in particular two hypotheses: markup of complex products should be relatively higher, and complexity should increase when competition intensifies. We first establish a relationship between financial complexity and product profitability. We price a subset of very homogenous retail structured products based on liquid underlying assets with Least Square Monte Carlo and then examine the explanatory power of product complexity for markups. We find that the more complex a product is, the more profitable it becomes. Based on the realized ex-post performance of 48% of the products that have matured, we also show that the more complex a product is, the lower its final performance. These findings are consistent with higher complexity being associated with a higher profit for the distributing intermediaries. Second, we empirically investigate the effect of a competition shock on financial complexity. We implement a difference-in-differences methodology to assess the impact of Exchange Trading Fund (ETF) entries, on complexity. This instrument has first been used by Sun (2014) in the US to study the price impact of competition on active management investment products. The entry of ETFs represents an increase of competition for retail structured products, as ETFs can be offered as a substitute to these products. We find that the same distributor offers more complex products in countries where ETFs have been introduced than in countries where they have not been introduced. A specification with bank-year fixed effects further mitigates potential concerns over reverse causality between ETF entries and financial complexity. We also assess the impact of the number of competitors in the retail market for structured products on complexity, thus exploring another dimension of competition. We show that the average complexity of the product offer from the same distributor is higher in markets where the number of competitors has increased, which is again consistent with distributors adapting to the competitive environment. This result is robust to controlling for country level financial sector profitability, which could drive endogenously the number of competitors.

We use a new dataset that contains detailed information on all the retail structured products that have been sold in Europe since 2002. This database has key characteristics that facilitate text analysis, as well as a clean identification strategy in an empirical industrial organization study. It covers 17 countries and 9 years of data, with both strong inter-country and inter-temporal heterogeneity. It includes more than 300 competitors. At the issuance level, a detailed description of payoffs, information on distributors, and volume sold are available.

There are several reasons to study the financial complexity dynamics in the retail market for structured products; one of them is the sheer size of the market. In Europe alone, outstanding volumes of retail structured products add up to more than EUR 700bn, which is equivalent to 12% of the mutual fund industry. Assets under management have been steadily growing, despite the financial crisis, with the US market exhibiting USD 160bn of retail structured product issuance since 2010. As direct participation in financial markets has been structurally decreasing in Europe, structured products often represent a privileged way of getting exposure to stock markets. In addition, information asymmetry is high between innovators, investment banks structuring the products, and the final consumer: the mass-market retail investor. We find many examples of products that pile up many complex features which are then marketed to savings bank customers, who are less likely to be sophisticated.[1] This finding illustrates the gap between supply-side complexity and demand-side sophistication. In this study, we define financial complexity from the investor's point of view, meaning how difficult it is for him or her to understand a product and compare it with possible alternatives.[2]

[1] See section 3 for an example.

[2] We do not take the structuring bank point of view: how difficult it is to create a given product. A product simple to understand can be challenging to structure. For instance, derivatives on real estate, although easily understood by retail investors are extremely difficult to structure for banks, mainly for

Our work contributes to several fields of the literature. First, our paper builds on the theoretical literature on financial complexity. Ellison (2005) and Gabaix and Laibson (2006) describe how inefficient product complexity emerges in a competitive equilibrium. To account for the complexity increase in financial products, Carlin (2009) and Carlin and Manso (2011) develop models in which the fraction of unsophisticated investors is endogenous and increases with product complexity. Carlin (2009) shows that as competition intensifies, product complexity increases. Our paper tests direct implications from these models by empirically assessing the role of competition in the evolution of financial complexity. Sun (2014) tests empirically the effect of competition on price discrimination against consumers with low price sensitivity. More specifically, our work contributes to the emerging field on complex securities (Griffin et al. (2013), Ghent et al. (2013), Carlin et al. (2013), Amromin et al. (2011), Sato (2013)).

Our project also complements the literature on the role of financial literacy and limited cognition in consumer financial choices and bank strategies. Bucks and Pence (2008) and Bergstresser and Beshears (2010) explore the relationship between cognitive ability and mortgage choice. Lusardi and Tufano (2009a) find that people with low financial literacy are more likely to take poor financial decisions. Complexity might amplify these issues. This paper also relates to the recent interest in the role of financial intermediaries in providing product recommendations to potentially uninformed consumers (Anagol and Cole (2013)).

Our paper also adds to the literature on structured products. Hens and Rieger (2008) theoretically reject completing markets as a motive for complexity by showing that the most represented structured products do not bring additional utility to investors in a rational framework. Empirical papers on the retail market for structured products have focused on the pricing of specific types of products. Henderson and Pearson (2011) estimate overpricing by banks to be almost 8%, on the basis of a detailed analysis of 64 issues of a popular type of retail structured products. This result challenges the completeness motive, as it will come at too high a cost.

In terms of policy implications, our work stresses the need to assess product complexity independently from risk. An additional step may be to impose a cap on complexity or to foster the standardization of retail structured products to limit the competition dynamics we observe. Such measures suppose for the regulator to develop and use a comprehensive and homogenous measure of product complexity beforehand.

Our paper is organized as follows: we begin in section 2 by providing background information on the retail market for structured products. Our methodology for building

liquidity reasons. The incentive is clear for a structuring bank to be the only one to price a product as it allows charging the monopolistic price.

a complexity index is described in section 3, as well as the trend towards increasing complexity. Section 4 considers possible demand-side explanations for the increase in financial complexity. Section 5 explores the strategic use of financial complexity. Finally, section 6 concludes.

1.2 The Retail Market for Structured Products

1.2.1 Background

Retail structured products regroup any investment products marketed to retail investors with a payoff that is determined following a formula defined ex-ante. They leave no place for discretionary investment decisions along the life of the investment.[3] Our study excludes products with pay-offs that are a linear function of a given underlying performance, e.g., ETFs. Retail structured products are typically structured with embedded options. Although these products largely rely on equities, the exposure one can achieve with them is very broad: commodities, fixed income or other alternative underlyings, with some example of products even linked to the Soccer World Cup results.

Below is an example of a product commercialized by Banque Postale (French Post Office Bank) in 2010:

> *Vivango is a 6-year maturity product whose final payoff is linked to a basket of 18 shares (largest companies by market capitalization within the Eurostoxx50). Every year, the average performance of the three best-performing shares in the basket, compared to their initial levels is recorded. These three shares are then removed from the basket for subsequent calculations. At maturity, the product offers guaranteed capital of 100%, plus 70% of the average of these performances recorded annually throughout the investment period.*

This example illustrates the complexity of a popular structured product, which contrasts with the likely level of financial sophistication of the average client of Banque Postale. The biased underlying dynamic selection and the averaging of performance across time makes the product complex to assess in terms of expected performance.

The retail market for structured products has emerged in 1996 and has been steadily growing from then on. In 2011, assets under management of retail structured products amount to about 700 billion euros in Europe, which amounts to nearly 3% of all European financial savings, or 12% of mutual funds' asset under management. Europe, with

[3] Retail structured product do not give any discretion to the investor in terms of exercising options, which is done automatically, as opposed to mortgages.

a market share of 64%, and 357 distributors in 2010 is by far the largest market for these products. However, the US and Asia are catching are growing quickly. The US market has met USD160bn of retail structured product issuance since 2010.[4] Regulation, both in terms of consumer protection and bank perimeter is the main explanation for the difference in size between the European and the US markets. Consumer protection imposes retail structured products to have a high minimum investment in the US, typically USD250,000. Furthermore, the Glass Steagall Act limited internal structuring of these products until its repeal in 1999. The predominant role of personal brokers as financial advisers in the US, as opposed to bank employees, may also have played a role.

The growth of this market has been fostered by an increasing demand for passive products, as the added value of active management has become more and more challenged (Jensen (1968) or Grinblatt and Titman (1994)). Structured product profitability for the banks structuring and distributing them also plays an important role (Henderson and Pearson (2011)). Indeed, on top of disclosed fees, some profits are hidden in the payoff structure that is hedged at better conditions than offered to investor. The incentive to hide markup within the product has been increased in Europe by recent MiFID regulation that requires distributors to disclose commercial and management fees. In addition, retail structured products, when packaged as securities or deposits, can offer a funding alternative for banks, and a possible way of transferring some specific risks to retail investors.[5]

The organization of the retail market for structured products is largely explained by the nature of the structuring process. Since these products are very complex to structure, only large investment banks have the exotic trading platform required to create them. But no equivalent barriers of scale exist on the distribution side, and distribution channels are more dispersed. Consequently, entities distributing the products to retail investors are often, but not necessarily, distinct from investment banks that structure them. These products have been marketed by a large range of financial institutions, from commercial banks, savings banks and insurance, to organizations active in wealth management and private banking. Many providers emphasize in their marketing efforts their expertise in structuring even when they do not actually structure the products, but only select them and implement a back-to-back transaction with an entity that can manage the market risk. Therefore, competition is playing out at two levels: between structuring entities, which sell to distributors, and between distributors, which sell to retail investors. Our analysis focuses on the latter, as we are interested in the dynamics of financial complexity in retail markets.

[4] Source: Euromoney Structured Retail Products.

[5] Recent issuances often allow bank to transfer tail risk to retail investors, as product will incur losses only in case of a strong decrease of the underlying, such as a 30% decrease in the index.

The regulatory framework is a key determinant of the development and structure of this market, in which both bank supervision and investor protection exist. European national regulators, which are subordinated to a supranational regulator since 2011, the European Securities and Markets Authority (ESMA), have been increasingly attentive to protecting retail investors. The European Commission has developed a single Europe-wide regulatory framework defined by the UCITS Directive. However, until 2010, national regulators mainly focused on disclosure requirements, which may have amplified issues of an asymmetric relationship between intermediaries and clients by mandating information requirements that were too abundant or too technical for clients, such as backtesting. MiFID regulation introduced client classification and corresponding products appropriateness. Investors are warned when they choose a product deemed unusual or inappropriate. However, some national regulators appear to mix complexity with risk, and focus on the latter. For instance, in his latest guidelines about structured products (REF 2010), the French regulator limits product complexity if and only if investor capital is at risk.

1.2.2 Data

Our original data stems from a commercial database, called *Euromoney Structured Retail Products*, which collects detailed information on all the retail structured products that have been sold in Europe since the market inception (1996). As no benchmark data source exists, it is difficult to determine the exact market coverage of the database. However, some country-comparisons suggest that the database provides a comprehensive repository of the industry.[6]

The retail market for retail structured products is divided into three categories: flow products, leverage products, and tranche products. We focus on tranche products, which are non-standardized products with a limited offer period, usually 4 to 8 weeks, and a maturity date. These products have the largest investor base, the highest amount of assets under management (they stand for 90% of total volumes), the highest average volumes, and exhibit the largest heterogeneity in terms of pay-offs. We therefore exclude flow products, which are highly standardized and frequently issued products, as they represent a high number of issuances with very low volumes (sometimes even null).[7] We also exclude leverage products, which are short term and open-ended products. In tranche

[6] For instance, the coverage on Danish products is 10% larger than that of a hand collected data on the same market in Jorgensen et al. (2011)

[7] These products, for instance bonus and discount certificates, are very popular in Germany. Indeed, hundreds of flow products are issued every day and 825,063 of them have been issued from 2002 to 2010. However, their size is only 20,000 Euros on average, against 8.8 million euros for the core market that we consider.

products, investors typically implement a buy and hold strategy, because there are significant penalties for exiting before the maturity of the product. As of December 2010, the total volume (number) of outstanding structured tranche products was respectively EUR 704bn (41,277) in Europe.[8] Data are available for 17 countries in Europe, and cumulated volumes per country since the market inception are given in Table 1.1. Italy, Spain, Germany, and France dominate the market in terms of volume sold, making up for 60% of the total. We match this data with additional information on providers (Bankscope and hand-collected data), market conditions (Datastream) and macro-economic country variables (World Bank) at the time of issuance.

INSERT TABLE 1.1

Since 2002, the retail market for structured products has seen the emergence of two major trends: both the volume sold (Figure 1.1) and the number of distributors have significantly increased (from 144 in 2002 to 357 in 2010), with a slight decrease since the financial crisis (Table 1.2). The market is divided between commercial banks, private banks, saving banks and insurance companies, implying a heterogeneous investor base.

INSERT FIGURE 1.1

Table 1.2 provides summary statistics on the underlying type, distributor type, marketing format, volume and design of the products in our dataset. We observe that equity is the most widespread exposure, either through single shares, basket of shares or equity indices. Although slightly decreasing over time, the fraction of products with an equity underlying represent 77% of products from our sample. In terms of format, structured notes are becoming increasingly popular, as opposed to collateralized fund type product. This trend is likely to be motivated by banks trying to raise funding through these instruments. With the number of products increasing, the average volume per product has been decreasing over the last ten years. Finally, products where the investor is guaranteed to receive at least her initial investment, which were dominant at the beginning of the period, are becoming less popular and represent around half of the products in the recent years.

INSERT TABLE 1.2

[8] If we include leverage and flow products, the number of outstanding structured products are 406,037 products and volumes are EUR 822bn.

1.3 Measuring Financial Complexity

1.3.1 Classifying Payoffs

This subsection describes how we measure product complexity in the retail market for structured products. We develop an algorithm that converts the text description of 55,000 potentially unique products into a quantitative measure of complexity in a robust and replicable manner. This algorithm identifies features embedded in each payoff formula and counts them. The rationale of our approach is that the more features a product has, the more complex it is for the investor to understand and compare.

We first develop a typology of all the features retail structured products may be composed of. This typology classifies the features along a tree-like structure. The eight nodes of the tree represent the steps that an investor may face to understand the final payoff formula of a retail structured product. Only the first node, the main pay-off formula, is compulsory. The following nodes cover facultative features. Example of features are: reverse convertible, which increases the investor exposition to a negative performance of the underlying, or Asian option, where the value of the payoff depends on the average price of the underlying asset over a certain period of time. Each one of the eight nodes of our typology includes on average five features. Therefore, our methodology covers more than 70,000 combinations of features and hence differentiated products. Table 1.3 displays the structure of our typology by representing each node of the tree. We provide the description for each node and definition for each pay-off feature in the appendix. Our typology covers exhaustively the features that presently exist in the market.

INSERT TABLE 1.3

In a second stage, an algorithm scans the text description of the final payoff formula of all the 55,000 products and counts the number of features they contain.[9] This algorithm first runs a lexicographic analysis by looking for specific word combinations in the text description that pinpoint each feature we have defined in our typology. The algorithm identifies more than 1,500 different pay-off features combinations in our data. Then we simply count the number of features to measure complexity. This approach assumes that all the features defined in our typology are equally complex. Like for any index, the equal weighting is a simplification, but it avoids subjective weighting biases. Given the depth of the breakdown we develop, the potential error introduced by equal weighting is probably a minor concern when compared to indexes built on a small number of components.

[9] Each formula description has been translated by the data provider, and only contains the necessary information to calculate the performance of the product.

Table 1.4 shows how our methodology applies to two existing products. While the first product is only made of one feature at the compulsory node: *Call*, the second exhibits three distinct features: *Call*, *Himalaya*, and *Asian option*, indicating a higher level of complexity. The length of the product descriptions also appears to be an increasing function of the number of features.

INSERT TABLE 1.4

Our methodology allows us to identify and measure the complexity of the payoff formula of all the past and currently existing retail structured products, but also that of virtually any new products that might be invented and marketed in the future. A simple typology based on the final product formula with corresponding levels of complexity would indeed not have been satisfying given the high diversity we observe. Our methodology is especially appropriate as far as it allows us to capture the piling up of features we observe in the market. Furthermore, our algorithm can easily be updated to take into account future developments of the market. Updating our algorithm only requires adding a branch to the feature tree when some new features are created.

1.3.2 Results

Figure 1.2 shows the unconditional average complexity of products from our sample by year. Complexity appears to be an increasing function of time, with almost no decrease in its growth trend following the financial crisis.

INSERT FIGURE 1.2

To examine this graphical evidence more formally, we regress our complexity measures on a linear time trend, as well as year fixed effects in a second specification. We control for a battery of products characteristics, such as underlying type, distributor, format, country, volume and maturity. Results are shown in Table 1.5. Both specifications indicate that complexity has been steadily and significantly increasing over time. The coefficient of the linear trend is positive and highly significant. Coefficients on the year fixed effects are increasing with time.

INSERT TABLE 1.5

Despite the widespread view that the financial crisis has driven down the complexity of financial instruments, we find that this is not the case for products targeted to retail investors. This fact points towards product structuring being driven by the supply side of the market, not the demand side.[10] This result is robust to the measure of complexity we use. In section 5 and 6, we explore an industrial organization explanation for this increase in complexity.

We then look into the evolution of the *distribution* of complexity. Figure 1.3 plots the distribution of products from our sample along our complexity index, for three sub-periods. The increase of complexity is not driven only by a fraction of the distribution of complexity, but instead increases across all complexity quartiles. Over time, we observe a decrease in the share of simple products, as well as an increase in the share of the most complex products. This empirical fact is consistent with banks piling up new features on existing pay-off combinations.

INSERT FIGURE 1.3

1.3.3 Robustness Checks

As a first robustness check for our measure of complexity, we use the length of the formula description, measured by the number of characters. Table 1.4 illustrates that the more complex a product is, the higher the number of words needed to describe its payoff.

As a second robustness check, we consider the number of different scenarios that impact the final return formula. The same product formula can indeed vary depending on one or several conditions at maturity or along the life of the product. This measure is close to counting the number of kinks in the final payoff curves, as a change of scenario translates into a point of non-linearity for the pay-off function.[11] We quantify the number of scenarios by identifying conditional subordinating conjunctions such as "if", "when" and "whether" in the text description of the payoff formula. Overall, we observe a correlation around 0.6 between our three different complexity measures, which illustrates that they are coherent and still complementary.

We observe the same increasing trend over the year when using the length of descriptions or the number of scenarios as a complexity measure. Figure A.0 in the appendix provides graphical evidence for this result.

We also consider the possibility that a change in regulation, more specifically the implementation of the MiFID directive on November 1st, 2007, might have led to a different methodology for describing pay-offs, therefore creating a measurement error.

[10]The rise in complexity does not appear to be driven by banks providing additional insurance in the products. On the contrary, reverse convertible features, that expose investors to downside, are more frequent after the crisis than before. This increased popularity is likely to relate to a higher volatility that increases the value of selling options. We discuss further this point in the next session.

[11]However this measure also accounts for path dependency that is not captured by the number of kinks of the final pay-off function.

Our result are robust to this regulation shock for the following reasons. First, the text description we use is extracted from the prospectus and translated by our data-provider based on the same and stable methodology. This description is therefore not impacted by the requirement of additional disclosures, such as backtesting and warnings. In addition, the most significant yearly increase in complexity we observe is anterior to this regulatory change. Finally, we control the time-consistency of the text description by identifying manually products with identical pay-offs features, before and after the MiFID directive was implemented. We find that payoff descriptions remain very similar, and include around the same number of characters.

1.4 Demand-Side Explanations of Financial Complexity

This section discusses possible explanations for the increase in complexity we observe that are based on various aspect of the demand side and their possible evolution.

1.4.1 Catering to Changing Needs and Preferences

A first potential explanation for the increase in complexity that we document is that it is driven by changing consumer preferences or investor needs and a desire of intermediaries to cater to these varying patterns by offering a different portfolio of products. If some product formats or underlying assets require a relatively high complexity, and become popular for instance for tax efficiency reasons, a change in the product mix to cater to such changes could explain the evolution of complexity. Also, assuming that only sophisticated investors use complex products, if unsophisticated investors leave the market, we would observe a rise in average complexity. These explanations have in common that they predict a time-varying composition of the portfolio of structured products that are available and marketed.

Evidence from data goes against this potential explanation. First, as shown in Table 1.5, this trend of increasing complexity is robust to conditioning on format, underlying, distributor and country fixed effects, as well as maturity changes. Therefore our stylized fact cannot be explained by hypotheses that imply a time-varying composition of the market for structured products in terms of product and distributor mix.

Second, volume appears to be a poor predictor of complexity. Total issuance volume follows a hump shape over our sample period, while complexity has been increasing over the whole period. Whereas volumes in 2011 are close to the 2006 level, complexity is significantly higher. Moreover, conditioning on product issuance volume does not remove the significance of the year fixed effects in column 2 of Table 1.5. Also, the decrease in issuance volume after 2007 is in line with other risky products such as ETFs, and does not suggest a massive flee from these types of products vs. simpler ones within the risky financial assets. Overall, change in the composition of the population of retail investors is likely to be low.

1.4.2 Risk Sharing and Increasing Completeness

A second potential explanation for the increase in complexity is that banks are progressively offering products that better suit retail investor demand for risk sharing opportunities and increasingly complete markets. However, several stylized facts in our data appear inconsistent with this explanation.

First, we find that the most complex products are not offered to the most sophisticated and affluent investors, who should possess both the skills required to apprehend these products and the diversified portfolio that these products could complement.

We use the type of the investor's financial institution to proxy for investor sophistication and wealth. Savings banks provide financial services mainly to rural and low to middle class households, whereas private banks mainly focus on high-income individuals. Hence, we group distributors into four categories: savings banks, commercial banks, insurance, and private banks / wealth managers.[12] Table A.1 in the appendix describes the 20 main distributor groups in 2010 and their type. Among them, three are savings banks (the Deutsche Volksbanken and Raiffeisenbanken, the Deutsche Sparkassen and the Spanish Caja de Ahorros), 12 are commercial banks (Deutsche Bank, RBS, KBC etc.) and 2 are private banks or wealth managers (Garantum and J.P.Morgan).

INSERT TABLE 1.6

Table 1.6 displays statistics on the level of complexity per type of distributor. We observe that savings banks, while targeting unsophisticated investors, distribute on average more complex products than the other types of distributors: commercial banks, insurance companies, and private banks/wealth managers. We confirm this unconditional statistics by regressing the product complexity on distributor type dummies, controlling for product characteristics. The second panel in Table 1.6 shows that savings bank products are significantly more complex than the products of the control group, which consists of commercial banks. Moreover, the coefficient on the savings bank dummy is higher than the one on private banks, which target more sophisticated investors.

[12]For example, in Germany, savings banks include Sparkassen (31% market share in 2010) and Volksbanken/Raiffeisenbanken (27% market share), the main commercial banks are Deutsche Bank (5%) and Commerzbank (3%), private banks include Sal. Oppenheim (<1% market share in 2010).

Second, market conditions appear as an important driver of structuring choices. While, under the reasonable assumption that retail investors are more risk averse than financial institutions, the demand for protection should increase with market volatility, we observe the opposite: the share of products exposed to tail risk increases with volatility.

INSERT FIGURE 1.4

Figure 1.4 illustrates the evolution of both short volatility products - products that perform well if volatility decreases during the life of the product - and the implied volatility index on European stock markets (VSTOXX).[13] [14] We observe that the ratio of short volatility products increases when implicit volatility is high, an effect that is observable even after the financial crisis. This finding suggests that instead of matching investors' needs, financial institutions exploit market conditions to inflate investor expectations, as products including selling options can offer higher returns, although at a higher risk, when volatility is high.

Finally, if complex products indeed better match demand of retail investors, they should have been marketed as soon as they were invented. Although research and development of financial products is costly and therefore can take some time to implement, innovations we observe in the retail market for structured products are minor and could have been quickly disseminated.

1.4.3 Gambling Products

A third explanation for complex products is that these products would represent gambling opportunities. Gambling within financial markets is a documented behavior in the literature (Kumar (2009)). Although this hypothesis can hardly account for the *increase* in complexity unless there would be an increasing appetite for gambling, it is worth considering as an explanation for the existence of complex products. First, a large fraction of the products in our sample presents the opposite payoff of a lottery: they provide a small gain with a high probability, and a large loss with a small probability, as they are implicitly selling options. These pay-offs could however be consistent with prospect theory, if retail investors underweight the real probability of extreme events. Second, our analysis does not cover the type of products that would be most amenable to gambling motives, namely pure optional products, such as turbos and warrants, which present lottery like pay-offs (low probability of a very high gain). These products appeal to a small investor

[13] The most popular underlying in the market is the Eurostoxx 50.

[14] Features corresponding to a short volatility exposures are: reverse convertible, cap, knock out, and callable products. Reverse convertible products are implicitly selling a put option, leading to downside exposure to the underlying. On the opposite, cap, knock-out and callable features limit the product upside when market volatility is high.

base that is not representative for the retail structured market. Another problem for the gambling hypothesis is that some households invest a significant fraction of their financial wealth into these products, for instance through life insurance products. For example, life insurance contracts, where investments are concentrated and these products are popular, constitute more than 26% of household financial wealth in Europe.[15] In addition, the numerous examples of households suing banks in the UK, France, Germany, Switzerland and Spain, due to poor product performance, seem to contradict the hypothesis that this market essentially exists for households that want to gamble. For example, in September 2008 CHF700 million invested in capital guaranteed products structured by Lehman Brothers were lost, which led to litigation.

All these potential explanations for the increasing complexity in retail financial products appear to not withstand the stylized facts we observe in our data. A final possible explanation is that in the retail market for structured products banks compete through complexity. The next section details a relevant theoretical framework and provide evidence consistent with this hypothesis.

1.5 The Strategic Use of Financial Complexity

1.5.1 Theoretical Considerations

Our research hypothesis is that firms use complexity to mitigate competitive pressure. This section discusses theoretical models on product complexity in competitive markets that support this hypothesis. There are two main rationales for consumer obfuscation, which is a purposeful increase in complexity to make a product pricing or design harder to understand. One rationale is to increase search costs, which leads to oligopoly pricing (e.g., Salop and Stiglitz (1977); Varian (1980); Stahl (1989)) or even monopoly pricing (Diamond (1971)). Another rationale is to price discriminate between sophisticated and unsophisticated consumers by adding expensive facultative "add-ons" or "shrouded attributes" to a base good (Ellison (2005) and Gabaix and Laibson (2006)). When applied to financial markets, this price discrimination strategy translates into making price disclosure more complex (Carlin (2009), Carlin and Manso (2011)). In the following subsections, we discuss the theoretical literature and develop two testable implications. First, complex products should be more profitable than simpler ones. Second, when the level of complexity is endogenously determined by firms, complexity should increase along with competition to preserve markups.

[15]Source: Household Finance and Consumption Survey, available at www.ecb.europa.eu.

A. Increasing Search Costs to Charge Oligopoly Prices

Consumer search costs impact markups, as they allow firms to charge oligopoly prices (see Diamond (1971); Salop and Stiglitz (1977); Varian (1980); Stahl (1989)). Stahl (1989) considers a model of search with perfect recall in which only a fraction of consumers incur a search cost. The model produces price dispersion. As search costs increase, price dispersion changes smoothly from marginal cost prices to monopoly prices, and firm profits increase.

Product complexity in retail finance is likely to increase search costs. Indeed, it takes more effort to compare the pricing of financial products with three payoff features than products with only one feature, as there are more dimensions to simultaneously compare on. An alternative approach that links search costs with product differentiation is the model from Hortacsu and Syverson (2004) in the index mutual fund industry. Their model incorporates investors' taste for specific attributes, and search frictions that deter investors from finding the fund offering them the highest utility.[16] This theoretical background leads to our first empirical prediction that more complex product should exhibit higher markups.[17]

B. Price discriminating through complexity

In Ellison (2005), and Gabaix and Laibson (2006), firms offer a base good that can be coupled with "add-ons", or "shrouded attributes" that are more profitable. Firms sell products to two categories of investors: sophisticated and unsophisticated ones. Sophisticated consumers observe the price of the shrouded attributes, whereas unsophisticated consumers do not. In equilibrium, only unsophisticated investors buy shrouded attributes in addition to the base good. By providing clear information on shrouded attributes a firm would only attract sophisticated consumers who pay less (Ellison (2005)), or decrease the fraction of unsophisticated consumers (Gabaix and Laibson (2006)) and therefore reduce profits. Consequently, firms offer complex products at equilibrium and make large profit despite the competitive pressure.

The discrimination strategy between sophisticated and unsophisticated consumers

[16] Products from our study are likely to simultaneously appeal to some taste and increase search frictions.

[17] Robert and Stahl (1993) in a search cost model with perfect recall show that as competition increases, firms decrease the level of information they disseminate in the market. Consumers are ex ante identical and firms can inform some of them through advertising at a cost increasing and convex in the fraction of informed consumers. As competition increases, the incentive to inform consumers decreases since the chance to capture informed consumers decreases. Rational firms tend to withdraw from the advertising competition and content themselves with their local monopoly of uninformed consumers. One could regard advertising as an action that educate investors about the price structure of retail financial products and hence reduce their complexity. However the assumption on advertising cost is not directly transposable to the market of this analysis.

applies well to retail market for structured products. In this market, financial firms can sell a base good, for instance a call-type product, to which they add facultative payoff features, such as a cap on the gain at maturity, or an Asian option feature.[18]

When applying price discrimination to financial products, Carlin (2009) develops a model in which the share of unsophisticated/uninformed consumers is endogenous and results from the level of complexity chosen by the financial firms offering the products. Financial firms create ignorance by making price disclosure more complex. Sophisticated investors or experts are fully informed about prices independent from the level of complexity, and buy from the firm offering the lowest price, while uninformed investors purchase the good from a randomly chosen firm. Hence, each firm both captures a fraction of the unsophisticated consumers, and can win demand from the experts. When competition intensifies, the chance to obtain a share of the experts decreases. To compensate for this decrease in potential profits, each firm increases product complexity and therefore the fraction of unsophisticated investors they capture. Firms increase strategically product complexity to preserve profits in the face of a higher competition.

Finally, we write a simple model presented in the appendix. This toy model is derived from Carlin (2009), but differs in that consumers are heterogeneously distributed across firms and may face switching costs. Therefore, the price and complexity strategy of firms depends on the fraction of consumers they capture *ex-ante*. With two categories of investors, experts and uninformed consumers, and the presence of switch costs, this model is at the intersection of the two strands of theoretical literature we have explored. Firms' tradeoff is between offering a complex product at a high price to the fraction of uninformed consumers they capture or competing for experts. This tractable model leads to three results we observe in our data: first, firms targeting unsophisticated consumers offer relatively complex products, second, complex products are more profitable than simple ones, and third, firm entry leads to increasing complexity.

1.5.2 Financial Complexity and Product Profitability

This section presents calculations of the markups of the 101 retail structured products that were issued in Europe in July 2009 with the Euro Stoxx 50 index as an underlying. We define markup as the difference between the offering price and the fair market value we calculate through a local volatility model. We find that markups are increasing with product complexity.

We focus on a restricted sample in terms of period and underlying in order to maximize accuracy and within sample comparability. First, opting for a sample of products with

[18]In an asian option, the value of the payoff depends on the average price of the underlying asset over a certain period of time as opposed to at maturity.

the same underlying ensures that heterogeneity in complexity only comes from the pay-off formula, and not from the underlying assets. In addition, the choice of a single index as an underlying allows us to discard any measurement errors in terms of implied correlation, as opposed to products linked on a basket of stocks. Second, the Eurostoxx 50 index is one of the most liquid financial indexes, and is the most frequent underlying asset for the products in our total sample. Eurostoxx 50 options with various moneyness and maturities trade daily on several exchanges with tight bid-ask spreads. High quality and detailed volatility data is therefore available from the market places, which is key for pricing accurately these complex products.

Third, by focusing on a short time window we ensure comparability of market conditions. We choose July 2009 as the number of issuances and heterogeneity of products linked to Euro Stoxx 50 during this month was the highest recorded since market inception. Focusing on a specific month and estimating all the products issued during this month is a consistent first step of our analysis.[19] The next step of our analysis will be to do the same exercise for July 2007 and July 2011, to confirm that our results are robust when we expand the estimation period. We could also test whether the relationship between markup and complexity varies across time.

A. Methodology

We estimate the fair value of our sample of retail structured products based on a local volatility diffusion model in which the underlying asset follows the following diffusion:

$$\frac{dS_t}{S_t} = r_t dt + \sigma\left(t; S_t\right) dW_t \tag{1.1}$$

where S_t is the price of the underlying, $\sigma(t; S_t)$ is the volatility surface as a function of maturity and underlying spot price, W_t is a Brownian motion, and $r(t)$ is the interest rate yield.

Using a local volatility specification, in contrast to a simple Black and Scholes formula, is key for pricing the considered products since they frequently possess deeply out of the money embedded options, such as an implicit sale of put options, or a cap on the final pay-off.[20] Models of stochastic volatility may improve the accuracy of the pricing (Dumas et al. (1998)) but are challenging to calibrate. Moreover, the purpose of our pricing exercise is to identify at which price structuring banks can hedge the pay-off, which they assess using local volatility models. Retail structured products pay-offs are largely path

[19]This methodology is more rigorous than choosing products randomly over different dates, as we could not efficiently control for time fixed effects due to the small size of the sample.

[20]Henderson and Pearson (2011), or Jorgensen et al. (2011) use constant volatility but look mainly at products with at the money options.

dependent. To account for this specificity, we use the Least Square Monte Carlo (LSM) methodology (Longstaff and Schwartz (2001)), which is well recognized and implemented by both academics and professionals. Performing accurately this calculation-intensive methodology that includes both volatility surface and path dependence was helped by the use of the Lexifi pricing tool.

Our implied volatility data is from Eurex, the largest European derivative exchange. We use the EUR swap rate curve to discount cashflows, which we obtain from Datastream. The daily stock prices and the historical values of the interbank rates (Euribor) are collected from Bloomberg. We finally compute a constant dividend yield from future prices that are also extracted from Bloomberg.

We estimate the hidden markup of the products as the difference between the issuance price, which is typically indicated on the prospectus of the product, and the fair price we calculate with our asset pricing methodology. Appendix B provides detailed information on each product we price, as well as the corresponding hidden markup we calculate.

B. Results

We find an average markup of 2.4% without including disclosed entry and management fees. Our estimates are lower than in Henderson and Pearson (2011), and we obtain 27 products with negative markups. All these negative markups correspond to products that provide funding to the bank issuing them, as they are not collateralized. Therefore, we should discount the fair value by the funding cost of the bank for these products. When discounting, we do not observe anymore negative markups, except for two cases. Additionally, when we add disclosed fees to hidden markups, we obtain an average profitability of 6.0%.

The purpose of our pricing exercise is to identify a relationship between product complexity and profitability. Thus, the cross section of markups within our sample matters the most, while a systematic error would not bias our analysis. We estimate the following cross-sectional regression of product markups on our main complexity proxy:

$$YearlyMarkup_i = \alpha \times \mathit{NbPayoffs}_i + \beta \times X_i + \epsilon_i \tag{1.2}$$

where $YearlyMarkup$ is the difference between the issuance value and the fair value we estimate, normalized by the product maturity, *NbPayoffs* is the number of payoffs embedded in the structured product formula as a measure for its complexity, and X_i is a vector of product level controls. As discussed earlier, we include a dummy *Credit Risk* for products that are non-collateralized, as they provide funding to the issuer.

INSERT TABLE 1.7

Table 1.7 presents the results. We find a statistically and economically significant relationship between complexity and profitability. This result is highly significant despite the small sample size. One additional feature in a payoff formula translates into an increase in the yearly markup by 0.28 percent of the notional. With an average maturity of 5.5 years it corresponds to an increase of around 1.5 percent of the notional of the total markup, or half of the average markup. This result does not depend on the complexity measure we use: an additional scenario and a one standard deviation variation in the length of the description leads to an increase in the yearly markup of respectively 0.27 and 0.24 percent (see appendix). To address composition effect concerns, we add additional controls to our baseline specification. Column 2 of Table 1.7 shows the coefficients when we control for distributor fixed effects.[21] In column 3, we control for the primary feature fixed effects, to ensure that our result is not driven by some specific types of products. Column 4 adds fixed effects for the 4 most frequent facultative features.[22] In column 5, we add disclosed fees to the hidden markup, and use this total profitability measure as the dependent variable. Finally, column 6 shows an additional robustness check: we use markup calculated with a Partial Differential Equation methodology as a left-hand side variable.[23] For all these specifications, we find a significant and robust positive relationship between product complexity and markups. These results show that the more complex a product is, the more profitable it is for the bank to structure it. The economic significance of this result is high, explaining the strong incentives banks have to issue complex products.

C. Ex post performance

Finally we test whether the relatively high level of *ex ante* markup at the issuance of more complex products translates into relatively low *ex post* performance. We find a negative relationship between product complexity and performance, which is consistent with higher complexity being associated with higher profits that are absorbed by the banks.

Performance is an important criterion to analyze the impact of financial complexity on investor surplus, as higher hidden fees could be offset by superior product performance. Our database includes the final performance for 48% of the growth products that matured before 2011.[24] We substitute yearly performance to yearly markup in the previous

[21]There are 35 different issuers in our sample.

[22]Among them, we find that the reverse convertible feature implies significantly higher markup of 0.7 percentage points.

[23]We obtain a smaller number of observations as some products present a computational challenge due to their path-dependent nature.

[24]Germany and Austria are excluded from this analysis as the performance ex post is not available for these countries. We only include growth products, as they offer a unique flow at maturity, and therefore

specification:

$$YearlyPerf_i = \alpha \times NbPayoffs_i + \beta \times X_i + \epsilon_i \tag{1.3}$$

Where *YearlyPerf* is the ratio of the final pay-off minus the issuance price, over the issuance price, which is then normalized by the product maturity, *NbPayoffs* is the number of payoffs embedded in the structured product formula as a measure of its complexity and X_i is a vector of product level controls. Because our sample covers around 7,500 products and spans over several years, we are able to include underlying and year fixed effects.

INSERT TABLE 1.8

Table 1.8 presents the OLS regression coefficients of the annualized performance on product complexity. We observe a significant negative correlation between a product complexity and its performance, despite our battery of controls. Complexity seems therefore to reduce investor surplus ex-post. To ensure that different levels of risk related to the levels of complexity do not drive our results, we control for feature fixed effects, which for instance capture whether the initial capital invested is guaranteed at maturity. Our results hold for each of the three measures of complexity. We also restrict the sample to Eurostoxx 50 products in columns (2), (4), and (6) to maximize comparability of performance, but the result does not change.

1.5.3 Complexity and Competition: The impact of ETF entry on complexity

In this subsection, we exploit the staggered entry of a new but simple product across European countries - Exchange Traded Funds or ETFs - as an exogenous shock to the competition environment of the retail market for structured products. This shock has first been used by Sun (2014) in the US to study the price impact of competition on active management investment products.

The entry of ETFs represents an increase of competition for retail structured products, as ETFs can be offered as a substitute to these products. Both ETFs and retail structured products belong to the segment of passive management funds. Additionally, ETFs are simple products whose price is easily observable by sophisticated investors. Their linear pay-offs make them easy to comprehend for an investor and their cost - which consists in disclosed management fees -is also easy to observe and low. These characteristics

do not pay any coupon during the life of the product.

make ETFs an excellent fit for the theoretical framework we previously described. The prediction is that entries of simple products should help banks to discriminate between sophisticated and unsophisticated investors.

A. Measuring ETF entries

The first challenge of using ETF entries in Europe lies in the identification of the date when ETFs were first commercialized across European countries. Even more relevant to our analysis is the date when investors' attention turned to these products. We use Google Trend, focusing on the use of the search-term "ETF", to accurately capture this timing. The country-level time series provided by this tool allows us to identify in which month "ETF" started being used as a search-term by Internet users. This time corresponds to when the ETF asset class starts drawing interest from potential investors in the considered country. To avoid measurement errors, we check that "ETF" does not mean anything other than "Exchange Traded Fund" in the different languages of our sample countries. We also check in Factiva that this first occurrence in Google Trend is contemporary to media coverage. This analysis reveals that ETF entries have been staggered across European countries, with entry years spanning from before 2004 (when Google Trend starts) for Italy to 2010 for Poland.

B. Difference in differences on the impact on complexity

We exploit the staggered nature of ETF entries to implement a difference-in-differences methodology, allowing a clean identification of the impact of the competition shock on complexity.

INSERT FIGURE 1.6

Figure 1.6 plots the average evolution of complexity before and after ETF entry in each country. While there is no clear trend prior to the entry, the average complexity in the retail market for structured products rises significantly after ETF entry.

We confirm this graphical evidence by estimating the following model, at the country-year and distributor-country-year level:

$$Y_{d,c,y} = \alpha + \beta \times Treated \times post + \delta_y + \theta_c + \gamma_d + \epsilon_{d,c,y}$$

where $Y_{d,c,y}$ is the average complexity for distributor d, in country c and in year y. $Treated$ is a dummy equal to one for the countries where ETFs have been introduced, and *post* is a dummy equal to one for the years after the first occurrence of ETF as a search-term. As more than half of the product distributors are present in several countries, we put distributor fixed effects (γ_d) in addition to year (δ_y) and country fixed effects (θ_c).

Thus, we effectively identify the difference in offer for the same distributor when ETFs are available as potential substitutes to structured products and when they are not.

INSERT TABLE 1.9

Results are shown in Table 1.9. We find a positive and significant impact of ETF entries on the aggregate level of complexity, both at the country level (Panel A) and distributor-country level (Panel B). As we are using distributor fixed effects for Panel B, we show that the same distributors offer more complex products in countries where ETFs are available than in countries where they are not. This result is even robust to distributor-year fixed effects, which minimizes concerns over the potential self-selection of the distributors active in a given year.

We also find that the effect of ETF entry on product complexity is robust when excluding the most simple products of our analysis, i.e. the products with only one pay-off (see columns 4 and 5 of Panel A). This result shows that ETF entries do not only create a substitution effect, but that they actually contribute to an aggregate increase in complexity.

C. Endogeneity Concerns for ETF Entries

Quantitatively, we also re-run our difference-in-differences methodology, including interaction terms between treated and a dummy equal to one for the year preceding the ETF entries. While we find that the initial interaction term is still statistically significant, this additional term is not significant, which points toward the absence of a pre-existing increasing trend of complexity prior to the ETF entry. Moreover, discussions with practitioners point towards ETF entries being mainly driven by institutional details at the country level. One of the main drivers is the obtention of eligibility for tax-efficient schemes, such as life-insurance.

1.5.4 Complexity and Competition: Number of Competitors in the Retail Market for Structured Products

As a final step, we assess the impact of the number of competitors in the retail market for structured products on complexity, thus exploring a complementary dimension of competition.

A. Methodology

We use panel data at the country and distributor level spanning respectively 15 countries and 486 distributors to empirically test our theoretical framework.[25]

[25]Two countries are excluded due to low representativeness: Hungary and Poland. Volume sold since

We measure competition intensity by computing the number of competitors in the retail market for structured products per year in each country. This measure corresponds to our theoretical framework that focuses on market entries, as opposed to distribution of market share. To ensure that the distributors we identify are independent competitors, we match our data with Bankscope and regroup distributors by holding companies. We regroup savings banks of the same network, such as Sparkassen in Germany or Cajas in Spain into the same provider group as their geographical coverage does not overlap nationally. Hence, we identify 471 competitors that have been active one or more years over the period 2002-2010 in the retail market for structured products.

We measure average financial complexity with two different panels: one at the country-year level and another one at the distributor-country-year level. For each panel we compute a volume weighted average of the previously described complexity indexes: number of payoff features, description length and number of scenarios.

B. Country Panel

We estimate the following panel data regression, at the country level:

$$Y_{c,y} = \alpha + \beta * Competition_{c,y} + \delta_y + \theta_c + \epsilon_{c,y} \tag{1.4}$$

where $Y_{c,y}$ is the average complexity in country c in year y. $Competition_{c,y}$ is the number of distributors active in the retail market for structured products in country c and year y. Country fixed effects θ_c control for time invariant determinants of product diversity, such as the size of the market for example. Year fixed effects δ_y control for aggregate shocks or common trend in the retail market for structured products. We compute robust standard errors. The parameter of interest is β, which measures the impact of an increase in the number of competitors on product diversity. We observe in column 1 that the level of financial complexity increases as competition intensifies. This result is consistent with our theoretical framework. We substitute the number of distinct product types sold in country c in year y as a dependent variable in column 2, and find that this increase in complexity is concomitant with a higher differentiation of the product offer at the country level. We find that the number of product types also increases when competition intensifies.

INSERT TABLE 1.10

C. Distributor-Country Panel

inception has been lower than 10 million euros in these countries. Norway is not taken into account over the period 2008-2010 due to a ban on selling structured products to retail investors.

To deepen our analysis, we conduct a similar estimation at the distributor-country level. This level of analysis allows us to put distributor fixed effects and absorb unobserved variables that are unvarying at the distributor level. More precisely, we estimate the following model:

$$Y_{d,c,y} = \alpha + \beta * Competition_{c,y} + \delta_y + \theta_c + \phi_d + \epsilon_{d,c,y} \tag{1.5}$$

This specification partially addresses endogeneity concerns. Indeed, we look at how distributors adapt depending on the level of competition of the market in which they participate. We exploit the fact that 51% of the providers participate in more than one market. Sources of endogeneity at the country and distributor level are therefore addressed by our fixed effects.

We observe that distributors adapt indeed their offer to the level of complexity: the same distributor will offer relatively more complex products in a relatively more competitive national market. This result is consistent with competition having a causal effect on financial complexity.

D. Robustness

To ensure that our results are not driven by a systematic measurement error in our complexity index, we implement robustness checks for each of our results, using both the number of scenarios and the length of the description. These tests reinforce our results as the coefficients remain of the same sign and significant in almost all our specifications. Results are displayed in the online appendix.

1.6 Conclusion

Identifying the drivers of financial complexity is key to our understanding of financial markets. We use unique data on the European retail market for structured products to study financial complexity, allowing a neat identification of its location and drivers. In this paper, we first develop an innovative measure of the complexity of retail structured products based on a lexicographic analysis of the prospectus of 55,000 products. This measure shows that complexity has been significantly increasing in this sizable market. We then consider several explanations for this increase. Composition effects, or increasingly complete markets for retail investors, do not appear as satisfactory explanations when analyzing our data.

We therefore focus on the hypothesis that distributors use complexity to mitigate competitive pressure. Our theoretical framework, which includes a toy model in the appendix, yields two main empirical implications that we test using our dataset. Uninformed consumers tend to overpay products when they cannot observe their prices, as documented by several papers (Anagol and Cole (2013), Anagol and Kim (2012), Choi et al. (2010)). We calculate the fair-value and markup of a representative sub-sample of our products using Monte-Carlo simulations with local volatility diffusions. We find that the more complex a retail structured product is, the more profitable it is for the bank. An ex-post performance measure of retail structured products confirms that these relatively high level of markup translates into relatively low performance for more complex products.

Finally, when investigating the relationship between complexity and competition in our data, we find evidence of a causal relationship. We find that the average complexity increases when a simple substitute product enters the market, or when the number of competitors increases. In combination with our results on product performance, this finding represents evidence of a potentially pernicious effect of competition and raises the question of regulation and investor protection in retail finance.

1.7 Figures and Tables

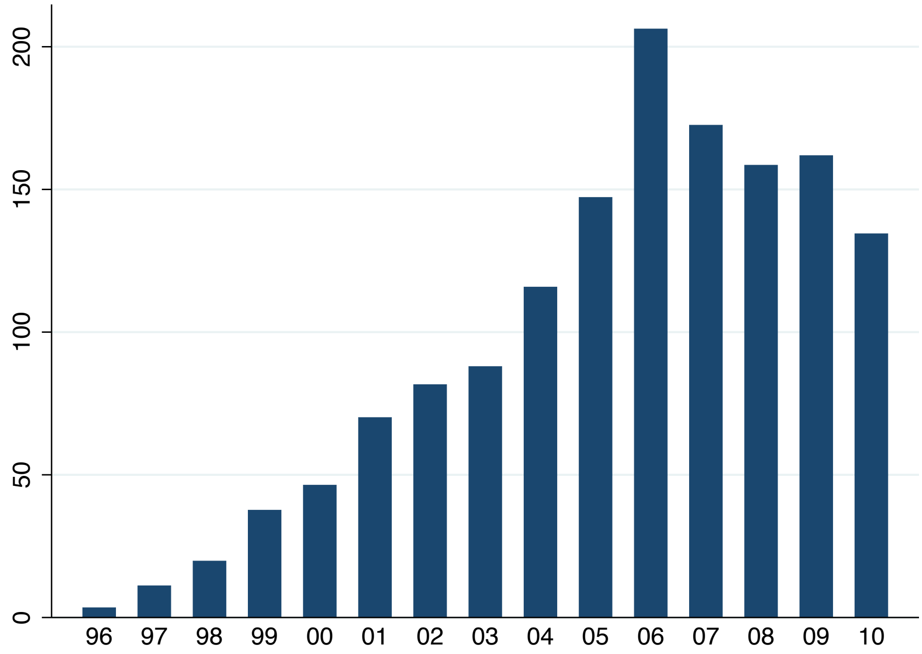

Figure 1.1: Volume Sold per Year, in billion euros

This figure shows volume issuance of tranche retail structured products over the period 1996-2011 in the European market, in billion Euros. Included countries are the following: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Spain, Sweden, UK. Source: Euromoney SRP

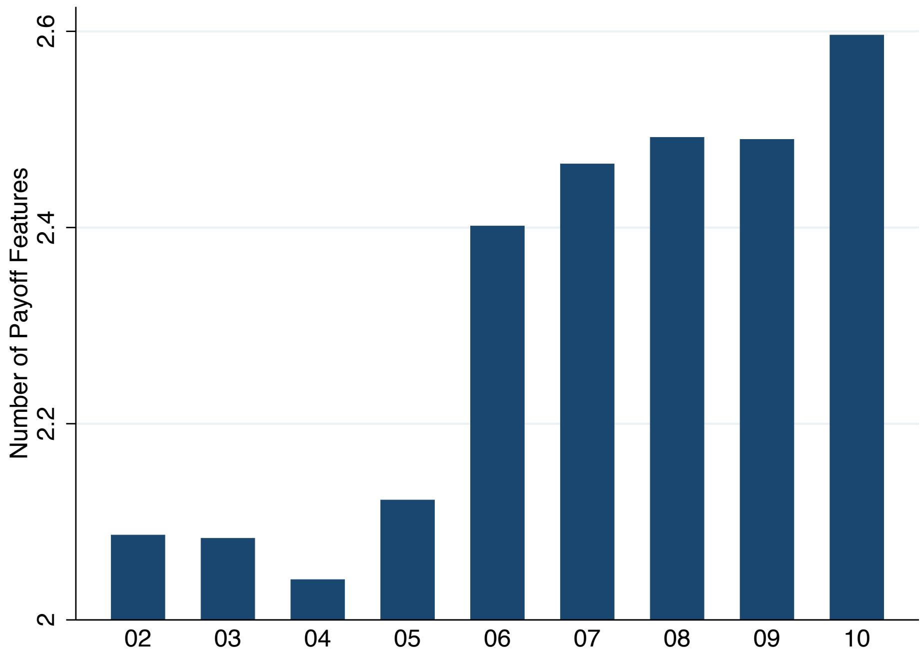

Figure 1.2: Average Product Complexity by Year

This figure shows the average complexity of retail structured products by year. The sample covers 55,585 products from 17 European countries. Complexity is measured as the number of features embedded in each product payoff formula. We obtain this complexity measure through a lexicographic analysis of the detailed text description of the final payoff formula(from Euromoney SRP).

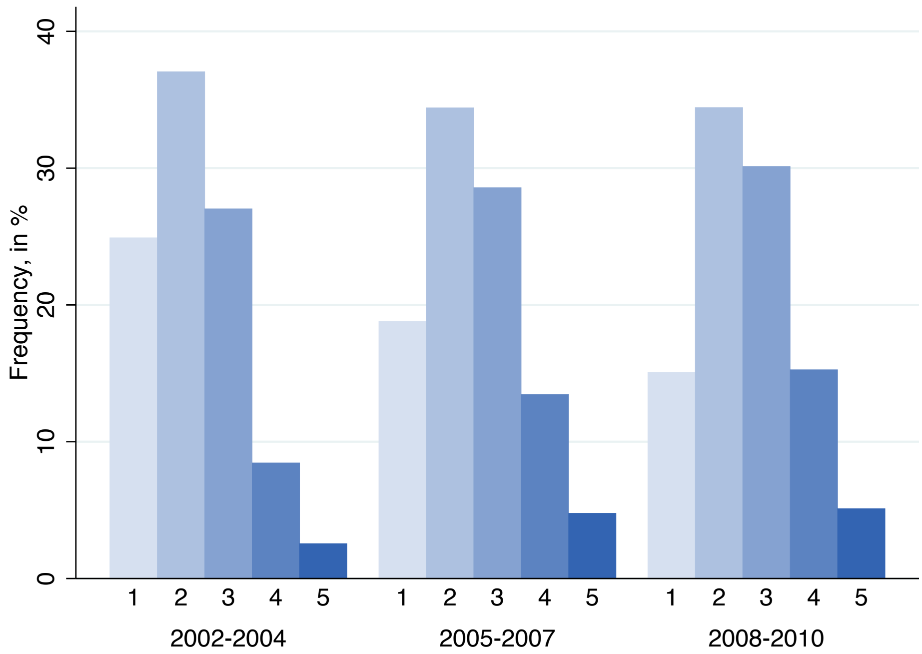

Figure 1.3: Evolution of the Distribution of Product Complexity

This figure shows the evolution of the distribution of our complexity variable over three periods: 2002-2004, 2005-2007 and 2008-2010. The sample covers 55,585 products from 17 European countries. Complexity is measured as the number of features embedded in each product payoff formula. We obtain this complexity measure through a lexicographic analysis of the text description of the final payoff formula (Source: Euromoney SRP).

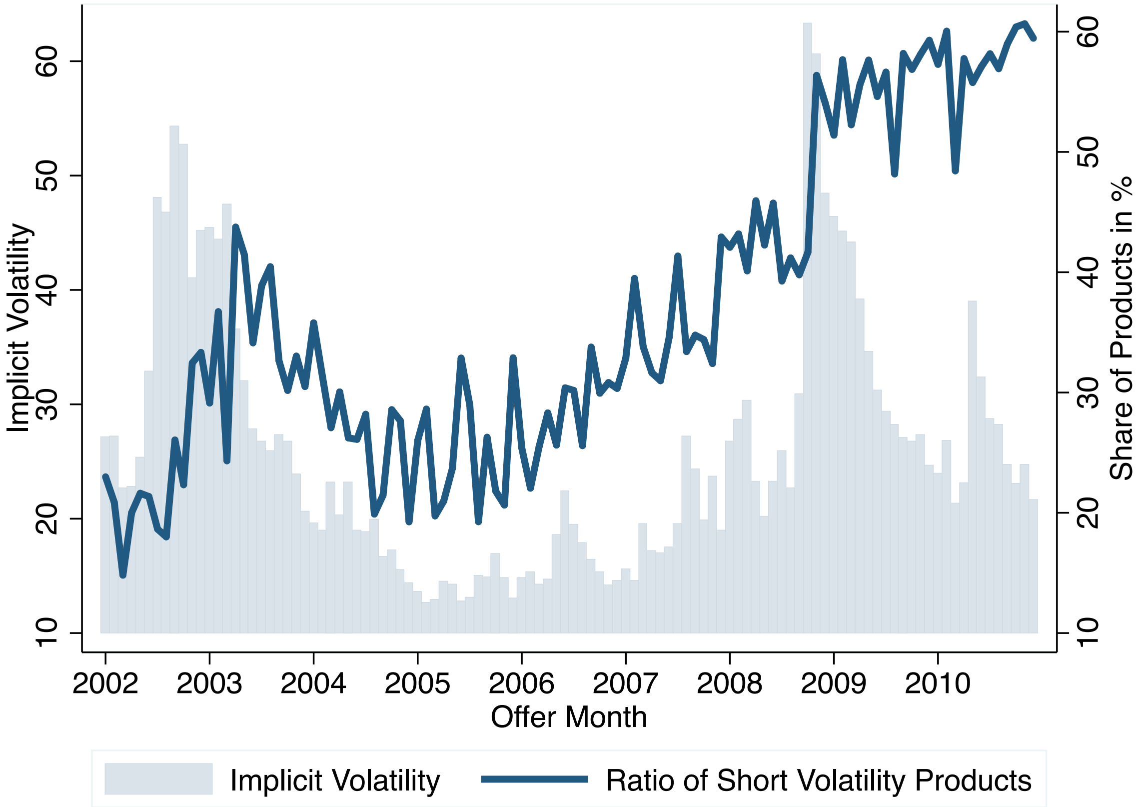

Figure 1.4: Ratio of Short Volatility Products and Implicit Volatility

This figure shows the share of short volatility products issued each month and the level of the implicit volatility index over the 2002-2011 period. Short volatility products include products with one or several features that induce either a loss when the underlying index drops below a certain threshold or a cap on the final payoff when the underlying index is above a certain threshold. These features are defined in the Appendix. Implicit volatility is measured by the implied volatility index on European stock markets (VSTOXX, Source: Datastream).

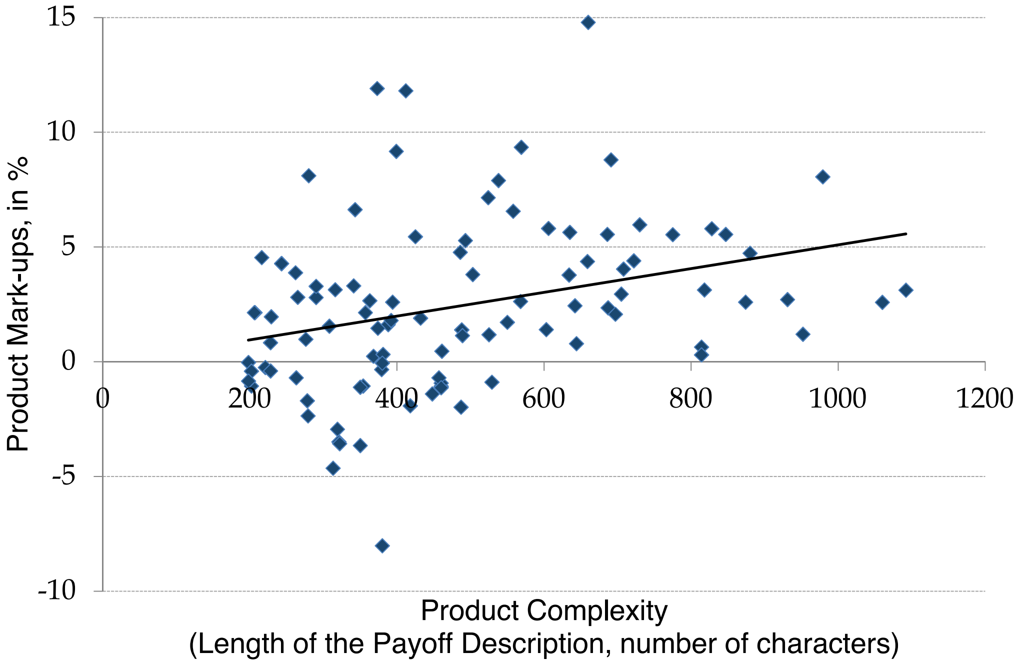

Figure 1.5: Description Length and Product Markups

This figure plots the markup of a product over its level of complexity for 101 products issued in July 2009 and indexed to the Eurostoxx 50. Complexity is measured by the number of characters used in text description of the payoff formula of each product. We define markup as the difference between the offering price and the fair market value we calculate through a local volatility model. We use the Longstaff and Schwartz OLS MonteCarlo pricing methodology in order to account for path dependence (Longstaff and Schwartz (2001)). Markups are expressed in % of notional, length in number of characters. Pay-off descriptions are from Euromoney SRP.

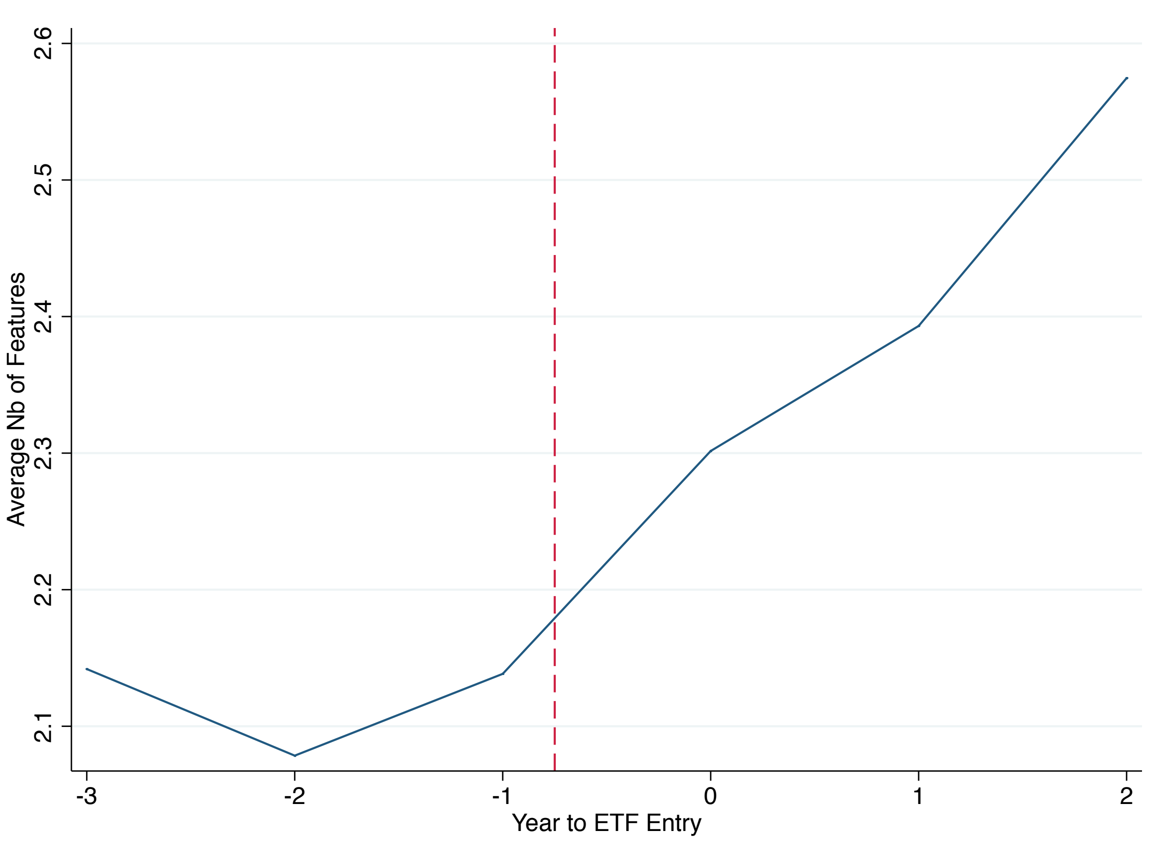

Figure 1.6: ETF Entry and Financial Complexity

This figure plots the average product complexity as a function to the distance to ETF entry. The complexity is defined as the number of payoff features as developed in section 3. The ETF entry is measured by the appearance of the search-term "ETF" in Google Trend.

Table 1.1: Country-Level Summary Statistics

Country	**Total Issue**	**Number of Products**	**Number of Distributors**	**% of Fin. Savings**	**% of Mutual Funds**
	Since 2002	*Since 2002*	*Since 2002*	*2010*	*2010*
	(Billion Euros)			*(Percent)*	*(Percent)*
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Italy	343	5,724	79	2.8	28
Spain	204	4,734	60	2.8	37
Germany	162	14,861	43	2.3	22
France	158	1,801	73	2	12
Belgium	135	4,021	46	8.5	69
UK	110	6,135	141	1.1	8.3
Netherlands	37	2,741	36	1.1	30
Sweden	34	4,529	31	2	9
Portugal	24	928	24	3.2	73
Austria	20	3,275	42	3.3	28
Denmark	17	563	31	.82	7.2
Ireland	16	1,075	40	2.1	.91
Norway	15	1,288	25	.28	1.6
Finland	9	1,251	25	2.1	9.3
Poland	8	1,518	45	1.5	19
Czech Rep.	6	939	24	2.8	45
Hungary	2	202	15	1.9	22
European Market	*1,300*	*55,585*	-	*3*	*12.9*

This table reports the aggregated volume of retail structured product issuance (column (1)), the total number of products sold since inception (column (2)) and the number of distributors in each national markets (column (3)). Column (4) shows the penetration rate of retail structured products defined as the share of household financial savings and column (5) compares the size of assets under management of retail structured products to the one of the mutual fund industry. Retail structured products can take the form of a structured note, which is not included in the mutual fund industry. Figures in the table only include tranche products which are non-standardized structured products, with a limited offer period and a maturity date and which stand for 90% of the market in terms of volume. Flow products (e.g. bonus and discount certificates) and leverage products (e.g. warrants and turbos) are excluded (they stand for more than 1 million issues since 2002 but only 10% of the market in terms of volume). Data is from Euromoney Structured Retail Products.

Table 1.2: Product and Distributor Summary Statistics

Variable	**2002-2004** (1)	**2005-2007** (2)	**2008-2010** (3)	**Full Sample** (4)
Underlying Type (in %)				
Equity	82.1	77.5	70.5	76.6
Single Index	*36.2*	*35.9*	*36.9*	*36.1*
Single Share	*2.9*	9.5	7.5	8.1
Basket	*42.9*	*32.1*	*26.1*	*32.3*
Interest Rate	5.1	4.5	13.9	6.6
Commodity	0.6	5.5	4.0	4.5
FX Rate	1.8	3.1	4.6	3.2
Other	10.4	9.5	6.9	9.1
Distributor Type, Number (Market Share, in%)				
Commercial Banks	102 *(40.8)*	132 *(41.0)*	133 *(37.4)*	172 *(36.7)*
Saving Banks	21 *(8.4)*	20 *(6.2)*	24 *(6.7)*	28 *(6.0)*
Private Banks	94 *(37.6)*	123 *(38.2)*	152 *(42.7)*	202 *(43.1)*
Insurance	23 *(9.2)*	30 *(9.3)*	31 *(8.7)*	40 *(8.5)*
Other	10 *(4.0)*	17 *(5.3)*	16 *(4.5)*	27 *(5.8)*
Total	250	324	357	471
Product Format (in %)				
Non Collateralised Assets	61.0	83.9	88.4	81.7
Security	*44.6*	*69.7*	*76.6*	*67.7*
Deposit	*16.5*	*14.2*	*11.8*	*14.0*
Collateralised Assets	39.0	16.1	11.6	18.3
Life Insurance Product	*6.9*	*6.3*	*4.6*	*6.0*
Fund	*31.8*	*9.6*	*7.0*	*12.1*
Pension	*0.3*	*0.2*	*0.1*	*0.2*
Volume (in million Euros)				
Mean	38.6	18.6	14.9	20.5
10th percentile	5.9	3.5	2.0	3.2
90th percentile	84.0	30.0	27.0	40.0
Product Design				
Capital Guarantee (in %)	82.3	62.0	55.4	60.9
Average Maturity (in years)	5.0	4.3	4.0	4.2

This table reports summary statistics of characteristics of retail structured products in terms of underlying asset, distributor type, format, volume and design. The sample covers 55,585 products from the 17 European countries listed in Table 1, and data is from Euromoney SRP.

Table 1.3: Typology of Retail Structured Product Features

	Families of Facultative Features						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
	Initial Subsidy	**Underlying Selection**	**Exposure Modulation, Downside**	**Exposure Modulation, Upside**	**Path Dependance**	**Exotic condition**	**Early Redemption**
	↓	↓	↓	↓	↓	↓	↓
Main Feature							
1. Call →	*Final Product:*						
2. Put→	*Each product includes one main feature*						
3. Spread→	*and 0 to 7 facultative features*						
4. Pure Income→	*with a maximum of 1 per family*						
5. Digital→							
6. Floater→							

This table describes how a pay-off formula is broken down into distinct features. Each family of facultative features contains features that are mutually exclusive. A structured product possesses exactly one main feature, which defines the primary structure of the product. Details of each feature are provided in appendix.

Table 1.4: Measuring Complexity

	Example 1: Unigarant: Euro Stoxx 50 2007	**Example 2: Vivango Actions Mars 2017**
Details		
Year	2002	2010
Country	Germany	France
Provider	Volksbanken Raiffeisenbanken	La Banque Postale
Description	This is a growth product linked to the performance of the DJ Eurostoxx50. The product offers [*100% capital guarantee at maturity*]$^{(1)}$ along with a [*predetermined participation in the rise of the underlying*]$^{(1)}$ over the investment period *[...]*$^{(x)}$: Text identifying Payoff x	This is a growth product linked to a basket of 18 shares selected as being the largest companies by market capitalization from within the eurostoxx50 at the time the product was launched. Every year, the average performance of [*the three best-performing shares*]$^{(2)}$ in the basket compared to their initial levels is recorded. These three shares [*are then removed*]$^{(2)}$ from the basket. At maturity, the product offers [*a minimum capital return of 100%, plus 70% of the average of these performances*]$^{(1)}$ [*recorded annually throughout the investment period*]$^{(3)}$.
Payoff Features	Call	Call - Himalaya - Asian Option
Complexity Measures		
Nb Payoffs	1	3
Nb Scenarios	1	1
Length	226	537

This table displays two real-life examples of product description, and shows how we convert these text descriptions into quantitative measures of complexity.

Table 1.5: Increasing Complexity

	Nb Payoffs		Nb Scenarios	Length
	(1)	**(2)**	**(3)**	**(4)**
Specification 1				
Year Trend	0.057***	0.053***	0.059***	14.71***
	(0.015)	(0.011)	(0.013)	(3.16)
Specification 2				
2003	0.078	0.161	0.180	10.43
	(0.088)	(0.097)	(0.047)	(9.50)
2004	0.049	0.103	0.172	29.58
	(0.089)	(0.096)	(0.039)	(8.54)
2005	0.121	0.105	0.275	56.67
	(0.106)	(0.114)	(0.051)	(11.17)
2006	0.271	0.294	0.371	87.33
	(0.100)	(0.087)	(0.064)	(12.83)
2007	0.292	0.342	0.426	103.09
	(0.094)	(0.086)	(0.061)	(12.41)
2008	0.337	0.380	0.366	100.36
	(0.088)	(0.084)	(0.060)	(12.52)
2009	0.378	0.384	0.451	110.42
	(0.111)	(0.083)	(0.076)	(17.22)
2010	0.453	0.434	0.613	129.34
	(0.106)	(0.084)	(0.072)	(15.45)
Underlying FE	Yes	Yes	Yes	Yes
Distributor FE	Yes	Yes	Yes	Yes
Product Format FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Volume Weight	No	Yes	No	No
Maturity	Yes	Yes	Yes	Yes
Observations	54,716	52,478	54,716	54,716

This table displays the coefficient of OLS regressions in which the dependent variables are our complexity measures, i.e. the number of pay-offs, the number of scenarios, and the length of the descriptive. The explanatory variables are respectively a year linear trend and year dummies in first and second specification. Number of payoffs features is obtained through a lexicographic analysis of the detailed pay-off descriptives. Number of scenarios is constructed by counting the number of conditions in the product descriptives. Length is the number of characters of the payoff descriptives. Standard errors are clustered at the distributor level. Data is from Euromoney SRP.

Table 1.6: Complexity Measures and Financial Sophistication

	Nb Payoffs (1)	Nb Scenarios (2)	Description Length (3)
Summary Statistics			
Savings Bank			
Mean	2.7	2.7	533
Standard Deviation	1.1	1.6	227
Max	8	16	2,595
Private Banking			
Mean	2.5	2.2	503.9
Standard Deviation	1.1	1.5	213
Max	7	9	2,102
Commercial Bank			
Mean	2.3	2.0	472.8
Standard Deviation	1.1	1.4	206
Max	7	11	2,203
Other			
Mean	2.5	2.2	503.9
Standard Deviation	1.1	1.5	213
Max	7	9	2,102
OLS Estimation			
Savings Bank	0.168**	0.217**	46.840**
	(0.082)	(0.103)	(23.375)
Private Bank	0.126*	-0.014	4.537
	(0.068)	(0.085)	(12.543)
Controls			
Underlying FE	Yes	Yes	Yes
Product format FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Volume	Yes	Yes	Yes
Maturity	Yes	Yes	Yes
Observations	54,716	52,416	54,716

The upper half of the table displays summary statistics of our three measures of complexity by distributor type. The bottom half of the table displays OLS regressions in which the dependent variables are our three measures of complexity. The explanatory variables are dummy variables indicating the type of the distributor. Number of payoff features is obtained through a lexicographic analysis of the detailed pay-off descriptive. Number of scenarios is constructed by counting the number of conditions in the product descriptive. Length is the number of characters of the payoff descriptive. Data is from Euromoney Structured Retail Products.

Table 1.7: Product Complexity and Profitability

	Product Yearly Markup, in %					
					Disclosed Fees Incl.	**PDE Pricing**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
# Payoffs	0.33***	0.30**	0.36***	0.28*	0.36**	0.41**
	(0.11)	(0.12)	(0.11)	(0.18)	(0.15)	(0.20)
Credit Risk Dummy	-0.36	-0.14	-0.35	-0.43	-1.64***	-0.34
	(0.27)	(0.54)	(0.27)	(0.31)	(0.44)	(0.43)
Controls						
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Distributor FE	-	Yes	-	-	-	-
Main Feature FE	-	-	Yes	Yes	-	-
Facultative Feature FE (Main)	-	-	-	Yes	-	-
Observations	148	148	148	148	148	108
R^2	0.240	0.547	0.332	0.402	0.458	0.078

This table displays coefficients of OLS regressions, in which the dependent variable is the yearly markup in percent of product notional for all the products indexed to the Eurostoxx 50 sold in Europe in July 2009 (101 products), as well as a random sample of 47 products indexed to the Eurostoxx in 2010. Markups are computed as the difference between the offering price and the product calculated fair value, which we obtain by using Longstaff and Schwartz OLS MonteCarlo pricing methodology (Longstaff and Schwartz (2001)) with a local volatility diffusion. Volatility surface data is from Eurex. The explanatory variable is the number of payoff features. Control variables include country fixed effects, distributor fixed effects, as well as main and facultative feature fixed effect. Standard errors are clustered at the distributor group level (30 clusters), and reported into brackets.

Table 1.8: Product Complexity and Ex-post Performance

	Product Yearly Return, in %					
	All	**ESTX50**	**All**	**ESTX50**	**All**	**ESTX50**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
# Payoffs	-0.290*	-0.273				
	(0.175)	(0.362)				
# Scenarios			-0.444**	-0.207		
			(0.212)	(0.228)		
Description					-0.002**	-0.003
Length					(0.001)	(0.003)
Controls						
Country FE	Yes	-	Yes	-	Yes	-
Distributor FE	-	Yes	-	Yes	-	Yes
Underlying FE	Yes	-	Yes	-	Yes	-
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Credit Risk Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Capital Protection FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,467	968	7,467	968	7,467	968
R^2	0.415	0.209	0.417	0.211	0.417	0.216

This table displays coefficients of OLS regressions, in which the dependent variable is the yearly rate of return for growth products that have reached their term. Growth products only have one final pay-off. Columns (2), (4) and (6) restrict the sample on products indexed to the Eurostoxx 50. The explanatory variables are our complexity measures: number of pay-off features (columns (1) and (2)), number of scenarios (columns (3) and (4)), and the length of the pay-off description (columns (5) and (6)). Control variables include country, year, distributor, underlying asset, and capital protection fixed effects and a credit risk dummy for products that are non-collateralized. Standard errors are clustered at the distributor level, and reported into brackets. Performance data is from Euromoney SRP.

Table 1.9: The Impact of ETF Introduction on Complexity

Panel A	Country Level				
	Nb Payoffs			**Nb Payoffs** (> 1)	
	(1)	(2)	(3)	(4)	(5)
ETF entry × Year $\geq t$	0.279***	0.305***		0.251***	
	(0.087)	(0.092)		(0.087)	
ETF entry × Year $= t-1$			-0.045		0.012
			(0.107)		(0.083)
ETF entry × Year $= t$			0.146		0.177
			(0.117)		(0.115)
ETF entry × Year $> t$			0.331**		0.421***
			(0.166)		(0.157)
Controls					
Country FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Banking Sector Profitability	-	Yes	-	-	-
Observations	112	83	105	112	105
R^2	0.650	0.725	0.669	0.457	0.493

Panel B	Distributor Level				
	Nb Payoffs				
	(1)	(2)	(3)	(4)	(5)
ETF entry × Year $\geq t$	0.108***	0.095***		0.032	
	(0.018)	(0.022)		(0.036)	
ETF entry × Year $= t-1$			-0.010		-0.009
			(0.023)		(0.044)
ETF entry × Year $= t$			0.078***		0.008
			(0.028)		(0.053)
ETF entry × Year $> t$			0.277***		0.165**
			(0.039)		(0.077)
Controls					
Country FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Distributor FE	Yes	Yes	Yes	Yes	Yes
Distributor-Year FE	-	-	-	Yes	Yes
Issued Volumes	Yes	Yes	Yes	Yes	Yes
Banking Sector Profitability	-	Yes	-	-	-
Observations	2,479	1,639	2,479	2,479	2,479
R^2	0.809	0.838	0.821	0.930	0.933

This table displays coefficient of OLS regressions on unbalanced panel data at the distributor-country level over the period 2002-2010. All countries are included except Norway over the 2008-2010 period due to a ban on structured products, and Hungary and Poland due to insufficient volumes. The dependent variable is the average complexity of products for a given country in a given year (Panel A), and for a given distributor in a given country and for a given year (Panel B). The difference-in-differences methodology is based on the staggered entries of ETF across European countries. ETF is a dummy which is equal to one once ETFs have been introduced in a given country, as measured by the appearance of the search-term "ETF" in Google Trend. Standard errors are clustered at the distributor level, and reported into brackets.

Table 1.10: Competition and Complexity: Number of Competitors

Panel A	**Country Level**				**Distributor Level**	
	# Payoffs		**# Types**		**# Payoffs**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
# Competitors	0.012**	0.019**	2.338***	4.139***	0.009*	0.016***
	(0.005)	(0.009)	(0.818)	(0.789)	(0.005)	(0.006)
Controls						
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Distributor FE	-	-	-	-	Yes	Yes
Banking Sector Profitability	-	Yes	-	Yes	-	Yes
Observations	132	101	132	101	2,507	1,682
R^2	0.553	0.578	0.812	0.854	0.444	0.462

Panel B	**Country Level**				**Distributor Level**	
	# Payoffs (Change)		**# Types (Change)**		**# Payoffs (Change)**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Δ # Competitors	-0.001	-0.008	1.499***	2.072***	0.010**	0.010*
	(0.004)	(0.007)	(0.558)	(0.525)	(0.005)	(0.006)
Controls						
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Banking Sector Profitability	-	Yes	-	Yes	-	Yes
Observations	117	88	117	88	1,822	1,183
R^2	0.001	0.017	0.204	0.382	0.005	0.009

This table displays coefficient of OLS regressions on unbalanced panel data at the country and distributor level over the period 2002-2010. All countries are included except Norway over the 2008-2010 period due to a ban on structured products, and Hungary and Poland due to low representativeness. Volume sold since inception has been lower than 10 million euros in these countries standing for less than 2% of financial savings. In panel A, the dependent variable is the average complexity of products, measured at the country x year level for columns 1 and 2, and at the distributor level for column 4 and 5. The dependent variable of column 3 is the number of product varieties offered in a country a given year. The explanatory variable for all columns is the number of competitors in the retail market for structured products at the country x year level. In panel B, the dependent variables are the yearly absolute change of the previously described variables. Banking sector profitability represents the aggregate amount of profit by bank in a given country and a given year. Standard errors are robust to heteroskedasticity in columns 1 to 3, and clustered at the distributor level in columns 4 and 5, and reported into brackets.

Chapter 2

Political Incentives and Financial Innovation

The Strategic Use of Toxic Loans by Local Governments

Joint work with Christophe Pérignon (HEC Paris)

Everything is possible, from angels to demons to economists and politicians. [Paulo Coelho]

"It's a joke that we are in markets like this. We are playing the dollar against the Swiss franc until 2042."
Cedric Grail, CEO of City of Saint Etienne, France (Business Week, 2010)

2.1 Introduction

Financial innovation aims at improving risk-sharing by completing markets. However, politicians might use innovative products for their own interests, which could lead in turn to additional cost or risk to the taxpayer. For instance, in 2001, to comply with Eurozone requirements, Greece entered into an OTC cross-currency swap transaction to hide a significant amount of its debt. In the US, municipalities regularly use bond advance refunding that provide them with short-term budget relief at a high cost (Ang et al., 2013).

Does financial innovation facilitate politicians' self-serving strategies at the taxpayer's expense? To answer this question, we study the use of innovative financial products by local governments. We focus on a type of structured loan that is termed toxic loans because of its high-risk profile (Erel et al., 2013). We hypothesize that these products are used as levers of rational self-serving strategies by governing politicians. Similar to the sophisticated mortgage borrowers studied by Amromin et al. (2013), politicians may deliberately exploit certain characteristics of these loans to their own advantage, regardless of the long-term risks they are associated with.

To empirically test this hypothesis, we exploit a unique dataset that includes actual positions with respect to toxic debt for nearly 3,000 French local governments. Using both cross-sectional analyses and difference-in-differences methodology, we show that politicians use these products more frequently and to a larger extent when their incentives to hide the cost of debt is high, when their area is politically contested, and when their peers implement similar transactions.

The structured loan phenomenon has been observed in Europe, Asia, and, to a lesser extent, in the US. In France alone, outstanding products represent more than EUR20 billion and bear unrealized losses estimated in the range of EUR5-10 billion (Cour des Comptes, 2011). A structured loan has three defining features: a long maturity, a fixed/low interest rate for the first years of the loan, and an adjustable rate that depends on the value of a given financial index (e.g., six-month Libor). The deferral of interest costs from the initial period to some states of nature of the second period allows a user to hide a significant fraction of the cost of debt. Among these structured products, we define toxic loans as those presenting specific features that create substantial coupon risk in the second period, characterized by high leverage and/or being tied to a volatile underlying index (e.g., foreign exchange rate). Such loans typically offer low initial rates.

During the recent financial crisis, as volatility spiked, the interest costs of toxic loan users increased to historically high levels and may even remain high for the remainder of their lifetimes. An interesting example is the City of Saint-Etienne, the 14th largest French city, which is currently suing its banks for pushing financial products that were alleged to be excessively risky. In 2010, the annual interest rate charged to one of its major loans increased from 4% to 24% as it was indexed on the British pound/Swiss franc exchange rate (Business Week, 2010). The total unrealized losses on Saint-Etienne toxic products reached EUR120 million in 2009, nearly doubling the city's nominal debt level of EUR125 million (Cour des Comptes, 2011). To obtain a sense of the geographic spread of structured debt among French local governments, Figure 2.1 displays an activity map for the second quarters of four consecutive years (2004-2007). The onset of toxic loans occurred around 2000; the market, which was largely developed by 2005, peaked in 2007.

INSERT FIGURE 2.1

Although both global and severe, the toxic loan phenomenon remains underinvestigated.[1] This lack of research primarily results from a lack of comprehensive data. We rely on two proprietary datasets that adequately complement one another. The first dataset contains the entire debt portfolio for a sample of large French local governments as of the end of 2007. For each debt instrument, we access information pertaining to the notional amount, maturity, coupon rate, type of product, underlying financial index, and lender identity. The second dataset includes all of the structured transactions made by Dexia, the leading bank on the French market for local government loans, between 2000 and 2009. This dataset provides loan-level information, including the mark to market and transaction date. This latter variable is critical for our identification strategy. Unlike the financial statements of local governments that do not distinguish structured loans from standard borrowing, these datasets provide detailed information on the types of loans that are used by each local government. In turn, these data allow us to address whether agency conflicts affect the financial decisions of politicians.

We provide empirical evidence of the self-serving use of toxic loans by politicians. We begin by showing that structured loans account for more than 20% of all outstanding debt. More than 72% of the local governments in our sample use structured loans. Among these structured loans, 40% are toxic. A cross-section of our data illustrates how politicians in financially distressed local governments are significantly more likely to turn to this type of loan, evidencing their higher incentive to hide the cost of debt. Indeed, local governments in the top quartile of indebtedness are more than twice as likely to have

[1] Capriglione (2014) studies the use of derivatives by Italian Local Governments.

toxic loans compared with those in the bottom quartile. We also find that incumbent politicians running in politically contested areas are more inclined to use toxic loans, which is consistent with the greater incentives to benefit from immediate savings to aid them in being re-elected.

We then exploit the time dimension of our data. We identify a treatment group that confronts elections during the sample period, as opposed to a control group that does not appoint management through elections (e.g., airports, harbors, and hospitals). Using a difference-in-differences methodology on these two subsamples, we find that the election timing plays a significant role: for the with-election group, transactions are more frequent shortly before elections than after them. Toxic loan usage also exhibits a herding pattern; politicians are more likely to enter into toxic loans if some of their neighbors have done so recently. This herding behavior reduces reputation concerns, while increasing the likelihood of a collective bail-out. Finally, we find that right-wing political parties are more likely to engage in structured loans to cater to the fiscal expectations of their voters while hiding the real costs of their strategy in some states of nature. Although measuring the exact role and extent of financial sophistication (Lusardi and Tufano, 2009b) is beyond the scope of this study, we control for this factor in our analysis to ensure that it is not driving our results. We also empirically eliminate the possibility of hedging as a motive for these transactions.

Our paper relates to several streams of literature. First, our work complements studies of the political agency problems (Besley and Case, 1995), political incentives (Rajan, 2010), their influence on financial decisions (Butler et al., 2009), and more generally on the political economy of finance: Dinc (2005) shows that government banks lend more in election years, and (Bertrand et al., 2007) document that politicians avoid layoffs prior to French elections. The main contribution of the paper is to show how politicians use innovative financial products for their own interests, and (Behn et al., 2014) investigate the effects of political determinants on bank bailouts.

Because toxic loans allow local governments to hide a significant fraction of the cost of debt, our work directly relates to the off-balance sheet borrowing of local governments (Novy Marx and Rauh, 2011). This study also adds to the abundant literature on peer effects and herding behavior in financial markets (Hong et al., 2005). Unlike previous studies on herding, we focus on the economic decisions of politicians. Finally, our paper addresses financial innovation and the associated risks (Rajan (2006), Gennaioli et al. (2012)). The paper proceeds as follows. In Section 2, we present the main types of structured loans and identify the toxic types. We describe our datasets in Section 3 and present our empirical analysis in Section 4. We conclude our study in Section 5.

2.2 The Toxic Loan Market

This section explains the specifications and functioning of structured debt, defines toxic loans, and provides a real-life example of a toxic loan. These characteristics were identified from product term sheets and abundant discussions with professionals from both buy and sell sides.

2.2.1 Common Characteristics of Structured Loans

Structured loans typically offer an initial period with a guaranteed low interest rate and a second period during which the interest rate may increase according to an explicit pre-specified formula. The loan structuring relies on an implicit sale of options by the borrowing local government. The options premium is initially subtracted from the interest cost. The risk of a structured product increases with its maturity, the volatility of the underlying financial index, the leverage in the coupon formula, and the cap level. We provide a real-life example at the end of this section and detail how toxic loans translate into hiding the actual cost of debt.

Under most government accounting standards, derivatives (either stand-alone swaps or those embedded within a structured loan) are not accounted for at fair value. In many countries, accounting standards do not even require the structured transactions to be disclosed. Only the interests that are actually paid must appear in financial statements; thus, a derivative, regardless of the evolution of its fair value and future cash flows, will generate accounting revenues as long as the flows that it creates in a given accounting year favor the local government. By construction, this situation always occurs during the initial low-interest period of three to five years, regardless of the market evolution during that time. Losses can appear in financial statements only when the guaranteed period is over.

Long-maturity debt is a prerequisite for structuring products with initial periods of low interest rates. Local governments are among the issuers that have the longest horizon. Furthermore, only local governments have the credit quality that is necessary for banks to accept such long credit exposure, which cannot be perfectly hedged. In discussions with practitioners, we learned that these transactions are also significantly more profitable than vanilla loans (approximately 5% of mark-up for toxic loans vs. less than 1% for vanilla loans). Counterparty risk is likely to be underestimated because of the widespread view that the state is implicitly guaranteeing local governments. As opposed to corporate clients, no collateral is required. Such requirements would jeopardize structured transactions, as the negative fair value of a derivative position would lead to immediate margin calls.

Structured products are easily transposable from one country to another. The legal documentation is limited to a three- or four-page contract. Structuring mechanics rely on worldwide known indices, such as the US Libor or EURUSD exchange rate. As global players, financial institutions simultaneously market the same products in different countries. Even if their diffusion is global, market penetration is higher in Europe than in the US, partly because cities and regional governments in Europe receive their financing primarily from banks whereas those in the US primarily raise funds by issuing bonds. Therefore, local governments in Europe may be more easily persuaded to use structured products. Another critical difference between Europe and the US concerns the level of complexity of the products. Indeed, local governments in Europe use much more complex products. Complexity often increases each time a product class must be restructured.

2.2.2 Which Structured Loans Are Toxic?

While some structured loans appear as toxic in the sense that local government are currently paying double-digit coupon rates, classifying their risk objectively ex ante is not trivial. We rely on the classification established by the French Government following the first legal actions: the Gissler Chart. Indeed, although they rely on the same mechanism (an implicit sale of options, the premium of which is subtracted from the initial coupon rate), structured loans exhibit diverse risk profiles, which correspond to different level of short term budget relief: the riskier a product, the higher the initial savings. The Gissler Chart classifies structured loans along two dimensions: the underlying asset, and the payoff structure. This scale ranges from Eurozone interest rate (minimum risk), to foreign exchange (maximum risk), and is based on the volatility of these underlying. For more details regarding the different types of structured loans, and the Gissler Classification, see the appendix.

We classify a structured product as toxic if it ranks higher than 3 on the Gissler Chart underlying risk table. Given this definition, loans that are indexed on the interest rate curve slope, foreign interest rates or on a foreign exchange rate are classified as toxic. Products that are linked to domestic interest rates or inflation are not considered toxic. We also use the full granularity of this risk classification.

This classification is ex ante based on the characteristics of a product at inception and is independent from the market conditions that prevail during the life of the product. A toxic product may have offered a low coupon level to its user ex post; nevertheless, the borrower entered into a high-risk transaction that would have created massive losses had the market situation been reversed. Furthermore, toxic products often exhibit swings in their mark to market. Structured products that are not classified as toxic still bear more risk than vanilla financing. The subsidy that such products offer in the favorable state of the world is financed by a higher coupon than in the unfavorable state. The nonlinear payoffs of such loans are also challenging to manage in practice, as they can create moderate but sudden increases in the cost of debt. Importantly,

2.2.3 Example of a Toxic Loan

Below, we present an actual toxic loan subscribed by the Rhône, the French county that comprises the city of Lyon. We observe an eight-year initial period with a low guaranteed coupon of 1.75%, which is significantly lower than the interest rate on an equivalent vanilla loan (slightly higher than Euribor or 4.50%). This initial fixed low rate is followed by a 12-month Euribor floating rate, coupled with uncapped exposure to CHF appreciation against EUR for the remaining 17 years. At today's levels (as of May 2014), the interest rate on this loan is more than 16%. Similar products with higher leverage or strikes have led some local governments to pay more than a 50% interest rate per year.

$Amount:$	$EUR\ 80\ million$
$Trade\ Year:$	2006
$Loan\ Maturity:$	2031
$Year\ 2006-2013:$	$Coupon(t) = 1.75\%$
$Year\ 2014-2031:$	$Coupon(t) = EURIBOR\ 12M(t) - 0.80\% \times Max(1.40/EURCHF(t) - 1, 0\%)$

2.2.4 Local Government Rationale

Toxic loans allow local governments to hide a significant fraction of the cost of their debt, and to provide with a secure budget relief for the period where the coupon is guaranteed. By deferring the payment of most of the interest of this period to a later date and only in certain states of nature, a local government cosmetically decreases its current cost of debt when entering into a toxic loan. Returning to the example in Section 2.3, the product provides a 2.75% annual subsidy, which is the difference between the rates on an equivalent vanilla loan and those on a toxic loan. If the entire debt of the local government consists in this type of financing, the cost of debt appear less than half than what it should be. This hidden cost of debt is repaid in the future in certain states of nature, namely, when the options embedded in the derivative component of the loan end up in the money. The details of structured loans do not appear in public filings; only their current interest rates appear. This lack of disclosure makes toxic loans difficult to detect for voters and therefore permits local governments to cosmetically reduce their cost of debt.

2.2.5 Post-crisis developments

The spike in market volatility triggered by the financial crisis drove the derivative mark-to-markets up, and often led the options to get in the money. Starting in 2010, local governments have been unwilling to pay two digit interest rates, and have been suing banks for mis-advice and questioned the validity of the transactions. They try to obtain the cancellation of the toxic loans, or to negotiate an exit at better terms. Court outcomes have been mixed, but led to the cancellation of the structured loans that had not stipulated an actuarial rate when implemented.

A nationwide solution has however been implemented in 2014, in the form of a 50% participation of the central government in the unwinding costs. This spending is financed by a new tax on banks, which exact amount has still to be fixed. This development represents a partial bail-out, and exhibit a trade-off between having only local taxpayers pay for the toxic loans, or sharing it over the entire French population. An additional issue facing the central government is that the main player in the market, Dexia, has been nationalized during the crisis. Therefore forfeiting all the mark-to-markets would be extremely costly for the French Government.

2.3 Data

Our unique datasets allow us to provide new insight into the effect of political incentives on the borrowing choices of local governments. Indeed, these data enable us to analyze risky strategies that are hidden from the public view. In most countries, the financial statements of local governments do not present the precise breakdown of debt by instrument. In particular, structured loans and swaps are not distinguished from vanilla loans. Whereas aggregate debt analysis can be conducted using public information only, our analysis of toxic loans requires that we know the exact composition of the debt portfolio of each local government. This requirement can be met using two proprietary datasets. The first dataset contains the entire debt portfolio for a sample of large French local governments (Dataset A) as of December 31, 2007. The second set includes all of the outstanding structured transactions of the leading bank on the market (Dataset B) as of December 31, 2009.

2.3.1 Local Government-Level Data from a Leading Consulting Firm (Dataset A)

A leading European financial consulting firm for local governments provided us with a detailed proprietary dataset for a sample of 293 French local governments. As shown in

Table 2.1, our dataset includes nearly all French regions (25) and French counties (96) as well as a number of intercity associations (76) and the largest cities (96). Collectively, these local governments have a total debt of EUR52 billion. Although our sample covers only a fraction of the French local governments, the overall debt coverage is extensive, as it includes the largest entities. Indeed, the sample aggregate debt represents 38.2% of the total debt of all French local governments and more than 52% of their structured debt (Fitch Ratings, 2008).

INSERT TABLE 2.1

We observe that virtually all local governments (95.6%) have some type of debt, and this fraction remains high for all types of local governments. However, the standard deviations and min-max ranges indicate that there are some large differences in the levels of indebtedness across local governments. The lower panel of Table 2.1 indicates that the maturity of the debt is on the long side (in the range of 12-15 years).

INSERT TABLE 2.2

Table 2.2 presents the breakdown by type of debt. Funding is achieved through the following channels: vanilla bank loans, bonds, revolving facilities, and structured debt. Overall, we find vast differences across local governments in terms of debt instruments. Some municipalities borrow through a single source (e.g., fixed rate loans, floating rate loans, structured debt, or revolving facilities), whereas others follow a more diversified financing strategy. Bank loans are by far the main source of financing for local governments (constituting 62.9% of outstanding debt and being used by more than 90% of local governments), with an approximately 50/50 breakdown between fixed and floating rates. Bonds account for a surprisingly low percentage of total debt: 3.3% of outstanding debt. Bonds are used by only 7.5% of local governments, likely because of the relatively higher cost for bonds and the numerous constraints that issuers encounter (rating requirements, the legal framework, and constraints on maturity) and that are not offset by tax breaks, as is the case in the US. It is interesting to compare the debt composition of local governments with that of the French Central Government, which comprises almost only bonds and bills. Finally, structured debt represents a significant share of the total debt of local governments, accounting for 20.1% of all outstanding debt and being used by more than 72% of the local governments in our sample. These ratios are particularly high for counties and cities. The fraction of structured debt varies extensively across local governments. Interestingly, we observe that 100% of the debt of some local governments is in structured products.

We now examine the specific composition of the structured debt of local governments. It is important to differentiate between the different types of structured products because they convey different levels of risk and because some structured products should not be considered toxic. A detailed breakdown of structured debt by type of structured product can be found in the appendix. The most popular products are those linked to domestic interest rates, which account for nearly half of the outstanding structured debt (47.7%). Other underlying indices (sorted by decreasing popularity) include the interest rate curve slope (26.8%), foreign exchange (14.8%), inflation (3.4%), and foreign interest rates (2.4%). Despite this overall range of products, there is significant heterogeneity among local governments. Some of these governments are massively exposed to toxic loans, with up to 70.5% of their total debt being exposed to the interest rate curve slope or 66.7% of the total debt to foreign exchange rate variations.

2.3.2 Bank-Level Data on Structured Transactions from Dexia (Dataset B)

Our second dataset is 10 times larger than the first set and contains detailed information on the structured products themselves. This internal risk management data were made public by the French newspaper Libération on its website and, to the best of our knowledge, have not yet been used in academia. The dataset contains information on structured transactions from only one bank (i.e., Dexia), but this bank has a 70% market share for public sector-structured loans (French National Assembly, 2011) and an extremely diverse customer base. Moreover, the data covers structured transactions over the period 2000-2009, which allows time-series analysis.

This dataset contains 2,741 different public sector entities: 16 regions (vs. 25 in Dataset A); 66 counties (vs. 96); 539 intercities (vs. 76); 1,588 municipalities (vs. 96); 288 hospitals (vs. zero); 115 social housing entities (vs. zero); and 129 other borrowers, including airports, harbors, chambers of commerce, healthcare cooperatives, public-private joint ventures, schools, research institutes, nursing homes, fair organizers, and charities. The local governments in our sample vary significantly in terms of size; for instance, 37 cities have fewer than 1,000 inhabitants, and 29 cities have more than 100,000 inhabitants.

INSERT TABLE 2.3

Table 2.3 provides summary statistics on the number of trades, notional amounts of structured products, associated mark to market, and foreign exchange-linked toxic products. The average number of structured transactions is approximately two, but 163 entities have more than five structured loans in their debt portfolio. On average, counties, regions, and social housing entities engage in more structured loans than other entities, likely because of the size of their total debt, as they are the largest entities. The notional amounts of structured products exhibit the same pattern but with greater dispersion across various types of borrowers.

Some mark to market figures are surprisingly high: 72 entities have more than EUR10 million of mark to market, with additional products potentially booked in other banks. Therefore, it would be extremely costly for these entities to convert their structured debt into vanilla debt. Counties are again the most strongly affected local governments according to this indicator, followed by regions. The mark to market scaled by notional amounts illustrate products' relative risk ex post and expected future losses to bear on top of principal repayment. Although these losses should be absorbable on average, as they represent approximately 10% of the borrowed amount through structured products, a fat tail of aggressive products with mark to market greater than 30% of the underlying notional amount increases the risk of default for some entities.

This tail risk largely results from foreign exchange products. Their frequency appears to be consistent with our observation from the previous dataset, in which 20% of the local governments using structured debt had foreign exchange products in their portfolios. These figures indicate that the level of contamination is severe for some entities, as their mark to market values sometimes reach record levels of 80% of the underlying loan notional amount. The data also include information on trade initiation dates. The aggregated numbers of transactions per quarter are plotted in Figure 2.2. We observe the rapid expansion of the market followed by a sharp contraction after 2007. The latter was exacerbated by media coverage of distressed local governments and by banks' own difficulties in 2008Q4.

INSERT FIGURE 2.2

2.4 Empirical Analysis

In this section, we study the role of political incentives in fostering the use of structured and toxic loans among local governments.

2.4.1 Incentives to Hide the Cost of Debt

Given their accounting treatment, structured products can be considered hiding a significant fraction of the cost of debt, which will be repaid only in some specific states of nature. Politicians have an incentive to hide the actual cost of debt and to spend money today while shifting the tax burden onto future generations (Novy Marx and Rauh, 2011).

We hypothesize that the incentive to hide a fraction of the cost of debt will be greater for highly indebted local governments, as monitoring by voters and other stakeholders is likely to be closer.

INSERT TABLE 2.4

Panel A in Table 2.4 provides an initial overview of the popularity of toxic loan usage for the top and bottom indebtedness quartiles of the local governments in Dataset A. The panel shows unconditional statistics that suggest that highly indebted local governments use structured and toxic loans more frequently and to a greater extent.

We extend the analysis in Table 2.5 and run several probit regressions on the use of structured and toxic loans by local governments based on Dataset A. In columns 1 and 2 (3 and 4), the explained variable is an indicator variable that is equal to one if the local government has some structured (toxic) products in its debt portfolio and zero otherwise. Columns 5 and 6 present the coefficients from an ordered probit regression in which the dependent variable is equal to the sum of the two previous dummies; namely, the dependent variable takes a value of two if toxic loans are used, one if structured but not toxic loans are used, and zero otherwise. For each specification, we assess the robustness of our conclusions using a set of extra control variables, including the debt average maturity, population, banking relationships (indicator variables for lending relationships with Dexia, Credit Agricole, Société Générale, and others), and territory characteristics (unemployment rate, share of agriculture, and industry in the active population). Furthermore, we control for several other economic variables and for fixed effects by local government types (regions, counties, intercities, and cities) in each regression and cluster standard errors by local government types.

INSERT TABLE 2.5

The results from Table 2.5 are consistent with the existence of greater incentives to hide the actual cost of debt for local governments that are swamped with debt. Such governments tend to use structured and toxic loans more frequently. Indeed the estimated coefficient on the debt/population is positive and statistically significant in all specifications. Because the level of debt will be more closely monitored in these local governments, they have stronger incentives to enter into such transactions. In a further robustness check (not presented), we also include the operating income per inhabitant and central government subsidy per inhabitant. Because regression coefficients are not statistically significant, we conclude that the debt burden dominates the effects of revenues or dependence on the central government. Another possible explanation for these empirical results would be that indebted local governments turn to toxic loans as last-resort financing when other means of financing are unavailable to them. However, our data are inconsistent with this alternative hypothesis, as some highly indebted local governments have no structured debt at all (thus, even these local governments can access standard financing).

We also report a negative relationship between the use of structured products and investments (measured by equipment expenditure per inhabitant). If we consider high investment expenditure, as opposed to operating expenditure, to be a signal of sound management, then it is reasonable to believe that well-managed local governments that are concerned about the future are more reluctant to take unnecessary risks in the financial markets. We believe that this negative coefficient is not due to reverse causality. In 2007, most products were in their guaranteed coupon period; thus, it is unlikely that local governments had to decrease their investments because of ballooning interest rates. However, the absence of satisfying instruments for the use of these products prevents us from using investments as a left-hand-side variable and being able to neatly identify the real effects of toxic loans. Overstaffing, which signals short-term spending and is measured through wages over operating costs, also shows a significant positive correlation with the use of toxic loans.

Debt average maturity provides us with another important control, as toxic loans require long-maturity debt (recall that these loans rely on an implicit sale of options). The type of banking relationship is also a critical driving factor for toxic loan usage. The presence of banks having a broad structured loan offering in their financing pool significantly increases the likelihood of a local government eventually using these products. The effect is greater for banks that specialize in loans to local governments, such as Dexia or Depfa, than for universal banks.

To complement our analysis, in columns 7 and 8 of Table 2.5, we conduct additional regressions to measure the extent to which the level of indebtedness influences borrowing choices. We analyze the structured debt/total debt ratio, the toxic loans/total debt ratio, and the foreign exchange loans/total debt ratio using OLS, thereby capturing the extent to which these products have been used. We control for the exact same variables as in Table 5. These additional regressions confirm our previous results regarding the importance of the level of indebtedness. Thus, a per capita debt increase of EUR1,000 leads to an increase of more than 12.8% of the share of structured loans in the total debt and 4.2% of the share of toxic loans. Table 6 also underlines the role of debt maturity, especially for foreign exchange-linked toxic loans that exploit the long end of the FX forward curves. Longer maturities also allow higher subsidies in a manner that is more than proportional and thus magnify the temptation to hide the cost of debt.

2.4.2 Political Cycle

Toxic loans represent a way of hiding the real cost of debt. We hypothesize that the political cycle interacts with incentives to hide the cost of debt, thus creating cross-sectional and time-series variations according to each local government's political situation. When their re-elections are likely to be contested or when the next election draws closer, incumbent politicians may desperately seek immediate savings for a limited time, possibly corresponding to their political mandate period. One means of achieving this short-term financial release without raising the suspicion of voters is the use of structured financial instruments. Toxic loans allow budget window dressing as a result of their initial low-coupon guaranteed period, as mentioned previously. This hidden characteristic and the accompanying short-term financial release may cause structured loans to be used more frequently in politically contested areas, whereas strongholds should exhibit lower usage. The timing of these transactions should also depend on the date of the next election in a local government; incumbent politicians have an incentive to implement transactions before the election to benefit from the immediate savings that they provide.

Politically contested areas

For a subsample of local governments in Dataset B for which past elections results are available, we proxy political stability by the number of years for which the party of the incumbent mayor (or its equivalent) has been in power. Toxic loans may catalyze agency problems, as they allow politicians to implement hidden self-serving strategies. The data appear to be consistent with this hypothesis. Indeed, Panel B in Table 4 illustrates how politically contested local governments make more important use of structured loans compared with political strongholds. We also conduct OLS regressions on three different measures of the usage intensity of structured loans: (1) structured debt/total debt ratio, (2) mark to market/total debt ratio, and (3) toxic debt/total debt ratio. The results are presented in Table 2.6.

INSERT TABLE 2.6

The results in Table 2.6 provide further favorable evidence for a positive effect of political uncertainty on the use of toxic loans: strongholds are less inclined to enter into these transactions. All of the estimated coefficients on the number of years in power are indeed significantly negative. This finding indicates the increased incentives for politicians with challenging re-elections to enter into risky transactions, which can be either a form of risk-shifting strategy or a poison pill for the next government because losses require several years to materialize. It has been shown that political uncertainty reduces firm investment (Julio and Yook, 2012), and we complement this stream of literature by demonstrating the influence of this uncertainty on the economic decisions of politicians. We control for political affiliations and the size of local authorities. The latter proxies for financial sophistication, as larger local governments devote more staff and resources (e.g., consulting and software) to the management of their debt and thus have greater expertise in this area.

Finally, our results indicate that small local governments use more structured products than large governments do. All three measures of the relative use of structured and toxic loans are significantly negatively correlated with the log of the population. This finding suggests that banks have more successfully marketed these products to clients that are less likely to possess the sufficient financial knowledge to fully understand and adequately monitor them. Small local governments appear to use structured loans in larger quantities and to be more inclined to enter into the riskiest transactions; this finding is consistent with overindebtedness patterns in households with low debt literacy (Lusardi and Tufano, 2009b).

Effect of election timing

We use a difference-in-differences approach to test whether local governments engage more frequently in structured debt prior to an election. We compare a treatment group that includes counties, municipalities, and intercities that hold elections at the end of 2008Q1, with a control group consisting of public entities with no elections (e.g., hospitals, social housing entities, and airports). The management teams of the entities from the treatment group are chosen simultaneously following the same election cycle. Those from the control group have management renewals according to individual and random timing. The control group also includes political entities that have electoral cycles but no election during that particular year (regions). We implement a difference-in-differences methodology by comparing the difference of the probability of implementing a trade before and after the election between the two groups. The purpose of this approach is to be able to precisely identify the influence of election timing on structured transaction implementation. Using panel conditional logit regressions, we examine the likelihood of implementing a structured transaction in a given quarter before and after the election (for periods of 12 and 18 months before and after the election) by controlling for quarter fixed effects. The model specification is as follows:

$$\Pr(Transaction)_{i,t} = Q_t + \alpha_i + \beta \times I_{\{Treatment\ Group\ =\ 1\ \cap\ Pre\ Treatment\ =\ 1\}} + \varepsilon_{i,t}$$

where the dependent variable is the probability that local government i conducts a transaction in quarter t, Q_t are the time fixed effects for each quarter, α_i are individual fixed effects, and the $I_{\{Treatment\ Group\ =\ 1\ \cap\ Pre\ Treatment\ =\ 1\}}$ variable is an interaction term between a dummy variable that is equal to one if local government i is in the treatment group and a dummy variable that is equal to one if quarter t is before the election. The results are shown in Table 2.7.

INSERT TABLE 2.7

When comparing to the control group with no elections, we observe that the local governments in the treatment group are significantly more likely to implement structured and toxic transactions in the period preceding the election than in the period following it. The results are robust to the time window under consideration. We also conduct a placebo analysis in which we randomly select a sample of the same size as our initial treatment group and use it for the interaction term. The coefficients obtained are smaller in magnitude and statistically insignificant, which is consistent with our results being driven by the election cycle.

2.4.3 Herding

Local government members and civil servants belong to strong local and political networks that facilitate word-of-mouth diffusion. This channel of communication is critical for triggering herding, as structured transactions typically remain private. Therefore, peer effects should play an important role in terms of both ignoring personal beliefs and managing one's reputation (Scharfstein and Stein, 1990) to create a cascade effect. Following the crowd can indeed be a rational strategy. First, when structured products perform well, structured loan users benefit from a low interest rate on their debt. Second, when structured products perform poorly, all structured loan users confront the same turmoil, and a collective solution must be found. This "risk taking from the herd" also relates to models of collective moral hazard, as it increases the likelihood of being bailed out if risk materializes (Farhi and Tirole, 2012). Therefore, the propensity of a given local government to use structured loans increases with the number of contaminated local governments in the same geographical zone.

To identify this behavior, we again exploit the time dimension of Dataset B. Although the majority of the variables studied in the previous section exhibit low time variation, the number of trades in a given geographical zone shows both time-varying and cross-sectional heterogeneity, which calls for a panel data identification strategy that controls for individual fixed effects.

INSERT TABLE 2.8

We construct an explanatory variable that is equal to the number of active local governments from the same geographical zone (county level). An active local government is defined as a local government that entered into at least one structured transaction in the previous quarter (or the previous two quarters). We again use a panel conditional logit model to estimate the effect of the number of active neighbors of a local government on its likelihood of entering into a similar trade in the current period. We also run a panel OLS regression to explain how large the new transactions are. The model specification is as follows:

$$\Pr(Transaction)_{i,t} = Q_t + \alpha_i + \sum_{k \in J(i)} I_{k,t-1,\{Active\,=\,1\}} + \varepsilon_{i,t}$$

where the explained variable is the probability that local government i conducts a transaction in quarter t, Q_t are quarterly fixed effects, α_i are individual fixed effects, $J(i)$ is the set of local governments from the same county as local government i, and the $I_{k,t-1,\{Active\,=\,1\}}$ variable is a dummy that is equal to one if local government k was active in quarter $t-1$. In the OLS specification, the left-hand-side variable is replaced by the aggregated notional amount of transactions implemented by local government i in quarter t.

Table 2.8 shows the conditional logit and OLS regression coefficients. We show that the number of active neighbors in the previous quarter and semester appears to significantly increase both the likelihood and the extent to which a local government enters into structured debt transactions. Note that this result cannot be caused by a time trend, as we use quarter fixed effects. Because time lags alleviate endogeneity concerns, we conclude that this market exhibits herding behavior. This effect shows low persistence, as the estimated coefficients decrease when we consider two quarters. To the best of our knowledge, this finding is the first empirical evidence of the peer effects for liability-side decisions and the first illustration of herding in the economic decisions of politicians.

An alternative explanation for this correlation in borrowing choices would be the existence of regional shocks on the supply side. However, as Dexia covered the entire French territory before the inception of the structured debt market, this finding is unlikely to be driven by new branch openings. The arrival of a highly convincing salesperson in a given region could also create such local shock. However, because of the long-term relationships within this industry and the low employee turnover thus implied, effects are unlikely to occur at quarterly frequency or simultaneously in different geographic zones.

2.4.4 Political Affiliation and Fiscal Policy

Political affiliations play an important role in financial decisions (Bonaparte et al. (2012), Hong and Kostovetsky (2012)). Belonging to a right- or left-wing political party can influence the economic opinions of leaders, optimism, and relationships with banks, which may in turn affect the appetite of politicians for risky loans. More specifically, right-wing politicians typically implement tighter fiscal policy (Hibbs, 1977). Structured loans are consistent with this purpose because they reduce the cost of debt in the short term without increasing nominal value - an indicator that is closely monitored by voters. Pressure has increased on the budgets of local governments. Therefore, local governments that are controlled by a right-wing party should more heavily rely on structured loans, as their incentives to lower the debt nominal level and balance the budget are higher. Right-wing voters are typically more sensitive to these aspects, as evidenced by recent polls on partisan issues. Right-wing politicians may use toxic loans to cater to voter expectations, if only for the short term.

Panel C in Table 2.4 shows that local governments that are managed by right-wing parties tend to exhibit greater and more widespread use of structured loans, especially toxic loans. Thus, such governments hold 50% more toxic debt in their balance sheets than authorities under left-wing control. Moreover, the regressions in Tables 5 and 6 include an indicator variable of right-wing-managed local authorities, which shows significant explanatory power for the use of structured and toxic products. This result supports our hypothesis that right-wing politicians aim to minimize public spending and may have a less defensive posture toward financial markets and innovation (Kaustia and Torstila, 2011). The economic significance of this result is confirmed by the estimated coefficients for the right-wing dummy with different model specifications in Table 2.5, which are based on a different and larger dataset.

2.4.5 Alternative Motive: Hedging

One may wonder whether structured loans have been used as hedging devices. From a theoretical perspective, it appears unlikely that toxic loans are used for hedging purposes. Indeed, as shown in Section 2.2, the payoffs of structured products are typically nonlinear and convex because of the embedded sale of out-of-the-money options. Therefore, a local government would benefit from hedging through these instruments only if its operational cash flows presented a strong surplus in some tail events. To rule out this alternative explanation, we examine the correlation between French local government revenues and the main indices that are used in structured products: Euribor 3 months, CMS 10Y - CMS 2Y, EURCHF, and EURUSD. Our analysis is based on all French regions, French counties, and the 100 largest cities, and it covers the 1999-2010 period. Overall, we find little correlation between revenues and financial indices (all results are available in Table A2 in the appendix). We also run a pooled regression of the change in operating revenues for all local governments on the change in the financial indices used to structure the loans while controlling for inflation. The estimated parameters that are associated with the financial indices also remain insignificant. We also perform similar regressions at the local government level and again find no significant results. This additional analysis suggests that structured debt is unlikely to serve as a hedging device for local governments. This conclusion is consistent with empirical evidence of corporations using "hedging policies" to make directional bets (Baker et al., 2005). Finally, the hedging motive was never suggested during our conversations with buy-side and sell-side practitioners.

2.5 Conclusion

In this paper, we present an empirical investigation of the role of political incentives in the use of complex financial products. Although it is commonly believed that users of complex products do not have sufficient information or understanding of the risks involved, we show in this paper that local governments make strategic use of complex debt products.

We find that most local governments use structured loans and that these types of loans account for a surprisingly high 20% of their total outstanding debt. Furthermore, such loans are utilized significantly more frequently within local governments that are highly indebted, which is consistent with their greater incentives to hide the actual cost of debt. Incumbent politicians from politically contested areas are more likely to use structured debts, and transactions are more frequent before elections than after elections. Toxic loan users appear to exhibit herding behavior. Participation in structured transactions by one's neighbor during the previous period significantly increases the likelihood of behaving similarly. Moreover, right-wing politicians are more inclined to use structured loans than their counterparts from the left.

During the subprime crisis, securitization facilitated a political agenda of easy access to home ownership. Similarly, we show that financial institutions have innovated to design financial securities that are aligned with the political incentives of local government members. Our results convey potential regulatory implications. Rather than banning structured loans, we suggest imposing strict public disclosure requirements on transactions by local governments to increase reputation risk and facilitate monitoring by voters. Furthermore, changing public accounting standards to account for mark to market losses and gains should curb the incentives at play by increasing transparency, as observed in comparable markets (Jenter et al., 2011). Such changes would limit the use of toxic loans while maintaining the autonomy of local governments in terms of financial decisions. However, the greatest risk of toxic loans likely lies in outstanding transactions and the accompanying non-realized losses. The recent bailout answer only partially to this challenge.

2.6 Figures and Tables

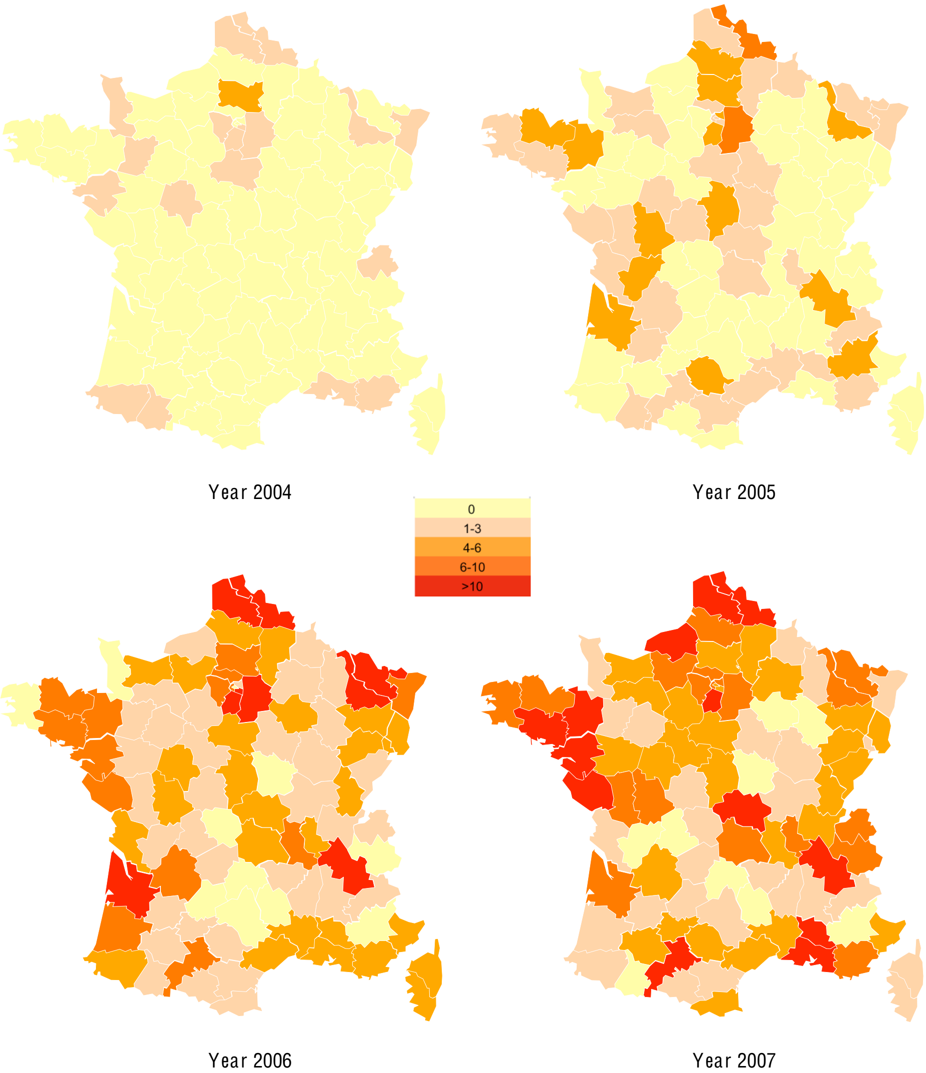

Figure 2.1: Geographical Evolution of Structured Debt Activity

This figure displays the number of active local governments, which are defined as those that have implemented at least one structured debt transaction in the second quarter of the displayed years (from 2004 to 2007). Q2 is the period in which the recently voted budget is financed. Map division is at the French county level. The data are obtained from Dexia's client portfolio (Dataset B).

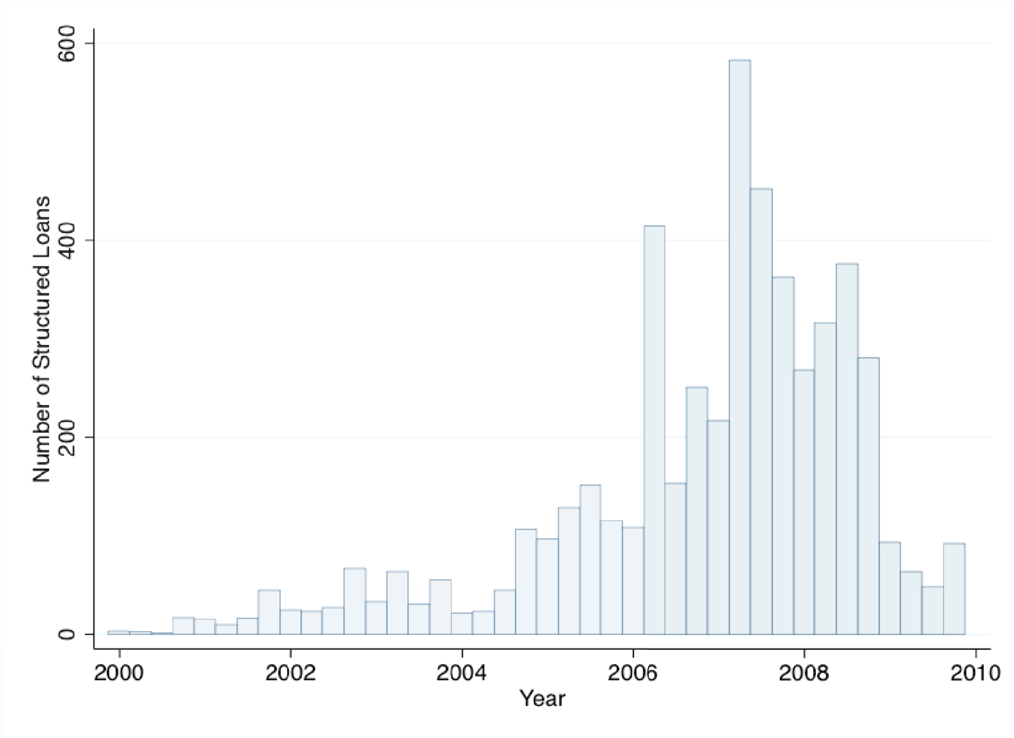

Figure 2.2: Number of Structured Debt Transactions per Quarter

This figure displays the number of structured loans initiated during a given quarter by local governments in France for the 2000-2009 period. The data are obtained from Dexia's client portfolio (Dataset B).

Table 2.1: Debt Profile of Local Governments

	All	Regions	Counties	Intercities	Cities
Sample observations	293	25	96	76	96
% of Total	-	92.60%	96.00%	42.50%	10.10%
Total Debt					
Amount	51994.7	10369.9	21162.4	7874.6	12587.7
Mean	177.5	414.8	220.4	103.6	131.1
Stdev	248.5	375.5	178.7	194.4	263.8
Min	0	0	0	0	0
Max	1850.5	1405.3	834	1013.8	1850.5
% of use	95.60%	96.00%	99.00%	89.50%	96.90%
Average Maturity					
Mean	12.9	14.6	12.4	14	12.3
Stdev	4.3	3.9	3.6	5.4	3.8
Min	0	5.8	4	1.9	0
Max	32	22.8	22.3	32	21.9

Note: This table contains summary statistics on the total debt and average debt maturity for a sample of French local governments. The data are obtained from a survey conducted by a specialized consulting firm as of December 31, 2007 (Dataset A). All debt figures are expressed in millions of euros, and maturity figures are expressed in years. Maturity figures are calculated by excluding local governments that have no debt. Including overseas territories, France is divided into 27 regions, 100 departments, and 36,700 municipalities. Each of these divisions possesses a governing body that is elected by its population. Cities are defined as municipalities with a population exceeding 10,000 inhabitants. France contains a total of 950 cities. Intercities are associations of cities and surrounding municipalities that share some common expenses, such as transport or sports equipment. The mayors of the associated municipalities elect the president of the intercity. The sample aggregated total debt represents 38% of all-local-government aggregated total debt. Source: "Conseil des Communes et Régions d'Europe" (2007)

Table 2.2: Local Government Debt Breakdown by Types of Instruments

	All	Regions	Counties	Intercities	Cities
1.Vanilla Financing					
Aggregate	34611.5	7831.4	13100	5780.1	7900.1
Share in %	66.60%	75.50%	61.90%	73.40%	62.80%
Mean	118.1	313.3	136.5	76.05	82.3
Stdev	182.9	308.9	123	159.1	174.8
Max	1265.6	1081.2	608.3	888.7	1265.6
% of use	94.90%	96.00%	97.90%	88.20%	96.90%
2. Revolving Facilities					
Aggregate	6953.2	1410.1	3260.6	759.8	1522.7
Share in %	13.40%	13.60%	15.40%	9.60%	12.10%
Mean	23.7	56.4	34	10	15.9
Stdev	55.2	77.5	48.4	22.6	67.1
Max	646.2	308.4	282	110	646.2
% of use	58.40%	64.00%	74.00%	40.80%	55.20%
3. Structured Debt					
Aggregate	10429.9	1128.5	4801.9	1334.7	3164.9
Share in %	20.10%	10.90%	22.70%	16.90%	25.10%
Mean	35.6	45.1	50	17.6	33
Stdev	70.2	59.1	92.8	35.9	64.3
Max	648.3	215.3	648.3	241.5	501.7
% of use	72.40%	72.00%	74.00%	63.20%	78.10%
Of Which Toxic Loans					
Aggregate	4372	401.3	2393.2	481.9	1095.6
Share in %	8.40%	3.90%	11.30%	6.10%	8.70%
Mean	14.9	16.1	24.9	6.3	11.4
Stdev	44.4	44.4	65.1	15.6	30.7
Max	509.9	215.2	509.9	92.4	218.7
% of use	43.00%	36.00%	52.10%	35.50%	41.70%

Note: This table contains summary statistics on the different types of debt for a sample of French local governments. The data are obtained from a survey conducted by a specialized consulting firm as of December 31, 2007 (Dataset A). Aggregate denotes the sum of the debt notional amount over all local governments. Total debt is the sum of all debt instruments for a given local government. This table displays statistics on aggregated and local government-level amounts of debt. Notional figures are in millions of euros, except for share in % and % of use. Share in % represents the aggregated amount of a given debt instrument in the sample divided by the aggregated total debt of the sample. Vanilla financing includes fixed rate and floating rate loans as well as bonds. A revolving facility is a credit line that allows a borrower to flexibly draw down, repay, and redraw loans advanced to it.

Table 2.3: Structured Transactions

	All	Regions	Depart.	Intercit.	Muni.	Hospit.	Social Housing	Others
Number of Trades								
Mean	1.9	2.8	3.4	1.8	1.9	1.8	2.7	1.7
Stdev	1.6	3.3	2.5	1.5	1.3	1.3	2.7	2.1
Max	20	14	11	12	13	9	16	20
Structured Notional								
Mean	8.6	37.2	50.6	7.8	5.6	11.2	15.3	11.9
Stdev	22.6	46.3	82.1	19	12.9	24.4	19.1	30.9
Max	459.3	175.5	459.3	282.1	271.6	219.5	135.6	214.9
Mark to Market								
Mean	1.4	4.7	8.5	1.3	0.9	1.7	2.4	2.3
Stdev	5.1	7.2	22	3.8	2.8	3.9	4.1	9
Max	147.4	23	147.4	49.2	54	31.7	18.5	75.3
Mark to Market/Notional								
Mean	11.80%	9.00%	10.90%	11.60%	11.50%	13.20%	13.10%	12.50%
Stdev	8.90%	5.10%	8.10%	8.20%	8.60%	9.10%	13.60%	9.00%
Max	79.30%	21.40%	40.90%	51.00%	79.30%	50.40%	59.70%	53.80%
FX Products								
% of use	17.70%	25.00%	36.40%	17.80%	16.20%	22.20%	21.40%	10.10%
Max notional	400	91.7	400	232.7	70.1	104.2	68.9	94.4
Max mtm	134.1	16.1	134.1	43.8	23.4	36	14.8	38.6
Max ratio	86.80%	45.90%	45.40%	59.00%	86.80%	61.10%	75.50%	61.30%

Note: This table contains summary statistics regarding the number of structured transactions, the total structured notional amount, the total mark to market, and the use of FX products at the local government level of the entire client portfolio of Dexia as of December 31, 2009 (Dataset B). The table includes the following types of public entities: regions, counties, intercities, municipalities, hospitals, social housing entities, and others (airports, harbors, chambers of commerce, healthcare cooperatives, public-private joint ventures, schools, research institutes, nursing homes, fair organizers, and charities). All notional and mark-to-market figures are expressed in millions of euros. Mark to market represents the amount that a local government should pay to the bank to unwind the derivative component of a structured debt (i.e., to convert it into vanilla debt).

Table 2.4: Toxic Loan Usage and Political Incentives

	Debt Hiding Incentives (A)			Political Stability (B)			Political Affiliation (C)		
	First Quartile Indebted	Last Quartile Indebted	Test	Strongholds	Non-Strongholds	Test	Left Wing	Right Wing	Test
% of use: Struct.	41.00%	89.60%	***	n.a.	n.a.		70.30%	74.60%	
% of use: Toxic	19.30%	54.50%	***	n.a.	n.a.		38.10%	48.60%	**
Structured/Total	14.50%	26.30%	***	23.40%	29.10%	***	19.00%	21.00%	
Toxic/Total	5.10%	9.90%	**	13.10%	16.50%	*	5.90%	9.10%	**
Mtm/Total	n.a.	n.a.		3.40%	4.80%	***	n.a.	n.a.	
Observations	83	77		163	173		138	155	

Note: This table contains summary statistics regarding the frequency and the extent of structured and toxic loan usage for sub-samples of the local government survey data (Panel A and B) as well as for Dexia's client portfolio (Panel C). In Panel A, the first (last) quartile of the indebted sample includes the 25% least (most) indebted local governments. In Panel B, the stronghold sample includes local governments that have been ruled by the same party for more than 20 years, whereas the non-stronghold sample includes local governments that have been ruled by the same party for fewer than 10 years. In Panel C, the left-wing (right-wing) sample includes all local governments managed by a left-wing (right-wing) party. % of use: Struct (% of use: Toxic) denotes the percentage of local governments in the sub-sample that have at least one structured (toxic) loan in their debt. Structured/Total is the mean value of structured debt over total debt, whereas Toxic/Total is the mean value of toxic debt over total debt. Mtm is an abbreviation for mark to market, which is the amount that a local government must pay to the bank to unwind the derivative component of a structured debt (i.e., to convert it into vanilla debt). Therefore, Mtm/Total denotes the mark to market over total debt. The Test columns display the level of statistical significance of a t-test between the mean values of the right column minus the left column. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table 2.5: Incentives to Hide Cost of Debt

	Probit				Ordered Probit		Magnitude	
	Structured (1)	Structured (2)	Toxic (3)	Toxic (4)	(5)	(6)	Structured (7)	Toxic (8)
Debt/Population	1.564***	2.081***	0.751***	0.679***	0.812***	0.817***	12.831***	0.021**
	4.28	4.29	5.07	7.53	4.55	8.07	7.71	4.32
Right-Wing Dummy	0.226***	0.364	0.223**	0.365***	0.210**	0.323***	2.317	0.018*
	3.56	1.47	2.15	8.05	2.44	3.27	0.79	2.62
Equipment Expenditure/Pop.		-0.004***		-0.001*		-0.002***	-0.02	-0.000**
		-3.71		-1.67		-2.88	-2.08	-3.29
Wages/Operating Expenditure		3.809***		0.965		2.350***	-0.592	0.006
		5.51		0.94		4.38	-0.04	0.23
Debt Average Maturity		0.075***		0.057***		0.083***	1.204**	0.004**
		2.99		3.05		4.94	3.65	3.75
Log (Population)		0.070***		0.085***		0.082***	1.110**	0.003**
		3.56		8.13		18.87	5.5	4.97
Unemployment		0.019		0.046*		0.030*	-0.239	0.001**
		0.84		1.65		1.66	-1.14	3.42
Agriculture		0.003		0.076**		0.039***	-0.914	0.002**
		0.09		2.33		2.71	-2.19	4.29
Industry		0.047**		0.025		0.039	0.309	0.002
		1.98		1.53		1.45	0.89	1.83
Lender Relationship FE	NO	YES	NO	YES	NO	YES	YES	YES
Local Government Type FE	YES	YES	YES	YES	YES	YES	YES	YES
Pseudo R2̂ / R2̂	0.135	0.304	0.065	0.181	0.04	0.129	0.243	0.259
Number of Observations	293	275	293	275	293	275	263	263

Note: This table contains the probit regression coefficients using debt portfolio data from a sample of local governments (Dataset A). The dependent variable is a dummy variable for the use of structured products for the first two columns, a dummy variable for the use of toxic loans (as defined in section 2) for columns 3 and 4, and a variable covering the 6 levels of underlying risk for columns 5 and 6. Standard errors of the coefficients are clustered by types of local governments, and Z-statistics are reported in brackets. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table 2.6: Politically Contested Areas

	Structured Debt /Total Debt (1)	Structured Debt /Total Debt (2)	Mark to Market /Total Debt (3)	Mark to Market /Total Debt (4)	Toxic Debt /Total Debt (5)	Toxic Debt /Total Debt (6)
Years in Power	-0.1683*	-0.1761**	-0.0401**	-0.0373**	-0.0785*	-0.1245***
	-2.97	-4.94	-5.37	-6.9	-3.1	-9.91
Right-Wing Dummy		1.5221***		0.0204		2.8585**
		9.52		0.48		7.3
Log (Population)		-5.9739*		-0.8441*		-3.2835*
		-3.42		-2.91		-3.37
Local Gov. Type FE	YES	YES	YES	YES	YES	YES
R2 / Pseudo R2	0.1267	0.1603	0.0513	0.0614	0.0507	0.0665
Observations	389	389	389	389	389	389

Note: This table contains cross-sectional OLS regression coefficients using data from Dexia's client portfolio (Dataset B). The dependent variable is the measure of structured loan use intensity as indicated in the column header. Years in power refers to the number of years during which the political party of the incumbent (as of December 31, 2009) has been managing the local government. Standard errors of the coefficients are clustered by types of local governments, and t-statistics are reported in brackets. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table 2.7: Difference-in-Differences Estimation of Election Timing Effects

	C-logit Structured Trade		Placebo C-logit Structured Trade	
	+\- 18 months	+ \- 12 months	+ \- 18 months	+ \- 12 months
	(1)	(2)	(3)	(4)
Interaction Pre-Election/Treatment	0.3522***	0.3350***	0.0275	0.0262
	2.88	3.28	0.39	0.26
Quarter Fixed Effects	YES	YES	YES	YES
Regression Type	PANEL	PANEL	PANEL	PANEL
R2 / Pseudo R2	0.0815	0.0545	0.0805	0.0534
Number of Periods	12	8	12	8
Observations	2741	2741	2741	2741

Note: This table contains the conditional logit (C-logit) regression coefficients that are estimated using data from Dexia's client portfolio (Dataset B). The dependent variable is an indicator variable of a structured trade for a given local government in a given quarter. In columns 1 and 2, the explanatory variable is an interaction variable between a dummy for the treatment group (local governments having an election at the end of 2008Q1) and a dummy for the pre-election period. Columns 3 and 4 present a placebo analysis in which the treatment group dummy that is used in the interaction term has been replaced by a dummy on a random sample of similar size; the regressions include individual public entity fixed effects. Standard errors are clustered by type of public entity. Z statistics are reported into brackets. The time window is 18 months before and after the election (the end of March 2008) for columns 1 and 3, and the window is 12 months for columns 2 and 4. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table 2.8: Herding Behavior in the Borrowing Choices of Politicians

	C-logit Structured Trade		OLS Δ (Structured Debt Notional)	
	(1)	(2)	(3)	(4)
# of Active Public Entity in Same Zone the Previous Quarter	0.0183***		10.3991***	
	5.53		3.03	
# of Active Public Entity in Same Zone the Previous Two Quarters		0.0064**		4.3144*
		1.91		1.81
Quarter Fixed Effects	YES	YES	YES	YES
Regression Type	PANEL	PANEL	PANEL	PANEL
R2 / Pseudo R2	0.155	0.1486	0.0101	0.0098
Number of Periods	40	39	40	39
Number of Public Entities	2741	2741	2741	2741

Note: This table contains the conditional logit (C-logit) and OLS panel data regression coefficients that are estimated using data from Dexia's client portfolio (Dataset B). The dependent variable is an indicator variable of a structured trade for a given local government in a given quarter (or semester) for the conditional logit regressions and the incremental exposure on structured debt entered into by a public entity in a given quarter (or semester) for the OLS regressions. The explanatory variable is the number of active public entities in the same geographical zone (county level), which is defined as the number of public entities that have implemented at least one structured transaction in the previous quarter (or semester). The regressions include individual public entity fixed effects. Standard errors are clustered by type of public entity. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Chapter 3

Call Me Maybe?

The Effects of Exercising Contingent Capital

Adventure is just bad planning. [Roal Admunsen, Explorer]

3.1 Introduction

Excess leverage of financial institutions has been a major catalyst of the recent financial crisis, leading regulators and politicians to largely blame lenient bank capital rules for the level of leverage achieved by major financial institutions when entering the crisis. The debate on bank capital regulation, however, has revealed a fundamental policy dilemma. As advocated by both regulators (Report of the Independent Commission on Banking headed by Sir John Vickers (2013)) and academics (Admati et al. (2011)), a mandated drastic increase in bank common equity capital represents the logical answer to the risk of financial distress that became evident in the years 2007 - 2009, and will help prevent future bank bailouts by governments. Enforcing these higher requirements, however, is likely to have unwanted real effects such as credit contraction, as investors are reluctant to provide banks with additional equity (Jiménez et al. (2013)).[1] This reluctance translates also into industry practitioners fighting against tighter capital regulation (Ackermann (2010)). Therefore, contingent capital instruments that combine the advantages of both debt and equity appear as an attractive solution to this dilemna (Flannery (2005); Brunnermeier et al. (2009); Kashyap et al. (2008), French et al. (2010)). In principle, debt reductions and improvement in capitalization can also be achieved through *ex post* debt restructuring, for instance via debt-for-equity swaps. Contingent capital securities may, however, be more efficient at avoiding expensive bank bail-outs from states and help solving debt overhang issues (Duffie (2010)) without incurring any risk of default or failure of a debt restructuring plan. Substituting contingent capital to traditional common equity might allow banks to improve their resilience without incurring the costs of raising additional equity.[2]

The purpose of this paper is to assess how effective contingent capital instruments are in solving financial distress in financial institutions. More specifically, I address the following questions: When given discretion over the trigger, do financial institutions use the contingency offered by such instruments in times of stress? How do debt and equity investors react to contingent capital trigger events? What is the impact of such contingent capital triggers on the economic performance of financial institutions? A burgeoning literature on the theoretical analysis of contingent capital instruments has emerged, with an important focus on trigger incentives and effects (Sundaresan and Wang (2013), Pennacchi et al. (2011), Martynova and Perotti (2012), Zeng (2012), Flannery (2010)). To the best of my knowledge there is no empirical study on this topic yet.

[1] They find that when capital constraints become tighter banks respond by cutting back lending and not by relaxing the constraint through a new equity issue.

[2] The literature documents several deviation from Modigliani-Miller such as: equity underwriter's fees, under-pricing of the equity issue due to asymmetry of information, and the negative stock price reaction to the announcement of a new issue. For more details, see Eckbo et al. (2007).

To answer these questions, I use the widespread issuance of first generation hybrid bonds and the massive use of their contingent features by European financial institutions during the financial crisis. Contingent capital instruments are hybrids between debt and equity: they are issued as debt securities, with coupon payments and stated maturity, but include clauses that allow their discretionary or automatic conversion into equity-like claims during periods of stress. Contingent capital is cheaper than equity because of the tax shield it provides, and because it allows to raise equity only when needed. These instruments therefore limit the costs associated with equity issuance to certain states of nature (Bolton and Samama (2012)). Hybrid Bonds are the first generation of contingent capital instruments, and are known as Trust Preferred Securities (TPS) in the US. These debt-like securities give the issuer the option to postpone their repayment, potentially forever, therefore removing any roll-over risk. This contingent feature explains the eligibility of such instruments as regulatory capital, while the interests they bear are tax-deductible. Hybrid bonds proved to be very popular: worldwide, they amounted to more than USD 1 trillion in 2008. Under the new Basel III standards, regulators are encouraging financial institutions to issue new forms of contingent instruments such as Contingent Convertibles (CoCos), with the Swiss and British national regulators even giving specific targets to their financial institutions. This regulatory stance has led to a recent surge in contingent capital issuance. Under Basel III standards, total new contingent capital issuance can represent up to 3.5% of bank risk weighted assets, or around EUR 400bn only for the largest European banks.

I focus on the European Hybrid Bond market for two main reasons. First, the European market is by far the largest. In 2008, European Hybrid Bonds amounted to EUR 701bn, or 38.3% of European banks' regulatory capital. More than 80 percent of banks subject to the EU stress test have issued such hybrid bonds.[3] This amount compares to USD120bn (EUR86bn) of outstanding TPS that year, or 8.7% of US banks total capital in 2008.[4] The difference in market size follows from the larger size of the European banking sector, as well as the different regulatory frameworks.[5] The second and most important reason I focus on Europe is because this is where the triggers occurred. While European financial institutions have massively used the contingent debt relief offered by their hybrid bonds, American banks hardly, if ever, exercised options embedded in TPS during the financial crisis. This deviation is likely to come from contractual and institutional characteristics between the two markets.[6] Banks such as Citigroup and JP Morgan

[3]This perimeter includes 91 banks that contribute to systemic risk according to the European Banking Authority.

[4]Amount of total capital are from OECD and The Banker.

[5]The US did not apply Basel II standards, whereas European countries did.

[6]Cf. Section 7 for more details.

have been using the contingency of their European hybrid bonds, but not the one of their Trust Preferred Securities.

The paper's first contribution is to show that European banks have massively taken advantage of the contingent features of their hybrid bonds during the period 2009 - 2012. I find that banks used mainly two trigger mechanisms to obtain a contingent debt relief: maturity extension, and tender offer at a discount. Many issuers extended the maturity of hybrid bonds by not calling them at their first call date. Non-calls lead to an economic debt relief for issuers who wish to avoid refinancing at a higher cost, or cannot roll-over due to a liquidity dry-up. In my data, I find that European banks have not called at first call date a total of EUR 200bn of hybrid bonds. This amount represents 30 percent of outstanding hybrid bonds, or 11% of European banks' total capital. Financial institutions with the lowest capital ratios, who are therefore most likely to suffer from a binding regulatory capital constraint, are more inclined to this action. This finding mitigates the concern that the discretionary nature of the instruments may lead to risk-shifting behaviors, because financial institutions would renounce to reducing their debt under this hypothesis. Among the issuers that did not call, some launched simultaneously a tender offer on the hybrid bonds. The tender offer is typically implemented at a significant discount inherent to the change of maturity on a deeply subordinated claim. These combined actions allow the financial institution to immediately book the offer discount as a capital gain that increases permanently Core Tier 1 capital by the same amount, leading to a regulatory debt relief.[7] Investors have tendered more than EUR 87bn of hybrid bonds, which allowed banks to book EUR 22bn of capital gain.

The second contribution of the paper deals with investors' reaction to triggers. Contingent debt relief is, for the most part, received positively by regular debt holders, while reactions from shareholders are more mixed. The market reaction is more pronounced for non-calls coupled with tender offers, which is consistent with their effect on Core Tier 1 capital, a key indicator for the regulator during the crisis. Moreover, exchange offers into equity, which bring the largest effect on debt reduction, are received positively by both debtors and shareholders.

The third contribution consists in providing empirical evidence of positive and persistent economic effects for banks using contingent capital features. Financial institutions that obtain permanent debt relief through the exercise of contingent capital provisions show significantly higher returns on assets, and this relative improvement is proportional to the increase in Core Tier 1. This effect is robust to controlling for government bail-outs and seasonal equity offerings, and is driven by a more preserved lending activity.

[7]Core Tier 1 capital, or Common Equity Tier 1 capital, represents the highest quality of Tier 1 capital, meaning that it does not include goodwill and hybrid Tier 1 instruments.

Non-calls coupled with tender offers have similar economic effects as recently issued *Write-Off Bonds* and *CoCos*: an immediate gain, combined in some cases with an issuance of equity. Since regulators and financial analysts focus on regulatory capital, the impact of debt reliefs on regulatory capital ratios is key for the issuer. The discretionary nature of the events studied in this paper makes them even more comparable to the form of contingent capital proposed by Bolton and Samama (2012), *Contingent Capital with an Option to Convert*.[8] Therefore, my results illustrate how innovative liabilities products can help *ex ante* to decrease financial distress costs associated with high leverage.

For the purpose of my analysis, I build a unique and comprehensive database of European hybrid bond issuances and contingent debt reliefs from 1998 to 2012. I consider as contingent capital instruments any hybrid security classified as Tier 1 or Tier 2 under Basel II that is issued with default debt-like payoff terms and includes explicit option features that allow for an out-of-court transformation of these securities into more equity-like claims. I hand collect data on debt relief events at the bond level from issuer announcements and broker coverage reports and match this data with issuer financials, as well as CDS and share prices. In terms of methodology, I use logit regressions on contingent debt reliefs to identify the type of financial institutions that use the optionality offered by these instruments. I then implement an event study methodology on hybrid bond issuer stock and CDS prices to identify the market reaction to contingent debt relief trigger. I calculate abnormal returns associated to these events for both CDS and stock price. I explain the cross-section of market reaction through OLS regressions on the type of contingent debt relief and issuer capitalization. In a following step, I use the same data on contingent debt reliefs matched with bank financial statements. I implement a difference-in-differences analysis for measuring the impact of such actions on economic performance, as measured by return on assets. Although contingent debt relief is discretionary, I limit potential self-selection biases for my treatment group by using a control group obtained through propensity score matching. The propensity score is calculated on variables that capture the exposure to regulatory capital constraint.

This paper relates to several fields of the literature. First, this work addresses the question of bank capital structure (Admati et al. (2011), DeAngelo and Stulz (2013)), related bank debt overhang (Admati et al. (2012)), and behavior of distressed financial institutions (Acharya et al. (2013b)). This paper supports contingent capital instruments as an effective alternative to raising common equity requirements (Duffie (2010)), while addressing some of the concerns over potential pernicious effects (Sundaresan and Wang (2013)). Second, this study builds on the knowledge of subordinated debt and Trust Pre-

[8]These instruments are bonds convertible into shares, where the option to convert belongs to the issuer.

ferred Securities in the US (Krishnan and Laux (2005), Benston et al. (2003)), and provide insights on how contingent capital instruments perform well in practice. Therefore, my paper suggests another potential interpretation of the results of Boyson et al. (2013): the lower resilience during the crisis of TPS issuers might come from American banks not using the contingent features offered by these instruments. Third, my work relates broadly to financial innovation. An established literature studies the impact of innovative assets such as securitization on bank balance sheets (Loutskina (2011)), but my work underlines the importance of innovative liabilities. Although some financial innovation may be driven by adverse incentives (Pérignon and Vallée (2014)), contingent capital instruments illustrate how more financial innovation can create value (Perez-Gonzalez and Yun (2013)), and how more innovation on the liabilities side of the balance sheet may help prevent future financial crises (Haliassos (2012)). In addition, innovative liabilities can also complement lines of credit to help solving corporate roll-over risk (Acharya et al. (2013a)).

This paper is organized as follows: Section 2 provides background on the European market for hybrid bonds and the mechanisms of debt relief, and Section 3 presents the dataset built for the empirical analysis. Section 4 documents the magnitude of contingent debt relief and identifies the characteristics of contingent debt relief users. Section 5 provides hypotheses, methodology and results for the study of market reaction to debt relief, while Section 6 analyses the economic performance of issuers that have triggered permanent debt reliefs. Section 7 offers a discussion on validity and implications of my results, and Section 8 concludes.

3.2 Background and Debt Relief Mechanisms

3.2.1 The European Hybrid Bond Market in the Run-up to the Crisis

In 1998, the Basel committee modified its bank capital rules by clarifying its position concerning hybrid instruments and their eligibility as regulatory capital.[9] This announcement followed an increasing number of innovative hybrid instrument issuances: fixed income instruments with repayment in 5 to 10 years, which granted them coupon tax deductibility, but embedding an option to postpone repayment for a very long horizon or even until perpetuity. This option allows to transform debt-like security into loss absorbing claims quasi-similar to preferred shares: non-compulsory coupon payments, infinite maturity and no voting rights. The tax deductibility, the absence of covenants, and the

[9]Source: www.bis.org/press/p981027.htm.

non-dilutive nature of these instruments made them an attractive alternative to equity for banks.

When marketing the hybrid bonds to investors, issuers strongly hinted at their determination to always honor the call option and to repay the bond in full as soon as the first call date would be reached. Around 40% of the hybrid bonds also include a commitment device in the form of a step-up clause: the coupon increases by a pre-determined margin when the repayment is postponed.[10] Calling hybrid bonds at the first call date was the standard practice before the financial crisis. No exception occurred until the end of 2008, nor was there any expectation of non-calls, as can be inferred from security prices at issuance. Thus, Moody's (2009) writes: "Prior to the financial crisis, there was a tacit agreement between an issuer and investors that hybrid and subordinated debt would be called at the first call date".

Hybrid bonds gained investor interest as they offered higher yields than senior bonds, due to their junior status that rank them senior only to equity. Fixed income funds were allowed to invest in hybrid bonds, and hybrid bonds became a popular investment among fixed income asset managers seeking to increase funds performance.[11] Retail investors are also increasingly attracted to these types of subordinated instruments, as they appreciate the fixed coupon format and the issuers' reputation. The development of EUR 1,000 denominated bonds, vs. EUR 50,000 and EUR 100,000 denominations targeted at institutional investors, made it easier for retail investors to access the hybrid bond market. When assessing financial institutions' creditworthiness, rating agencies classified hybrid bonds as equity, which also fostered hybrid bond market development. The market has met a strong growth since its inception, with issuances rising from EUR2bn in 1998 to EUR105bn in 2008. Figure 3.1 shows the number of hybrid bond issues by quarter, as well as their initial maturities if bonds are called at first call date.

INSERT FIG 3.1

However, when the crisis hit and refinancing cost surged for financial institutions, banks reconsidered their call strategy. The watershed event was on December 16, 2008, in the midst of the financial turmoil: Deutsche Bank announced that it was not calling its Lower-Tier II Notes with first call date on January 2009. This first announcement of a non-call of a hybrid bond took many investors by surprise, and was poorly received by market operators, with some investors threatening to cease subscription to any future

[10] A step-up clause typically switch the coupon from fixed rate to variable rate and increases the coupon credit margin by 100 bps after the first call date, which often led to lower coupons than the initial ones during the financial crisis.

[11] Deutsche Bank research desk writes "Real money managers are the largest buyers of T1 [bonds]"(Bhimalingam and Burns (2011)).

debt and equity issuance from Deutsche Bank.[12] Following this announcement by one of Europe's leading banks, not calling hybrid bonds became increasingly frequent in 2009 and the following years. Despite the initial threats from investors, banks that have chosen not to call were not sanctioned when raising new debt, as illustrated by Deutsche Bank following issuance being oversubscribed. Starting in summer 2009, many banks coupled non-call with tender offers, naming this type of offer a *Liabilities Management Exercise*. By making explicit reference to an impending non-call, banks ensured that bonds trade at a significant discount, allowing them to make a capital gain on the tender offer.[13]

3.2.2 The Contingent Nature and Regulatory Treatment of Hybrid Bonds

Hybrid bonds exhibit a contingent dimension in the sense that the issuer has the option after the initial non-call period to postpone repayment for a long to infinite amount of time. The issuer also has the right to defer their coupon without creating an event of default.[14] Both decisions lead to a temporary debt relief, as long as the bond is not repaid. Appendix A provides an example of hybrid bond terms.

The optional nature of hybrid bonds allows them to gain regulatory treatment as capital under Basel II. Indeed hybrid bonds account for either Tier I or Tier II capital, depending on their legal maturity and conditions on coupon payments. Figure 3.2 illustrates where hybrid bonds stand in a financial institution balance sheet. For the same reason hybrid bonds are allowed capital regulatory treatment, they are also considered as capital by rating agencies, typically with a weight of 50% for Tier 2 securities and 100% for Tier 1 securities. Under Basel II, banks must hold at least 4% (respectively 8%) of their risk-weighted assets as Tier I capital (respectively Total Capital, including Tier II capital). National regulators put a limit on the use of hybrid bonds as part of Tier I capital, while the Basel Committee puts a 50 % cap on Tier II hybrid bonds as a share of total regulatory capital. Hybrid capital allows the issuer to meet regulatory capital ratios at a lower cost than equity for two main reasons. First, hybrid bonds increase the tax shield as their interests are tax deductible, which represents an important difference

[12] For instance, Bank of China writes in a letter to every European bank following Deutsche Bank decision: "any non-call by a given institution will result in that institution's debt (not just lower tier 2 but senior and tier 1 as well) being ineligible for future investment consideration ". Source: http://www.independent.co.uk/news/business/news/bank-of-china-furious-at-deutsche-debt-move-1207511.html.

[13] Explicit reference to non call policy appears in the majority of offer announcement. Source: Barclays Research.

[14] For non cumulative securities, issuer has even the right not to pay the coupons without creating any default, also such decisions have been extremely rare and typically imposed by the regulator.

with preference shares. Second, hybrid bonds are priced *ex ante* with a high likelihood of a redemption at first call date, and not priced to their maximum possible maturity, as would be the case with preference shares. The economic rationale is therefore to provide capital only when needed, therefore saving the cost of raising equity in the other states of nature. Additionally, these instruments allow issuers to diversify their investor base, by tapping institutional and retail bond investors without any voting right dilution.

INSERT FIG 3.2

3.2.3 Contingent Debt Relief Events

Hybrid bonds contains embedded contingent triggers that can be used to provide debt relief in times of stress. Figure 3.3 displays the different types of debt relief allowed by hybrid bonds, and Table 3.1 summarizes the consequent accounting effects.

INSERT FIG 3.3 & TABLE 3.1

Non-Call

Postponing the repayment of a hybrid bond is the simplest way for a financial institution to reduce debt service. To do so, the issuer only needs to announce that it is not calling the security at the first call date, and consequently extending it to its legal maturity, typically perpetual. The issuer can, however, call back every year the hybrid bond. A non-call represents an economic debt relief, because it reduces the value of debt while leaving the regulatory capital unchanged.

The numerical example provided in Table 3.1 is based on a EUR1bn Hybrid bond with 4% coupon and current refinancing cost at 7%. Postponing repayment of this bond allows savings of $(7\% - 4\%) \times EUR1bn =$ EUR30m per year, which impacts the Products and Losses statement. The balance sheet is left unchanged by this debt relief.

Coupling non-call with a tender offer

European financial institutions also implement permanent debt relief by simultaneously not calling hybrid bonds and launching tender offers on them. The non-call, whether anticipated or not, typically leads the bond to trade at a significant discount, as investors become the holder of a deeply subordinated perpetual bond with non compulsory coupons during a time of stress. The tender offer is thus realized at a significant discount which allows the financial institution to book the difference between nominal and tender price as a capital gain. The tender gain feeds into Core Tier 1 capital, and transfers wealth from affected hybrid bond holders to other debtors and shareholders. Precisely measuring the magnitude of this transfer is possible as it corresponds to the accounting gain booked by the issuer as a result of the debt relief. The issuer can offer payment in cash through a cash tender, or in new securities through an exchange offer for either senior notes, stocks or new hybrid bonds. The mode of payment impacts the leverage of the financial institutions and therefore matters for regulatory capital constraint as detailed in Table 3.1.

When looking again at our numerical example in Table 3.1, current refinancing cost value a perpetuity of EUR 4 at 57 cents per euros of nominal, allowing the issuer to reasonably offer a tender price of 60 percent of the nominal. Issuer can launch a cash tender at this price. Then, if fully subscribed, the capital gain is: $(100\% - 60\%) \times EUR1bn =$ EUR 400m. The core Tier 1 capital increases by this same amount. However, as the notes were part of the total capital, their repayment simultaneously decreases total capital by EUR 1bn, leading to a net effect on total capital of + EUR 400m - EUR 1bn = - EUR 600m. Another possibility for the issuer is to launch an exchange offer, for instance into equity. The exchange is proposed so that it is economically equivalent for the investor to a cash offer at 60 percent of the nominal. Thus, if the issuer's share is worth EUR 10, the issuer will propose to give 60 shares for each EUR 1000 nominal bond. In that case, the capital gain and core Tier I increase is also of EUR 400m, but the action simultaneously creates EUR 600m of common equity, leaving total capital unchanged.

3.3 Data

For the purpose of my empirical analysis, I build a comprehensive dataset that covers financial institutions financial statements, CDS, and share prices, hybrid bond issuances, and contingent debt relief triggers.

I start by compiling a dataset of the whole universe of hybrid issuances in Europe over the period 1998 to 2012.[15] I extract the characteristics of every hybrid bond issuance over the sample period from Dealogic DCM Analytics and Bloomberg. I merge these two sources using each bond unique ISIN identifier. I complement this data with handcollected information from issuers website and broker reports. I eliminate duplicates and standardize issuance characteristics variables across the different sources. I also convert all amounts into Euros. The cumulated volume of issuance in my database is EUR826bn. The dataset represents an extensive coverage of the market with for instance a scope of more than 90% of all outstanding hybrid bonds in 2007, as reported by

[15]European countries included in the analysis: Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Slovenia, Spain, Sweden, Switzerland, United Kingdom.

the Committee of European Bank Supervisors (CEBS) in 2007. Key issuance variables includes issuer name, country, security issue date, maturity, coupon, date of repayment postponement option, and Basel II tier of capital.

I then hand collect press releases from issuers and reports from bank research desks indicating that issuers have not called at first date a given hybrid bond issue. I also compile cash and exchange tender offer announcement and result releases. For each offer, I collect from these public releases the offer date, price, payment type (cash, senior debt, subordinated debt, new hybrid or equity), the amount tendered, and calculate the consequent accounting gain. I merge this information with the issuance characteristics using each hybrid bond ISIN code. I also merge this issuance level dataset with hybrid bond secondary trading prices with the same identifier. Some non-call events and tender offers may not be included in this study. I limit this concern by comparing my events list with the ones published by bank research teams, and typically have a larger sample.[16] Furthermore, not including some events can only bias against finding treatment effects, as some treated financial institutions would be mistakenly included in the control group.

As required for my event study and economic performance analysis, I associate the issuance level data gathered in the previously described steps with issuer level data. I proceed as follows. I manually identify subsidiaries and SPV issuers with their holding company. I then collapse key hybrid bond and debt relief data at the holding company-year level, using name and country as an identifier.

I then merge manually by name and country the contingent debt relief data with issuer senior and subordinated CDS spreads and stock prices from Datastream. Finally, I integrate balance sheet information from Bankscope through another manual merger by name of holding company. I convert variables of interest of Bankscope into euros.[17] This process results in a unique and reliable dataset that covers debt relief events, issuance characteristics, issuer financials, as well as related security prices.

3.4 Contingent Debt Relief Use

Gauging the Use of Contingent Debt Reliefs

Both hybrid bond issuance and recourse to contingent debt reliefs have been widespread during the sample period. Table 3.2 presents summary statistics on these two phenomena. Column I provides summary statistics on the use of hybrid bonds in Europe. The sample includes all Tier 1 and Tier 2 hybrid issuances between 1998 and 2012. I exclude

[16]For instance, Morgan Stanley (2012) lists 25 large European institutions that have not called some of their hybrid bonds.

[17]I only keep variables from Bankscope with a sufficient coverage and reliability, which I cross-check on a subsample of annual reports.

bullet Lower Tier 2 instruments from the study as they do not embed any optionality.[18] The European cumulated issuance amount of EUR826bn compares to issuances of TPS of USD185bn in the US over the 1996 - 2012 period (Boyson et al. (2013)), making Europe a much larger hybrid bond market. In my sample, 454 issuers use contingent hybrid instruments. Out of these 454 issuers, 167 have exploited the contingency of these instruments over the sample period by not calling them at first call date, while 85 issuers implemented permanent debt relief by coupling non-calls with tender offers. In total, non-calls cover more than EUR210bn in notional amount, while related tender offers have allowed issuers to book more than EUR22bn of immediate profit. These figures illustrate how European financial institutions have been making significant use of the possibility of debt relief offered by these instruments. Issuers have used the different debt relief mechanisms, some choosing not to call, some not to call and tender for cash, and some not to call and tender for other securities. The exact list of debt relief events and summary statistics for security prices and issuer financials is available in the online appendix.

INSERT TABLE 3.2

Characteristics of Contingent Debt Relief Users

Table 3.3 presents the result of logit regressions on implementing contingent debt reliefs, for both non-call and tender offers. The left hand side variable in the regressions is a dummy equal to one if the issuer has implemented during the sample period: a non call for columns (A) to (C); a non call coupled with a tender for columns (D) to (F). The analysis is conducted on a single cross-section, with financial data as of 2008, immediately prior to the first occurrence of contingent debt relief. These regression coefficients show that Tier 1 ratio, the most scrutinized regulatory capital ratio, is negatively correlated with the likelihood of implementing both types of debt reliefs: non call and tender offers. Contingent debt relief is therefore more widespread among under-capitalized financial institutions. These banks thus try to maintain or increase their amount of capital. This points towards financial institutions not engaging in risk-shifting when taking the decision to, or not to, implement a debt relief. Another important driver of the contingent debt relief decision is to be under fair value accounting for liabilities. The sign of the coefficient on the dummy for using this accounting choice differs according to the type of debt relief. Having liabilities fair value accounting increases the likelihood of not calling hybrid bonds, but decreases the likelihood of implementing tender offers. An immediate explanation is that institutions that have made this accounting choice at issuance do not need to launch a tender offer to book the decrease in value from their hybrid bonds as Core Tier

[18]So-called bullet Lower Tier 2 are subordinated bonds without any call feature.

1. Overall, these results suggest that risk-shifting does not play a dominant role in the financial institutions decisions regarding contingent debt reliefs. The possible negative signal of triggers, as well as fear of reputation damage resulting in a higher cost for future issuances, are likely candidates for explaining that a large share of banks still called their hybrid bonds at first call date.

INSERT TABLE 3.3

Figure 3.4 compares the amount of issuance and triggered securities by sector. This comparison helps understanding the motivation for two reasons. First insurance companies have similar regulatory capital constraints as banks, but have low need of funding. Insurers traditionally have a long position in cash due to the collection of insurance premia, and are even forbidden to borrow in some countries. Corporates on the other side, have funding needs but no regulatory constraints. Figure 3.4 shows that while hybrid bond issuances have been significantly larger for banks than for insurance and especially corporate, the fraction of triggered instrument is also much higher than for any of the other two categories. Trigger are almost non existent for corporation. This graphic evidence is consistent with regulatory capital being an important driver of the trigger decision.

INSERT FIG 3.4

3.5 Market Reaction to Contingent Debt Relief Events

3.5.1 Hypotheses

I consider three main frameworks to analyze market reaction to contingent debt relief triggers: Regulatory Capital Constraint, Signaling, and Risk-Shifting. Table 3.4 summarizes the predictions on debt and equity value for the three hypotheses developed below.

A. Regulatory Capital Constraint: *A contingent capital trigger helps releasing a binding regulatory capital constraint, and hence may allow to finance additional projects with a positive net present value.*
Banks need a minimum of book capital ratio to be able to conduct risky lending and investing. When undercapitalized, financial institutions can be forced by the regulator to forego positive NPV projects. Financial analysts also focus on these indicators when assessing the strength of a bank. As seen in Section 2, triggering contingent debt reliefs answers this issue by providing banks with additional regulatory capital. Bolton

and Samama (2012) considers contingent capital instruments that provide financial institutions with an insurance on regulatory capital to limit financial distress costs. This form of contingent capital is highly comparable to the debt reliefs event of this study, as its trigger is also discretionary to the issuer. Contingent capital increases firm value by releasing the capital constraint at a cheaper cost than equity, as the cost of raising equity is born only when needed. Furthermore, underpricing due to information asymmetry is limited as the issuance occurs several years before the potential distress. The increase in firm value obtained thanks to the trigger should translate into a tighter CDS spread and an increase in the stock price. In the case of equity issuance, the positive stock price reaction also illustrates that new equity is issued at a price below market price. Finally, the reduction of regulatory capital constraint should facilitate the funding of risky activities such as lending, which should be observable through an expansion or a lower reduction of the balance sheet compared to non treated financial institutions. This improvement should translate into a relatively higher economic performance after banks trigger contingent capital. Although economic debt overhang may also be at play, and should be impacted by non-calls, which decrease the market value of hybrid debt, I focus on the regulatory capital constraint for two main reasons. First, the discussion about regulatory capital is at the heart of this study. Second, non-calls typically occur for one issue at a time, whereas a tender offer covers multiple issues at the same time, making the potential effect larger and therefore easier to identify.

B. Signaling: *The use of a contingent capital trigger may act as a negative signal by revealing bad private information about the bank's financial situation.*
Markets may interpret debt relief announcement as a negative signal on bank financial health and balance sheet quality. Investors can infer from the use of contingent capital options that managers have negative private information that was not yet incorporated in the market prices. The overall effect on the bank value is then expected to be negative, leading Credit Default Swaps spreads to widen and stock prices to decrease. Current and future economic performance measures should then be negatively correlated with debt relief, identifying a strong selection effect.

C. Risk Shifting: *The use of a contingent capital trigger may decrease risk-shifting incentives by realigning shareholder incentives with the ones of debtholders.*
Due to their high leverage, financial institutions are inclined to risk-shifting (Acharya et al. (2013b), Landier et al. (2011)). Under this framework, managers have an incentive to implement high risk projects with negative present value, as long as their pay-offs are sufficiently increased in some states of nature. Exercising a contingent debt relief, when

it leads to a decrease in leverage, decreases future risk-shifting incentives. Managers of highly levered financial institutions may therefore forego the use of contingent debt relief triggers, despite the increase in firm value it would allow. If risk-shifting is not at play, discretionary and automatic contingent capital instruments should yield similar effects: the trigger of a contingent debt relief may lead to a decrease in equity value, that corresponds to a drop in future risk-shifting opportunities. On the other hand, debt value should increase as the likelihood of default decreases.

INSERT TABLE 3.4

Type of Contingent Debt Relief
Finally, the type of contingent debt relief should also matter for the valuation effects. When compared to all types of debt relief, market reaction and economic performance should be more positive for a debt relief that is permanent, cash neutral, and associated with equity issuance. First, tender offers should have a more pronounced effect than non-calls, as permanent debt reliefs allow issuers to gain the cumulated present value of refinancing savings and directly impact the capital ratios. Moreover, a change in market conditions or regulatory treatment might affect the value of non-called hybrid bonds and might lead issuers to end them, making their total benefit uncertain. Second, leverage neutral or improving transactions, such as exchange offers into equity or hybrid bonds, should lead to more positive effects than the ones that increase leverage and regulatory capital constraint, such as cash tenders or exchange into senior debt. These effects may vary according to the level of leverage of the considered financial institution. Third, exchanges into equity should better solve the regulatory capital constraint: by simultaneously transferring value from hybrid debt holders while raising capital, these transactions improve the most Core Tier 1 capital, while limiting dilution costs.

3.5.2 Event Study

I study the market reaction for both bondholders and shareholders by implementing an event-study methodology (Brown and Warner (1985) and MacKinlay (1997)). I analyze the impact of all debt relief, and then focus on permanent debt relief only. I use CDS spreads to measure debt value reaction because CDS are more liquid than bonds. For the equity value reaction, I examine stock prices.[19] If assuming semi-strong form efficiency, market reaction is only driven by information made public at the time of the debt relief announcement. Although a small number of debt relief announcements were made in conjunction with other issuer specific news, the large majority of debt reliefs was announced independently from any other corporate events, as observed on issuer press releases.

[19]This methodology is used for instance in Jorion and Zhang (2007).

Table 3.5 presents the mean cumulative adjusted returns of CDS and the mean cumulative abnormal returns of stock price to debt relief events. Panel A covers all non-call events, Panel B shows non-calls coupled with tender offers, and Panel C focuses on non-calls coupled with exchange offers only. I calculate adjusted returns of CDS as the change in a given issuer spread minus the change in its benchmark index. The benchmark index is the iTraxx Financial Senior for the senior CDS and the iTraxx Financial Sub for the subordinated CDS. This adjustement is comparable with the rating adjusted spread used in Jorion and Zhang (2007). Stock abnormal returns are calculated based on the CAPM model, using Eurostoxx 50 as the market index. Stock betas are estimated prior to the debt relief events, over a window of 200 days starting on the January 1, 2008.[20] Cumulative abnormal returns are the sum of abnormal returns over the considered windows: daily, over -1/+1 days, and over -2/+2 days. Panel A presents the results for senior CDS, Panel B for Subordinated CDS, and Panel C for stock prices.

INSERT TABLE 3.5

Positive Credit Market Reaction

Table 3.5 shows that debt relief events have a tightening effect on issuer CDS spreads, meaning investors perceive issuer credit quality to be improved. The effect on issuer CDS spread is statistically and economically significant for the subordinated CDS. Senior CDS spreads present the same tightening reaction, but results are not significantly different from zero. The larger magnitude of subordinated CDS reaction is consistent with these securities being more information sensitive than senior CDS, and less influenced by too-big-to-fail government put options. The tightening effect is stronger when restricting the sample to non-calls associated with tender offers, with a significant decrease in the spread of 9 bps on the announcement day. These results are robust to the time window considered, with the coefficient having the same sign and magnitude for 3 and 5 days windows. These effects are unlikely to be driven by liquidity, as bank CDS are typically more liquid than corporate CDS. Tender offers might however decrease the liquidity of some underlying bonds. Such an effect would bias against finding a tightening reaction, as a decrease in liquidity would widen the CDS spreads. This positive credit market reaction is consistent with both hypotheses of regulatory capital or risk shifting reduction, but not with a negative signaling effect.

Panel A of Table 3.6 examines the reaction by type of contingent debt relief: a non-call, a permanent relief through a cash tender offer, or a permanent relief through an exchange offer. I estimate the following model:

[20]Results detailed below are robust to using stock adjusted returns, calculated by subtracting the benchmark index performance to the stock performance.

$$\textit{Adj CDS Delta}_{i,t} = a + b.\textit{Type of Debt Relief}_{i,t} + c.\ \textit{Bank Characteristics}_{i,t} + \textit{Subordinated CDS Dummy}_i + \textit{Quarter FE}_t + e_{i,t}$$

where *Adj CDS Delta* is the CDS adjusted return, and *Type of Debt Relief* are dummy variables for permanent debt relief, cash tender, and exchange offer. The control group therefore comprises non-call-only events, on the day of notice of the decision. Standard errors are clustered by issuer.

Results are shown in columns (A) to (C) of Panel A in Table 3.6. Among all debt reliefs, permanent debt reliefs have a strong tightening effect on the CDS spreads. Cash tenders have the same tightening effect on CDS spreads. The situation is more heterogenous for exchange offers. I use leverage defined as total assets over total regulatory capital as an empirical proxy for regulatory capital constraint. By interacting the exchange offer dummy with leverage, I find that exchange offers lead to spread tightening in general, but to a CDS spread widening for highly levered institutions. To interpret this result, I need to discriminate by the type of security provided in the exchange, as the effect on leverage varies according to the type of exchange offer.

INSERT TABLE 3.6

Therefore in a next step, I restrict the sample to exchange offers, and study the reaction by type of securities offered in the exchange. I use exchange into hybrid debt as a control group. These regressions include controls for offer price and size. Standard errors are again clustered by issuer. The precise specification of the regressions conducted on the small subset of exchange offers is:

$$\textit{Adj CDS Delta}_{i,t} = a + b.\textit{Type of Security exchanged into}_{i,t} + c.\ \textit{Bank Characteristics}_{i,t} + \textit{Subordinated CDS Dummy}_i + \textit{Offer Characteristic Controls}_{i,t} + \textit{Quarter FE}_t + e_{i,t}$$

Results are displayed in columns A and B of Panel B in Table 3.6. An exchange into equity leads to the stronger tightening effect, while the impact of an exchange into senior is not significantly different from zero. However, when interacting with leverage, I find that exchange into senior debt leads to a tightening of the CDS spread for low leverage institutions, but to a widening of CDS spreads for highly levered institutions. This credit investor reaction is consistent with a poor perception of triggers that actually increase leverage for highly levered financial institutions, as it potentially drives up regulatory capital constraint or risk-shifting incentives.

Overall, the CDS spread reaction is consistent with the hypotheses that debt relief helps reduce both regulatory capital constraint and risk-shifting incentives, as credit quality is perceived as improved by market participants. More specifically, markets seem to validate transactions that have permanent effects. Consistent with reducing regulatory capital constraint, exchange into equity is positively received by debtors. In the next subsection, I study equity reaction to disentangle regulatory capital constraint from risk-shifting.

Reaction of Stock Prices

Stock market reaction to a contingent debt relief trigger differs according to the type of the debt relief. Overall, share prices appear to react negatively to the trigger events, as illustrated by Panel C of Table 3.5. However when looking at the cross-section of stock reaction by type of debt relief in Table 3.6, I observe that exchange offers receive a more negative reaction than non-calls and cash tender. When adding an interaction between the type of debt relief and the level of leverage, I observe the following. First, cash tender offers are positively received for low leverage financial institutions. When implementing these transactions, issuers face the following trade-off: improving their Core Tier 1 capital at the cost of decreasing their total regulatory capital. Negative stock market reaction for high levered issuers points towards the decrease in total regulatory capital being too costly for this type of issuer. Second, the level of leverage does not seem to impact the reaction to exchange offers, as interacting the exchange offer dummy with the level of leverage does not yield significant results.

As I did for CDS spreads, I restrict my event sample to exchange offers in panel B of Table 3.6. Similar to CDS spread reaction, stock price reaction is significantly higher for exchange into stocks, when compared to exchange into subordinated securities. Exchanges into senior debt do not yield an effect significantly different. It is unusual to observe a positive reaction to equity issue, as it typically leads to dilution. The specific design of this contingent debt relief, that allows to simultaneously book a capital gain, might explain this result. Economic magnitude of this result is high, but must be interpreted with caution due to the limited number of observations. Also, I cannot interact with leverage in this specification due to the size of the considered subset.

Overall, the stock price reaction is consistent with contingent debt relief decreasing risk-shifting incentives, and therefore decreasing equity value. Exchanges into equity, however, lead to an increase in both debt and equity value, which suggests that this relief helps relax the regulatory capital constraint. This result validates the relevance of an instrument that offers simultaneously an immediate gain in time of distress while raising some additional capital, and represents a rare occurrence of well received equity issuance.

3.6 Economic Effects of Contingent Debt Relief

3.6.1 Impact on Economic Performance

I estimate the effects of debt relief events on economic performance in a difference-in-differences set up. I focus on permanent debt reliefs as their effect on the P&L statement and balance sheet is larger and more persistent. However, I also control for temporary debt reliefs in my analysis. The treatment consists of permanent debt reliefs that occurred between 2009 and 2011. I use three different control groups of untreated financial institutions: first, all hybrid bond users for which financial data is available in Bankscope, which corresponds to financial institutions that were in a position to implement permanent debt reliefs, second, all financial institutions that used non-calls, and finally the financial institutions that have implemented permanent debt reliefs in 2012, but not before. Summary statistics of key financial variables are presented for the different subsets in the Appendix.[21] I estimate the following model on yearly financial data ranging from 2007 to 2011:

$$\textit{Return on Assets}_{i,t} = a + b.\ Post \times Treated_{i,t} + c.\ \textit{Treated}_i + d.\ \textit{Bank Characteristics}_{i,t} + \textit{Year FE}_t + e_{i,t}$$

where *Treated* is a dummy variable for having a debt relief in any year, $Post \times Treated$ a dummy variable for having a debt relief during this given year or a previous year. I control for not calling hybrid bonds and seasonal equity offering with dummies for such events. Regressions also include controls for previous accounting exercise total assets, Tier 1 capital ratio, impaired loans over equity, amount of hybrid bond, client deposits over total funding, risk weigthed assets over total assets, and yearly change in total assets, as well as a dummy variable for being publicly listed, and year fixed effects. Standard errors are clustered by issuers.

Results are presented in Table 3.7. Permanent debt relief is associated with a higher economic performance. The positive and significant coefficient on the dummy for permanent debt relief shows that these actions have a positive impact on return on assets (ROA). This result is robust to a battery of controls, and holds for all three control groups. This effect is economically significant: regression coefficients indicate an improvement of ROA between 0.6% and 1.0% according to the control group.

To confirm the validity of this result and limit concerns over unobserved variables to factors correlated with the size of the relief, I then interact $post \times treated$ with the capital gain obtained through the debt relief, as a percentage of total assets:

[21] Banks from the treatment group are on average larger and more frequently listed than for the control group

$$Return\ on\ Assets_{i,t} = a + b1.\ post \times treated_{i,t} + b2.\ post \times treated \times gain_{i,t} + c.\ treated_i + d.\ Bank\ characteristics_{i,t} + Year\ FE_t + e_{i,t}$$

Results appear in columns (B), (D) and (F) of Table 3.7 for the three control groups. The larger a permanent debt relief, the more it impacts the ROA of the affected financial institution. Again, a battery of controls, year fixed effect for example, also leaves the coefficients of interest significant. This coefficient mitigates concerns that unobserved variables are driving the previous results, as these variables need to be correlated with the size of the capital gain obtained through the contingent debt relief.

This higher economic performance for financial institutions that implemented permanent debt relief is consistent with the initial hypothesis that these actions help relax the regulatory capital constraint. By providing a gain in difficult times and allowing financial institutions get adequate capitalization when needed, debt relief can help avoid discounted fire sales or renouncing to positive NPV projects.

Moreover, the positive correlation between debt relief and economic performance makes reverse causality unlikely to drive the result. If at play, potential endogeneity would go against finding positive effects of debt relief, as the capital gain relates to how discounted hybrid bonds are, and therefore to how distressed the financial institution is. Therefore, potential self-selection would bias the treatment group towards having more banks in financial trouble than in the control group, which makes them consequently unlikely to exhibit relatively higher economic performance. Controls for key financial ratios should also limit this concern to unobserved variables. I further address and discuss the self-selection issue in the next section.

The coefficient on the dummy for hybrid bond non-call is negative and highly significant. Here this result is likely to be driven by a reverse causality effect: as shown in section 4, financial institutions use their temporary contingency when distressed, which makes it challenging to identify the real effects of this action. A potential treatment effect of non-call does not seem to dominate the selection effect. Seasonal equity offerings do not appear to be significantly correlated with economic performance measured as return on assets. Controlling for the change in balance sheet size is important to make sure that the improved economic performance is robust to asset sales, and does not come from concentrating operating income on a smaller asset base.

INSERT TABLE 3.7

3.6.2 Inspecting the Transmission Mechanism

Understanding the channel through which contingent instruments improve economic performance is key for assessing their relevance and efficiency. If these instruments help reduce regulatory capital constraint, financial institutions that have triggered debt reliefs should exhibit a smaller decrease in lending, as well as a higher performance of this activity. Reducing the regulatory capital constraint should allow financial institutions to finance relatively more positive-NPV projects. Using the same set up as in Table 3.7, I test these predictions by looking at the impact of contingent debt reliefs on the asset side of the balance sheet and on interest income. I estimate the following specification:

$$Y(i,t) = a + b.\ post \times treated + c.\ treated + other\ events\ control + Bank\ characteristics(i,t) + year\ FE\ (t) + e(i,t)$$

where Y(i,t) is successively log(Loans), Risk-Weigthed Assets over Total Assets, and Interest Income over Total Assets. I consider two control groups: hybrid bond issuers, and non-call users.

Table 3.8 displays the results. Contingent debt relief appears to impact the quantity of loans retained. When looking at asset composition, I find that treated financial institutions keep a higher ratio of risk weighted assets over assets. These results show that, on average, treated financial institutions stay more invested in risky assets during the financial crisis. This difference in asset composition translates into higher interest income, as exhibited by the positive and significant coefficient on $Post \times Treated$ in columns (C) and (F). These effects are robust to restricting the control group to non-call users. Altogether, these results corroborate the role of contingent debt relief in relaxing the regulatory capital constraint and its pernicious effects on lending in times of distress.

INSERT TABLE 3.8

3.7 Discussion

3.7.1 Alternative Hypotheses

Self-selection

A natural concern about comparing the economic performance of contingent debt relief users with the one of a control group is the self-selection bias. Conditionally on having issued hybrid bonds, financial institutions decide themselves to be treated due to the discretionary design of the trigger. This decision might be correlated with important variables that drive economic performance. To address this concern, I implement a propensity score matching to alleviate self-selection concerns. This high comparability comes however at a cost of a somewhat lower statistical power, as it decreases the sample size. The propensity score matching methodology allows to rule out endogeneity on past observable variables included in the logit analysis of the propensity score. This set-up therefore restricts endogeneity concern to unobserved time-varying variables.

Table 3.9 presents the same specifications as Table 3.7 and Table 3.8, with the control group built by using propensity score matching. The propensity score is calculated on the following variables with their 2008 value: total assets, Tier 1 capital ratio, client deposits over total funding, impaired loans over assets, risk weigthed assets over total assets, yearly change in total assets, as well as a dummy variable for being publicly listed. I take the closest five non-treated financial institutions for each treated financial institution, with possible replacement to maximize comparability. These replacements happen frequently, which explains the small size of the control group.

Both economic performance and balance sheet composition effects are confirmed by this additional robustness test. I use return on assets, log(Loans) and Risk Weighted Assets over Total Assets as left hand-side variables. The coefficient on the interaction dummy $Post \times Treated$ is significantly positive in all three specifications. The coefficient on the triple interaction terms $post \times treated \times gain$ in column (B) also bears a positive coefficient, which reinforces the validity of the result, as unobservable variables need to be correlated both with treatment timing and size to create endogeneity.

INSERT TABLE 3.9

A change in regulatory framework that fostered tender offers from mid 2010 mitigates endogeneity concerns on unobserved variables. As part of the Basel III standards implementation, the Basel Committee on Banking Supervision's announced on September 10, 2010 new standards for hybrid instrument to be included in regulatory capital.[22] For the vast majority, existing hybrid bonds did not comply with these new standards. This regulatory change led to an increase in the incentive to repurchase or exchange existing bonds for issuers, as opposed to only postponing their repayment. When a hybrid bond loses regulatory capital classification, it becomes less attractive for the issuer. This shock covers all financial institutions and therefore cannot be convincingly used in a difference-in-difference setting or an instrument variable analysis. However, its regulatory nature supports a significant exogeneity of the trigger for permanent debt relief to the bank unobservable characteristics. Tender offers are significantly more frequent after the regulatory change than before.

[22]The main requirement announced was to increase the loss absorption mechanism of hybrid instruments, namely by making nominal write-off or conversion into equity automatic below a pre-specified trigger, and to avoid any incentive to redeem the securities prior to their maximum maturity.

Government Bail-Outs
Several financial institutions that implemented contingent debt relief also benefited from government bail-outs. An alternative hypothesis is therefore that the observed positive effects of debt contingent relief on economic performance may be driven by the subsample of banks that benefited from government bail-outs. A capital injection from taxpayer money, while potentially creating governance issues, may help reduce the regulatory capital constraint.

To rule out this alternative explanation, I conduct the same OLS analysis as in Table 3.7, keeping the variables related to contingent debt relief, but I add a dummy for banks that were beneficiaries of a government-sponsored bail-out (henceforth, the bailed-out banks), as well as an interaction between being a bailed-out bank and being post bail-out. The online appendix shows the list of bailed out banks obtained from the European Commission website, that includes all financial institutions that have been the object of an individual aid. [23]

Table 3.10 shows that the positive effect of debt relief is robust to this additional control. I use the same control groups as in section 6. Column A corresponds to the control group of hybrid bond user, column B to non-call users and column C to the control group that implemented contingent debt relief post sample period. While the selection effect appears to be strong for bailed out banks, with a significant negative coefficient on the dummy for bail-out, the treatment effect identified on the interaction term is not significantly different from zero. This compares to the opposite results for contingent debt relief: no apparent selection effect, but a significant treatment effect. The association of improved economic performance with contingent debt relief is therefore robust to controlling for government bail-outs.

INSERT TABLE 3.10

Country effects
Debt reliefs are more frequent in some countries than others. The positive effect of debt relief triggers may come from difference in trends between countries within Europe, which are unrelated to the events I am studying. Sovereign risk and state of the economy are the usual suspects. Countries from the periphery of the Euro-zone, such as Portugal, Italy, Ireland, Greece and Spain have been facing both an important risk of default from their central government and a fragile health of their economy. Scandinavian countries, on the other side, have been partly immune to the economic crisis and the related sovereign debt turmoil. To rule out this explanation, I include in the main specification of my analysis of economic performance dummies for these two geographic zones, that I interact with

[23]Source: http://ec.europa.eu/competition.

year fixed effects. Table 3.11 shows that the positive impact of debt relief remains valid in this robustness check.

INSERT TABLE 3.11

3.7.2 Comparison with Second-Generation Contingent Capital Instruments

A parallel can be drawn between the two types of permanent debt relief and the two most discussed forms of contingent liabilities. Cash consuming debt relief is economically similar to write-off bonds, as it allows to book an immediate gain while having to provide only a fraction of bond nominal in cash to investors.

Permanent debt reliefs through an exchange offer are comparable to Contingent Convertibles (CoCos), as the immediate gain at trigger comes with the remaining fraction of nominal being exchanged into new securities, possibly stocks. On top of their discretionary nature, permanent debt reliefs differ from write-off bonds and CoCos to the extent that the investor can choose not to subscribe to the offer. Except for certain offers under Dutch auction format where it was not possible to infer the offer price, investors have largely subscribed to tender offers. A likely explanation is that investors were eager to use the liquidity they provided. Indeed, another important difference between the first-generation instruments, hybrid bonds and TPS, and the second generation is one of investor perception: while post-crisis investors cannot be mistaken about the bail-in design of their contracts, investors buying hybrid bonds prior to the crisis arguably may have been under the impression that they had bought plain-vanilla bonds. Retail investors in Spain and UK are currently suing banks for *product mis-sellling*, following investor losses due to non-calls and tender offers at a discount.[24] Finally, the main difference with CoCos lies in the discretionary nature of the studied debt reliefs. However, the results of section 4 indicates that risk-shifting is a limited concern. Therefore, the conclusion of this study should hold for automatic instruments when regulatory capital constraint, and validates the regulator positive stance towards CoCos. Furthermore, the results of this paper are supportive of the contingent capital design proposed by Bolton and Samama (2012). Multiple equilibria issues and external manipulation are less of a concern for discretionary instruments.

[24]Source: http://nyti.ms/14Z08ke.

3.7.3 Comparing Europe and the United States

During the recent financial crisis, American banks triggered significantly less debt relief than European ones. Trust Preferred Securities have been largely called at first possible date despite the difficulties of American financial institutions. In contrast to European hybrid bonds, many US hybrid bonds were trading above par, fostering issuers to use the regulatory call clause to call these bonds at par and refinance with cheaper securities.[25] The regulatory calls were made possible by the implementation of the Dodd Frank Act, which changed the regulatory treatment of TPS securities. The majority of US bank trust preferred securities traded above par due to bail-out guarantees and a more protective legal documentation. TPS are cumulative and include a dividend stopper clause, meaning that US investors are better protected against non payment of coupon and principal than European ones.[26] This effect, combined with a sharper decrease in interest rates is likely to have limited TPS trading discounts. Although permanent debt relief through extension coupled with tender offers seems very limited (Boyson et al. (2013)), there exists evidence of some use of open market purchase, as well as extension of a minority of trust preferred securities.[27] American banks such as JPMorgan or Citigroup have been steadily calling their USD denominated Trust Preferred Securities, while not calling their EUR denominated hybrid bonds. This decoupled strategy could also be driven by reputation concerns.

New TPS in the US are non-cumulative and should therefore behave more similarly to European ones. Would a sufficient amount of debt relief be identified in the US, the results of the paper should also hold for the US market.

3.8 Conclusion

This paper explores the European hybrid bond market to analyze the market reactions and economic effects of contingent capital triggers by financial institutions. While the European Sovereign Crisis and its effect on the banking sector has been under the spotlight for several years, the episode of non-calls and tender offers by European banks has drawn little attention. I document that financial institutions largely triggered the contingent features embedded into their hybrid bonds during the financial crisis, by not calling their

[25]The regulatory call clause allows issuer to call at any time at par if the instrument loses regulatory capital treatment. This clause is present in the documentation of all Trust Preferred Securities and hybrid bonds.

[26]Cumulative coupons means that any skipped coupons are accumulated to be paid in the future, at the latest at redemption date. Under a dividend stopper, the issuer cannot for a specified period of time, usually known as the *stopper period*, pay a coupon on another security or class of securities, typically stocks, if it does not pay a coupon on the security in question.

[27]http://seekingalpha.com/article/515731-is-your-preferred-stock-about-to-be-called

hybrid bonds at first call dates, and by simultaneously launching tender offers at a discounted price. The likelihood of using their contingent capital discretion appears higher for highly levered financial institutions, which makes risk-shifting behavior on that aspect unlikely. When conducting an event study on the dates of announcement of contingent debt relief, I find that CDS spreads tighten significantly. This increase in debt value is likely to be driven by a reduction of regulatory capital constraint. The reaction of stock prices is more mixed depending on the type of relief, but is consistent with a reduction in risk-shifting incentives. Exchanges into equity, however, are positively received by both debtors and shareholders, which is again consistent with reducing the regulatory capital contraint.

Moreover, contingent debt reliefs are associated with higher economic performance, and better preserved lending activity from their users. This result is robust to controlling for government bail-out and seasonal equity offering. I address potential endogeneity concerns due to self-selection of the treated group by using a propensity score matching on bank financials to constitute the control group.

My results empirically validate contingent capital as an effective solution to the dilemma of financial institutions leverage. By limiting financial distress costs in times of stress, contingent capital can replace higher capital requirement at a cheaper cost for the economy. In terms of security design, this paper supports the relevance of the form of contingent capital advocated by Bolton and Samama (2012). Giving the discretion of contingent capital to the issuer does not seem to lead to pernicious effects, while limiting the risk of manipulation by outsiders, which is a concern for CoCos currently being issued.

3.9 Figures and Tables

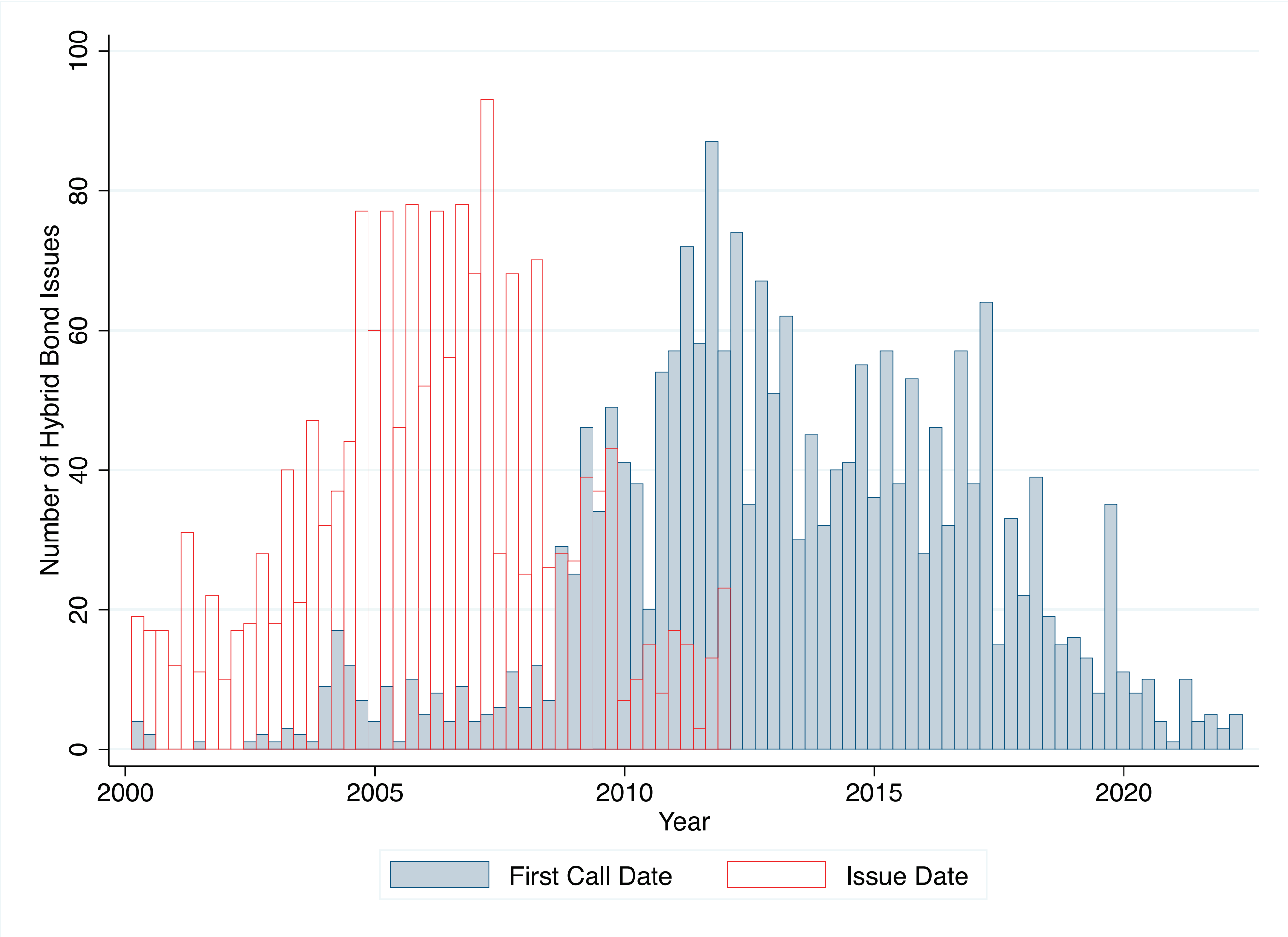

Figure 3.1: Issue Dates and Postponement Options of Hybrid Bonds

Note: This figure exhibits the number of hybrid bond issues and the number of postponement options by quarter. Source: Dealogic, Bloomberg, and company websites.

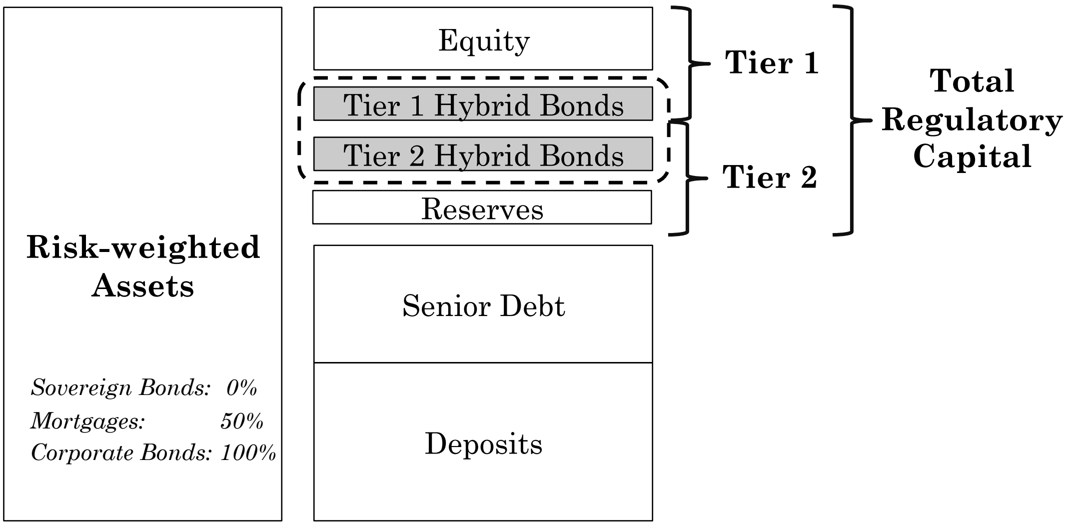

Figure 3.2: Financial Institutions Regulatory Balance Sheet

Note: This figure displays a stylized balance sheet under the Basel II framework. Banks must hold a minimum 4% Tier 1 ratio, and a 8% Total Capital Ratio. Tier 2 capital cannot be larger than Tier 1 capital. To qualify as Tier 1 capital, a hybrid bond needs to have a perpetual maturity if not called, and non-cumulative coupons.

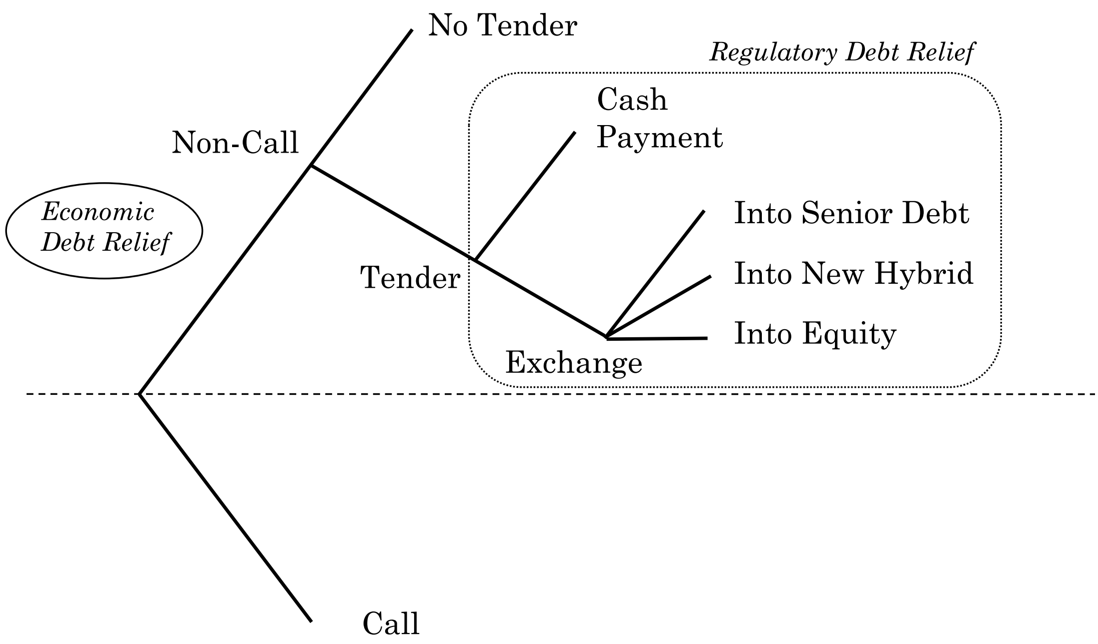

Figure 3.3: Types of Debt Relief

Note: This figure exhibits the different choices offered to an hybrid bond issuer to trigger a debt relief.

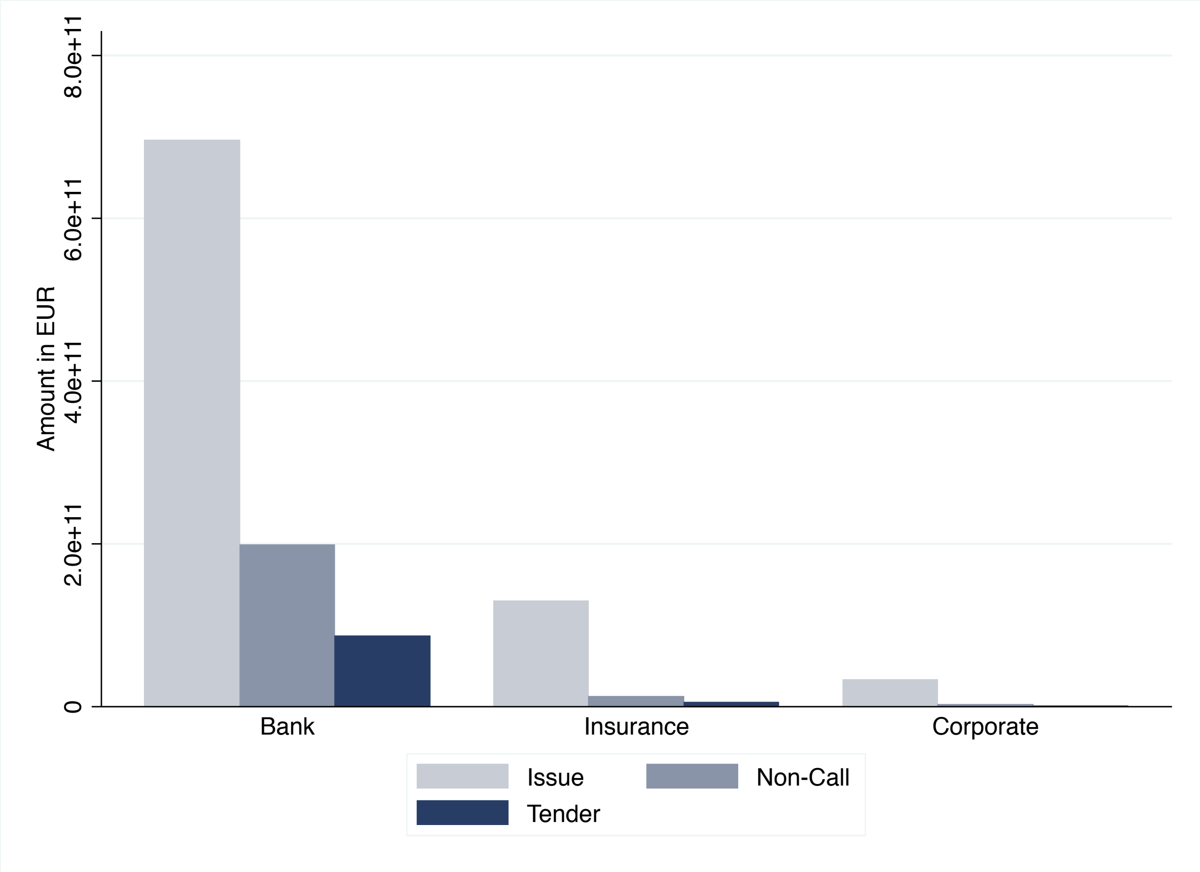

Figure 3.4: Share of Triggered Securities by Sector

Note: This figure exhibits total amounts of issuance, non call and tender offers by issuer industry sector. Tender offers include all offers for cash, equity, senior debt, or new hybrid bonds (see Figure 1.3). Source: DCM Analytics, Bloomberg, Company websites.

Table 3.1: Type of Debt Relief

	Non-Call	Cash Tender	Exchange into Senior	Exchange into Hybrid	Exchange into Equity
Panel A: Economic Effects					
Refinancing need	NO	YES	NO	NO	NO
P&L Impact	Lower Funding Cost	Capital Gain	Capital Gain	Capital Gain	Capital Gain
Impact on Total Capital	None	Decrease	Decrease	None	None
Panel B: Regulatory Effects					
Impact on Core Tier 1	None	Increase	Increase	Increase	Increase
Relaxing Effect on Regulatory Capital Constraint	None	+	+	+	++
Panel C: Numerical Example					
P&L Impact	+EUR30m (yearly)	+EUR400m	+EUR400m	+EUR400m	+EUR400m
Total Capital Impact	0	- EUR600m	-EUR600m	0	0
Core Tier 1 Impact	0	+EUR400m	+EUR400m	+EUR400m	EUR1bn

Note: This Table details the different type of debt relief with their effect on liabilities. Cash and Exchange Tender offers coincide with the postponement of bond repayment. The numerical example is based on a hybrid bond with a EUR1bn notional amount, a 4% yearly coupon and a current refinancing cost of 7%

Table 3.2: Summary Statistics on Hybrid Issuances and Debt Relief

	Hybrid bonds Issuance	Non-Call	of which Tender	of which Exchange
Panel A: All Financial Institutions				
Nominal Amount	EUR826bn	EUR211bn	EUR87bn	EUR43bn
% of Total Nominal		25.5%	10.5%	5.2%
Number of Issuers	454	167	85	41
Number of Issues	2482	745	550	270
Total Accounting Gain			EUR22bn	EUR11bn
Panel B: Banks from EBA Stress Test Perimeter				
Nominal Amount	EUR522bn	EUR140bn	EUR54bn	EUR27bn
Number of Issuers (/90)	75	54	42	20
Number of Issues	1101	364	346	150
Total Accounting Gain			EUR15bn	EUR8bn
Panel C: Insurance Companies				
Nominal Amount	EUR130bn	EUR12bn	EUR5bn	EUR2bn
Number of Issuers	74	17	5	3
Number of Issues	318	33	7	3
Top 3 Issuer	RBS Barclays Lloyds TSB	RBS ING Deutsche Bank	Lloyds RBS Santander	Lloyds RBS ING

Note: This Table displays summary statistics on Hybrid bond issuances. Nominal amount represent the aggregated nominal amount of hybrid bonds across all issuers. Total accounting gain corresponds to the capital gain booked as profit by institutions that implement tender offer at a discount. The Top 3 issuers corresponds to the financial institutions having issued, postponed repayment, and received for tender the largest amount in terms of notional.

Table 3.3: Contingent Debt Relief Users

	Logit Non-Call User			Logit Tender User		
	(A)	(B)	(C)	(D)	(E)	(F)
Tier 1 Ratio	-0.143**	-0.151**		-0.314**	-0.219	
	(-2.16)	(-2.17)		(-2.14)	(-1.41)	
RWA / Assets			408.791***			1152.144**
			(2.85)			(2.46)
Liabilities in Fair Value		1.039***	0.820**		-2.383**	-3.077**
		(2.87)	(2.34)		(-2.02)	(-1.97)
Log(Assets)	0.296**	0.240*	0.561***	1.209***	1.509***	2.980***
	(2.28)	(1.94)	(4.58)	(4.28)	(4.51)	(4.10)
Deposits / Total Debt	0.020	0.016	0.005	-0.010	-0.009	-0.053
	(1.63)	(1.17)	(0.37)	(-0.61)	(-0.61)	(-1.60)
Listed Dummy	0.055	0.086	-0.167	1.655*	2.515***	3.678***
	(0.14)	(0.21)	(-0.46)	(1.79)	(3.08)	(4.55)
Bank Type FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Country	Country	Country	Country	Country	Country
Pseudo R^2	0.2090	0.2348	0.2519	0.4039	0.4662	0.5425
N	179	179	171	162	162	154

Note: This Table presents logit regression coefficients on the use of contingent debt reliefs. The left handside variable is a dummy variable equal to one if the financial institution has implemented at least one non-call on hybrid bonds over the period 2009-2011 for column (A) to (C), and equal to one if the financial institution has implemented at least one tender on hybrid bonds over the period 2009-2011 for column (D) to (E). Financial data is as per 2008. Liabilities in Fair Value is a dummy variable equal to one if the bank is using fair value accounting for its liabilities. Bank type is defined as per Bankscope. Standard errors are clustered at the country level. T-statistics are displayed below their coefficient of interest.

Table 3.4: Predictions of Contingent Debt Relief Value Effects

	Relaxing Regulatory Capital Constraint	Negative Signaling Effect	Reducing Risk-Shifting Incentives
Debt Value	+	-	+
Equity Value	+	-	-

Note: This Table presents the predictions on debt and equity value for the three hypotheses developed in Section 5.

Table 3.5: Abnormal Return to Debt relief Events

Panel A: Senior CDS Spread	Mean	T-stat	N
All debt relief events			
CAR[-1, 0]	-0.694	-1.002	207
CAR[-1, +1]	-1.027	-1.113	207
CAR[-2, +2]	0.162	0.110	207
Permanent debt relief			
CAR[-1, 0]	-2.237*	-1.955	97
CAR[-1, +1]	-2.253	-1.420	97
CAR[-2, +2]	-0.778	-0.291	97
Cash neutral debt relief			
CAR[-1, 0]	-1.321	-0.859	40
CAR[-1, +1]	-0.279	-0.092	40
CAR[-2, +2]	1.058	0.250	40

Panel B: Subordinated CDS Spread	Mean	T-stat	N
All debt relief events			
CAR[-1, 0]	-3.814*	-1.726	170
CAR[-1, +1]	-5.576**	-2.528	170
CAR[-2, +2]	-3.595	-1.237	170
Permanent debt relief			
CAR[-1, 0]	-9.290**	-2.148	82
CAR[-1, +1]	-11.315***	-2.723	82
CAR[-2, +2]	-8.072	-1.455	82
Cash neutral debt relief			
CAR[-1, 0]	-11.966	-1.367	35
CAR[-1, +1]	-10.612	-1.380	35
CAR[-2, +2]	-6.304	-0.752	35

Panel C: Stock Price	Mean	T-stat	N
All debt relief events			
CAR[-1, 0]	-0.002	-1.194	134
CAR[-1, +1]	-0.010**	-2.530	134
CAR[-2, +2]	-0.012**	-2.359	134
Permanent debt relief			
CAR[-1, 0]	-0.001	-0.413	56
CAR[-1, +1]	-0.006	-1.076	56
CAR[-2, +2]	-0.015*	-1.864	56
Cash neutral debt relief			
CAR[-1, 0]	-0.014***	-3.153	20
CAR[-1, +1]	-0.019**	-2.272	20
CAR[-2, +2]	-0.027**	-2.617	20

Note: This Table presents the average cumulative adjusted return of CDS and the mean cumulative abnormal return of stock price to debt relief events. Panel A covers all debt relief events, Panel B permanent debt relief events and Panel C cash neutral permanent debt relief events. Time windows are daily over -1/+1 and -2/+2 days. Adjusted returns of CDS are calculated as the change in a given issuer spread minus the change in its benchmark index. The benchmark index is the iTraxx financial senior for the senior CDS and the iTraxx financial sub for the subordinated CDS. Stock abnormal returns are calculated based on the CAPM model, using Eurostoxx 50 as the market index. Stock betas are estimated in a window of 200 days, starting on the 1st january 2008. Cumulative abnormal returns are the sum of abnormal returns over the considered windows. Panel A presents the results for senior CDS, Panel B for Subordinated CDS, and Panel C for stock prices.

Table 3.6: Cross-section of CDS spread and Stock price reaction

	CDS adjusted return			Stock abnormal return		
	(A)	(B)	(C)	(D)	(E)	(F)
Panel A: All Debt Relief Events						
Tender Offer	-6.915*			0.001		
	(-1.83)			(0.17)		
Cash Tender		-6.843**	-2.345		0.008	0.053***
		(-2.05)	(-0.30)		(1.22)	(3.36)
Cash Tender * Leverage			-0.245			-0.002***
			(-0.79)			(-3.19)
Exchange Offer		-6.994	-31.515*		-0.011*	0.016
		(-1.35)	(-1.71)		(-1.92)	(0.83)
Exchange Offer * Leverage			1.320*			-0.001
			(1.68)			(-1.08)
Leverage			-0.396*			-0.000
			(-1.87)			(-0.60)
Log(Assets)	0.684	0.690	2.023	-0.003	-0.003	0.001
	(0.65)	(0.66)	(1.22)	(-1.40)	(-1.51)	(0.53)
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer
R^2	0.1348	0.1348	0.1799	0.0887	0.133	0.2705
N	373	373	351	137	137	118
Panel B: Exchange Offers Only						
Exchange into Senior		-15.031	-318.256*		0.008	
		(-0.70)	(-1.88)		(0.75)	
Exc. Senior * Leverage			14.849*			
			(1.99)			
Exchange into Equity		-19.697*	-57.741**		0.052***	
		(-1.90)	(-2.32)		(3.71)	
Exc. Equity * Leverage			2.203			
			(1.67)			
Log(Assets)		3.879*	0.305		-0.008	
		(2.03)	(0.15)		(-1.58)	
Leverage			0.132			
			(0.92)			
Quarter FE		Yes	Yes		Yes	
Cluster		Issuer	Issuer		Issuer	
R^2		0.473	0.5186		0.7183	
N		91	89		26	

Note: This table displays OLS regression coefficients where the left hand side variable is CDS adjusted change in columns (A) to (C), and stock price abnormal return in columns (D) to (E). Regressions (A) to (C) include controls for ranking and level of CDS spread. Tender Offer, Cash Tender, Exchange Offer are dummies variables indicating a debt relief of this type. Exchange into Senior and Exchange into Equity are dummy variables indicating an exchange offer into senior notes and equity, as opposed to an exchange into subordinated / hybrid debt. Leverage is defined as total assets over total regulatory capital. Standard errors are clustered at the issuer level. T-statistics are displayed below their coefficient of interest.

Table 3.7: Impact of Debt Relief on Economic Performance (ROA)

	Hybrid User		Non Call User		Tender User	
	(A)	(B)	(C)	(D)	(E)	(F)
Post x Treated	0.838***	0.551*	1.002**	0.736*	0.596*	0.352
	(2.66)	(1.66)	(2.46)	(1.68)	(1.83)	(0.95)
Post x Treated x Capital Gain		140.316**		114.121		114.406*
(% Assets)		(2.14)		(1.28)		(1.79)
Non-Call	-0.633**	-0.645**	-0.772**	-0.778**	-0.548**	-0.573**
	(-2.05)	(-2.07)	(-2.42)	(-2.42)	(-2.37)	(-2.47)
Seasonal Equity Offering	-0.192	-0.216	-0.153	-0.188	0.035	-0.010
	(-1.01)	(-1.09)	(-0.50)	(-0.58)	(0.22)	(-0.05)
Change in Assets	1.807***	1.807***	1.730**	1.728**	0.369	0.373
	(3.11)	(3.10)	(2.05)	(2.04)	(1.34)	(1.32)
Treated	0.025	0.033	0.071	0.087	-0.182	-0.166
	(0.15)	(0.20)	(0.32)	(0.38)	(-1.08)	(-0.96)
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer
R^2	0.1478	0.1484	0.137	0.1375	0.3875	0.3949
N	684	684	318	318	126	126

Note: This table displays OLS regression coefficients where the left handside variable is Return On Assets (ROA) over the period 2007 - 2011. Treated is a dummy variable for having a debt relief in any year, $post \times treated$ a dummy variable for having a debt relief during this given year or a previous year, and $post \times treated \times CapitalGain$ the interaction term with the size of capital gain from the debt relief, expressed in % of total assets. I control for repayment postponement of hybrid bonds and seasonal equity offering with dummies for such events in a given year. Columns (A) to (D) present OLS regression analysis, while columns (E) and (F) present an IV analysis, where $post \times treated$ is the endogenous regressor. Regressions include controls for previous accounting exercise total assets, Tier 1 capital ratio, client deposits over total funding, impaired loans over assets, risk weigthed assets over total assets, and yearly change in total assets, as well as a dummy variable for being publicly listed. Standard errors are clustered at the issuer level. T-statistics are displayed below their coefficient of interest.

Table 3.8: The Lending Channel

	OLS Hybrid User			OLS Non Call User		
	Log(Loans)	RWA/ Assets	Int. Income/ Assets	Log(Loans)	RWA/ Assets	Int. Income/ Assets
	(A)	(B)	(C)	(D)	(E)	(F)
Post x Treated	0.167*	0.001**	0.003**	0.181**	0.001***	0.005***
	(1.91)	(2.16)	(2.03)	(2.62)	(3.03)	(2.75)
Non-Call	-0.067	0.000	0.002	-0.110**	0.000	-0.002
	(-0.70)	(0.82)	(0.92)	(-2.17)	(-0.24)	(-1.36)
Seasonal Equity Offering	-0.170	0.000	-0.000	-0.036	0.000	0.002
	(-1.42)	(0.65)	(-0.23)	(-0.29)	(1.50)	(1.04)
Change in Assets	1.491***	-0.000	0.003	0.994***	-0.001**	0.001
	(3.46)	(-0.69)	(0.92)	(3.11)	(-2.00)	(0.28)
Treated	-0.106	0.000	-0.001	-0.092	0.000	-0.002
	(-1.02)	(0.09)	(-0.50)	(-0.79)	(0.15)	(-1.21)
Other Controls	YES	YES	YES	YES	YES	YES
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer
R^2	0.7003	0.5003	0.1407	0.8004	0.5329	0.222
N	710	678	710	329	316	330

Note: This table displays the coefficients of OLS regression, where the left handside variable is indicated in the column title. Non Op. Income / Assets means non operating income divided by total assets. Op Income / Assets means operating income divided by total assets. Int. Income / Assets is for interest income over total assets, and RWA / Assets stands for Risk Weighted Assets over total assets. Standard errors are clustered at the issuer level. T-statistics are displayed below their coefficient of interest.

Table 3.9: Robustness with Propensity Score Matching

Panel A: Economic Performance	ROA	
	(A)	(B)
Post x Treated	0.383*	0.153
	(1.81)	(0.66)
Post x Treated x Capital Gain		114.849**
		(2.35)
Non-Call	-0.650**	-0.660**
	(-2.08)	(-2.11)
Seasonal Equity Offering	-0.052	-0.084
	(-0.35)	(-0.54)
Change in Assets	0.504	0.511
	(1.52)	(1.52)
Treated	0.074	0.068
	(0.40)	(0.37)
Other Controls	Yes	Yes
Year FE	Yes	Yes
Cluster	Issuer	Issuer
R^2	0.2502	0.2569
N	167	167

Panel B: Lending Channel	Log(Loans)	RWA/ Assets	Int. Income/ Assets
	(A)	(B)	(C)
Post x Treated	0.142*	0.001*	0.001
	(1.91)	(1.73)	(0.59)
Non-Call	-0.157	-0.000	0.001
	(-1.07)	(-0.24)	(0.87)
Seasonal Equity Offering	-0.091	0.000	-0.001
	(-0.91)	(-0.18)	(-0.96)
Change in Assets	0.588***	0.000	-0.002
	(3.37)	(0.21)	(-1.09)
Treated	0.100	0.001	0.002
	(0.73)	(1.45)	(0.96)
Other Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Cluster	Issuer	Issuer	Issuer
R^2	0.8617	0.5853	0.5157
N	169	166	170

Note: This table displays the coefficients of OLS regressions, where the left hand side variables are Return on Assets (ROA), Log(Loans) and Risk Weighted Assets over Total Assets. Variables are as per Table 8 and 9. The control group is constituted using a propensity score matching methodology on using a contingent debt relief. The control group includes the five closest matches, with possible replacements. Standard errors are clustered at the issuer level. T-statistics are displayed below their coefficient of interest.

Table 3.10: Government Bail out effects vs. Contingent Debt reliefs

	Hybrid User (A)	Non Call User (B)	Tender User (C)
Post x Treated	0.702**	0.883**	0.563*
	(2.20)	(2.14)	(1.73)
Treated	0.481	0.621	-0.100
	(1.51)	(1.60)	(-0.51)
Post_b x Treated_b	-0.806	-0.824	0.500
	(-0.75)	(-0.61)	(1.48)
Treated_b	-0.703**	-1.171**	-0.570**
	(-2.51)	(-2.55)	(-2.27)
Non Call	-0.507*	-0.726**	-0.592**
	(-1.93)	(-2.52)	(-2.40)
Seasonal Equity Offering	-0.195	-0.080	0.029
	(-1.08)	(-0.31)	(0.17)
Other Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Cluster	Issuer	Issuer	Issuer
R^2	0.1828	0.201	0.4224
N	684	318	126

Note: This table displays the coefficients of OLS regressions, where the left handside variable is Return On Assets (ROA) over the period 2007 - 2011. Treated is a dummy variable for having a debt relief in any year, $post \times treated$ a dummy variable for having a debt relief during this given year or a previous year. Treated_b is a dummy variable for having benefited from a government bail out in any year, and $post\_b \times treated\_b$ a dummy variable for having a debt relief during this given year or a previous year. All other controls are the same as in Table 6, namely: previous accounting exercise total assets, Tier 1 capital ratio, client deposits over total funding, impaired loans over assets, risk weigthed assets over total assets, and yearly change in total assets, as well as a dummy variable for being publicly listed. Standard errors are clustered at the issuer level. T-statistics are displayed below their coefficient of interest.

Table 3.11: Country Group Trends

	Hybrid User (A)	Non Call User (B)	Tender User (C)
Post x Treated	0.850**	0.986**	0.579*
	(2.57)	(2.23)	(1.73)
Non-Call	-0.638**	-0.817**	-0.556**
	(-2.00)	(-2.40)	(-2.29)
Seasonal Equity Offering	-0.263	-0.2767	-0.0883
	(-1.28)	(-0.80)	(-0.64)
Change in Assets	1.957***	1.819**	0.546*
	(3.02)	(2.01)	(1.92)
Treated	0.065	0.228	-0.113
	(0.41)	(1.07)	(-0.60)
Scandinavia*Year FE	Yes	Yes	Yes
Periphery*Year FE	Yes	Yes	Yes
Rest of Europe	Control	Control	Control
Year FE	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes
Cluster	Issuer	Issuer	Issuer
R^2	0.1688	0.1599	0.4409
N	684	318	126

Note: This table displays the coefficients of OLS regressions with the same specification as Table 3.7. Regression also includes dummies variables for Eurozone periphery countries (Portugal, Italy, Ireland, Greece and Spain), as well as Scandinavian countries, interacted with year fixed effects. Standard errors are clustered at the issuer level. T-statistics are displayed below their coefficient of interest.

Chapter 4

Conclusion

The three chapters of this dissertation studies the retail market for structured products, the use of toxic loans by local governments, and the development of contingent capital instruments for financial institutions. This dissertation gives an overview of possible motives for financial innovation: obfuscation, political agenda, or strengthening of bank balance sheets. All three of these possible motives illustrate the ambivalence of financial innovation. Innovative financial products can not only be a powerful tool for a sound financial sector, but also an instrument of rent extraction from less sophisticated stakeholders. This dual nature of financial innovation raises the question, among others, of its regulation. Innovation and regulation often come hand in hand, but the question of regulating financial innovation itself raises challenges difficult to overcome, if only due to the diversity of the fields in which it plays a role. Developing an approval process as for the pharmaceutical industry, in the line of the proposition by Posner and Weyl (2013), is consistent with the potential damage that innovative financial products can cause, but seems difficult to implement. To specialize a watchdog on financial innovation could also be a promising road, but this option will need to be insulated from lobbying influences.

This dissertation is a first step towards better understanding financial innovation. The next steps of my research agenda will lead me towards two other fields: education and entrepreneurship. Income contingent loans, and crowdfunding are two promising forms of financial innovation that deserve a thorough analysis.

Chapter 5

Appendices

Appendix A Chapter 1

Appendix A.1 Typology of Retail Structured Products

Product Underlying

Asset Name	*Description (in frequency order)*
Equity (Single Index)	Eurostoxx50, FTSE100, SP500, DAX, Ibex35, OMSX30, Nikkei225, CAC40, BRIC40
Equity (Single Stock)	Deutsche Bank, Credit Suisse, Daimler, Zurich Finance, Roche, Abb, BASF, UBS, Siemens, Allianz, Nestle
Commodity	Gold, brent, electricity, silver, corn
Foreign Exchange	Euro/USD, PLN/Euro, CSK/Euro, CHF/Euro
Credit Default	The risk of default of a company or a country
Interest Rates	Euribor, Libor, Swap rate
Other	Inflation, Funds

Main Feature (Primary Structure)

Structure Name	*Definition*
Altiplano	The product offers a capital return of 100%, plus a series of fixed coupons on each sub periods if the underlying is above a predefined barrier.
Floater	The product offers a capital return of 100% plus a series of coupons that rise when the underlying reference rate rises.
Pure Income	The product offers a capital return of 100% plus a series of fixed coupons.
Digital	The product offers a capital return of 100%, plus a fixed coupon paid at maturity if the underlying is above a predefined barrier.
Call	The product offers a capital return of 100% plus a fixed participation in the rise of the underlying.
Put	The product offers a capital return of 100% plus a fixed participation in the absolute value of the fall of the underlying.
Spread	The product offers a capital return of 100% plus a participation related to the spread between the performances of different underlyings (shares, rates.).
Bull Bear	The final return is based on a percentage of the absolute performance of the underlying at maturity.

Feature Type 1: Initial Subsidy (facultative)

Feature Name	*Definition*
Discount	
Guaranteed Rate	
Bonus	

Feature Type 2: Underlying Selection (facultative)

Feature Name	*Definition*
Best of Option	The return is based on the performance of the best performing underlying assets.
Worst of Option	The return is based on the participation in the performance of the worst performing underlying assets.
Himalaya	A pre-selected number of best-performing assets are permanently removed from the basket, or frozen at their performance level, at the end of each period until the end of the investment.
Kilimanjaro	The lowest performing assets as well as the best performing assets have been progressively eliminated, or ignored from subsequent calculations, during the investment period.
Rainbow	Best performing assets are weighted more heavily than those which perform less well.

Feature Type 3: Exposure Modulation, Increased Downside (facultative)

Feature Name	*Definition*
Reverse Convertible	The product is capital guaranteed unless a performance criterion is not satisfied. In this case, the capital return is reduced by the percentage fall in the underlying, or the product pays back a predefined number of shares/bonds.
Precipice	The product is capital guaranteed unless a performance criterion is not satisfied.

Feature Type 4: Exposure Modulation, Limited Upside (facultative)

Feature Name	*Definition*
Cap	The return is based on the participation in the performance of the worst performing underlying assets.
Fixed Upside	The best performances of a basket of stocks or of a set of subperiod returns are replaced by a predetermined fixed return.
Flip Flop	The coupons are fixed in the first periods, and the distributor has the right to switch you into floating.

Feature Type 5: Path Dependence (facultative)

Feature Name	*Definition*
Cliquet	The final return is determined by the sum of returns over some pre-set periods.
Asian Option	The final return is determined by the average underlying returns over some pre-set periods.
Parisian Option	The value of the return depends on the number of days in the period in which the conditions are satisfied.
Averaging	The final index level is calculated as the average of the last readings over a given period (more than one month).
Delay	Coupons are rolled up and paid only at maturity.
Catch-up	If a coupon is not attributed in a given period because the condition required for the payment is not met, then that missed coupon and any subsequently missed coupon will be rolled-up and attributed the next period when the condition is met.
Lookback	The initial/final index level is replaced by the lowest/highest level over the period.

Feature Type 6: Exotic Condition (facultative)

Feature Name	*Definition*
American Option	The conditions must be satisfied during the whole considered period.
Range	The performance of the underlying is within a range.
Target	The sum of the coupon reaches a predefined level.
Moving Strike	The conditional levels are moving.
Bunch	The top barrier/cap concerns each asset whereas the bottom barrier concerns the whole basket.
Podium	The underlying is a basket and the final returns depend on the number of shares satisfying the conditions.
Annapurna	The condition must be satisfied for any security in the underlying basket.

Feature Type 7: Early Redemption (facultative)

Feature Name	*Definition*
Knockout	The product matures early if specific conditions are satisfied.
Callable	The issuer can terminate the product on any coupon date.
Puttable	The investor can terminate the product on any coupon date.

This table describes how a pay-off formula is broken down into distinct features. Each family of facultative features contains features that are mutually exclusive. A structured product possesses exactly one main feature, which defines the primary structure of the product.

Appendix A.2 - Figures

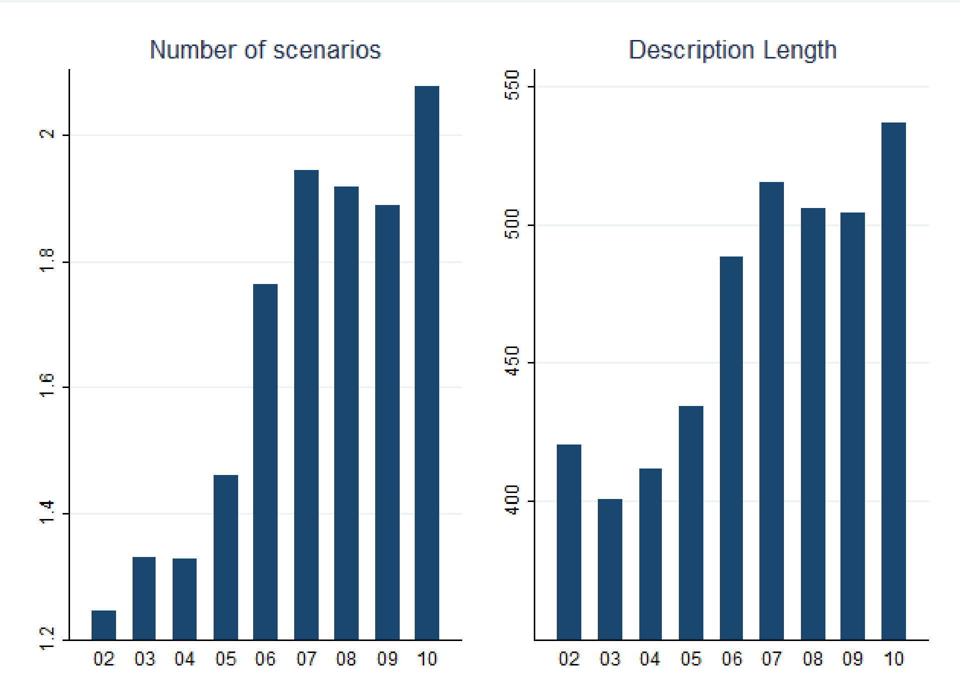

Figure A.0: . Average Product Complexity by Year

This figure shows the average of our robustness checks proxies for complexity by year. *Number of Scenarios* measures the number of conditions embedded in the final payoff formula, and *Description Length* the number of characters in the standardized text description of the payoff formula.

Appendix A.3 - Tables

Table A.1: . The 20 Main Distributors in terms of Market Share in 2010

Name	**Country of Origin**	**Market Share in %**	**N. of Payoffs**	**Type**	**Distribution Countries**
Deutsche Volks & Raiffeisenb.	DE	11.6	2.8	Savings B	AT DE IT PL
Deutsche Sparkassen	DE	10.6	2.7	Savings B	AT CZ DE
Deutsche Bank	DE	4.8	3.2	Commercial B	AT BE DE IT NL PL PT ES UK
UBS	CH	4.1	2.3	Private B	AT BE FR DE IT NL NO ES
RBS	UK	3.9	2.1	Commercial B	AT BE DK FI FR DE IE IT NL PT ES SE UK
KBC	BE	2.8	2.8	Commercial B	BE CZ FR HU IE NL PL UK
Santander	ES	2.7	2.4	Commercial B	PL PT ES UK
Unicredit	IT	2.7	2.7	Commercial B	AT CZ DE HU IT PL ES
Commerzbank	DE	2.5	2.8	Commercial B	AT BE FR DE HU IT NL NO PL ES
Barclays	UK	2.5	2.5	Commercial B	AT BE CZ FR DE IE IT NL PT ES UK
Bnp Paribas	FR	2.4	3.1	Commercial B	AT BE FR DE HU IT NL PL PT ES UK
Nordea	SE	2.3	2.0	Commercial B	DK FI IT NO PL SE
Garantum	FI	2.1	3.5	Private B	FI SE
Societe Generale	FR	2.1	3.2	Commercial B	AT BE CZ FR DE IT NL PL ES UK
Caja De Ahorros	ES	2.0	2.1	Savings B	PT ES
Investec	ZA	1.9	2.5	Private B	IE UK
Seb	SE	1.4	2.1	Commercial B	DK FI DE NO PL SE
Osterreichische Volksbanken	AU	1.4	1.5	Commercial B	AT DE HU
ING	NL	1.4	2.7	Commercial B	AT BE CZ FR DE IT NL PL ES UK
Jp Morgan	US	1.1	3.2	Private B	AT BE FR DE IT NL PL ES UK

Market shares are computed in terms of number of product issued in Europe in 2010. Countries of distribution are idicated with their ISO 3166 code

Table A.2: . Details of the retail structured product issued in July 2009 (1/4)

Product Name	**Provider Name**	**Country**	**Credit Risk**	**Maturity** in years	Number Payoffs	Markup in %	**Entry fees** in %	Mana. fees in %
Sprint Zertifikat	Hypovereinsbank	Germany	yes	4.4	1	-8.0	2.0	0.0
Summer Invest	Allianz Belgium	Belgium	no	4.9	1	-4.6	4.0	0.0
Phoenix 2	Bank of Scotland	Ireland	no	3.9	2	-3.6	3.5	0.0
Europa Anleihe 10% Plus Ii 08/09 - 08/14	Barclays	Austria	yes	5	2	-3.6	5.0	0.0
Europa Anleihe 10% Plus 07/09-07/14	Barclays	Austria	yes	5	2	-3.5	5.0	0.0
Eurostoxx 50 Zins Anleihe 4	Barclays	Austria	yes	5	2	-2.9	2.5	0.0
4Y Eur Market Recovery Note	ING	Belgium	yes	4	1	-2.4	0.0	0.0
Eurozone Coupon Note	Ing Bank	Netherlands	yes	5	2	-2.0	0.0	0.0
Dz Bank Vr Garantieanleihe 09/14	Dz Bank	Germany	yes	5	2	-1.9	2.0	0.0
3Y Market Recovery Note	ING	Belgium	yes	3	1	-1.7	0.0	0.0
Europa Kupon Anleihe	Landesbank Berlin	Germany	yes	5	1	-1.4	0.0	0.0
Seguro Rentabilidad Eurostoxx 114 Db	Deutsche Bank	Spain	no	3.4	2	-1.1	0.0	1.4
Barrier Note Dj Eurostoxx50	ING	Belgium	yes	1.5	2	-1.1	0.0	0.0
Seguro Rentabilidad Eurostoxx 119 Db	Deutsche Bank	Spain	no	3.9	2	-1.1	0.0	1.4
Cs Garant 100 Anleihe 13 Dj Euro Stoxx 50	Credit Suisse	Austria	yes	5	2	-1.1	2.0	0.0
Europa Protect-Anleihe 07/09	West Lb	Germany	yes	4	3	-1.1	2.0	0.0
Seguro Rentabilidad Eurostoxx 122 Db	Deutsche Bank	Spain	no	4.4	2	-0.9	0.0	1.2
Euro Booster 200%	Swiss Life Banque Privee	France	yes	5	4	-0.9	0.0	0.0
Europa-Anleihe	Landesbank Berlin	Germany	yes	5	2	-0.8	0.0	0.0
Seguro Rentabilidad Eurostoxx 110 Db	Deutsche Bank	Spain	no	2.9	2	-0.7	0.0	1.0
Cs Top Bonus 115 200	Credit Suisse	Austria	yes	5	2	-0.7	3.5	0.0
Partizipationsanleihe 01/09	Nordlb	Germany	yes	4	2	-0.4	0.0	0.0
Cp100 Cap-Performanceanleihe	Sal. Oppenheim	Austria	yes	4	2	-0.4	1.5	0.0
Vital Ibex Bolsa Garantizado	Caja Vital Kutxa	Spain	no	2.5	2	-0.3	5.0	5.6
Lbbw Safe-Anleihe Mit Cap	Landesbank Bw	Germany	yes	4	2	-0.3	1.0	0.0

Table A.3: . Details of the retail structured product issued in July 2009 (2/4)

Product Name	**Provider Name**	**Country**	**Credit Risk**	**Maturity** in years	Number Payoffs	Markup in %	**Entry fees** in %	Mana.
Igc Dj Eurostoxx50 - Juli 2009	Van Lanschot Bankiers	Netherlands	no	5	2	-0.1	2.0	3.3
Europa-Anleihe	Landesbank Berlin	Germany	yes	5	2	-0.0	2.0	0.0
Dj Eurostoxx50 Partizipations-Anleihe	Landesbank Berlin	Germany	yes	5	3	0.2	1.5	0.0
Objectif 7.5% Juin 2009	Swiss Life Banque Privee	France	yes	8	4	0.3	0.0	0.0
Easy Bonus-Zertifikat	West Lb	Germany	yes	4.3	2	0.3	1.0	0.0
Equity Protection Switchable	Deutsche Bank	Italy	yes	5	2	0.5	3.3	0.0
Objectif 7,5% Distribution Juillet 2009	Swiss Life Banque Privee	France	yes	8	4	0.6	0.0	0.0
Bs Garantia Extra 10	Banco Sabadell	Spain	no	3.1	3	0.8	5.0	3.0
Europa Protect-Anleihe Extra 03/09	West Lb	Germany	yes	6	2	0.8	2.5	0.0
Vr Extrachance Ii	Dz Bank	Germany	yes	4.4	2	1.0	3.0	0.0
Bbva Oportunidad Europa Bp	Bbva	Spain	no	2.9	2	1.1	5.0	6.8
Euro Booster	Swiss Life Banque Privee	France	yes	5	4	1.2	0.0	0.0
Ten Pea	Barclays	France	no	1	6	1.2	2.0	3.0
Dz Bank Bonuschance Control 3 09/13	Dz Bank	Germany	yes	3.5	2	1.4	0.0	0.0
Dz Bank Bonuschance Control Iii 09/13	Dz Bank	Austria	yes	3.5	2	1.4	0.0	0.0
Athena 11% Airbag	Swiss Life Banque Privee	France	yes	8	4	1.4	0.0	0.0
Bonus Pro Zertifikat	Hypovereinsbank	Germany	yes	4.4	1	1.5	2.0	0.0
Best-Entry Garant V-Anleihe	Bayerische Landesbank	Germany	yes	4.5	2	1.6	1.0	0.0
Europa Protect Anleihe Plus	Jpmorgan Chase	Germany	yes	6	2	1.6	2.0	0.0
Bbva Europa Garantizado	Bbva	Spain	no	2.9	3	1.7	5.0	3.6
Kbc-Life Mi Security Europe 2	Kbc Verzekeringen / Cbc Assurance	Belgium	no	7.6	2	1.8	3.0	18.2
Callable Booster Notes	Barclays	Belgium	yes	6	3	1.9	0.0	0.0
Eurostoxx Serenite 2009	Credit Suisse	France	no	6	2	2.0	3.0	12.0
Deposito Imbatible 8-5	Bbk	Spain	no	3.4	4	2.1	0.0	0.0
Rentenbank Capped Capital Protected Note	Abn Amro Bank	Netherlands	yes	7	2	2.1	0.0	0.0

Table A.4: . Details of the retail structured product issued in July 2009 (3/4)

Product Name	**Provider Name**	**Country**	**Credit Risk**	**Maturity** in years	Number Payoffs	Markup in %	**Entry fees** in %	Mana
Dz Bank Indexklassik Garant 5 09/13	Dz Bank	Germany	yes	4.4	2	2.1	2.5	0.0
Dz Bank Indexklassik Garant V 09/13	Dz Bank	Austria	yes	4.4	2	2.1	2.5	0.0
Dj Eurostoxx 50 Bonus Minimax	Landesbank Berlin	Germany	yes	3	3	2.4	0.5	0.0
Express Zertifikat	Deutsche Bank	Austria	yes	2	4	2.4	1.0	0.0
Mes-Rendements 10%	Finance Selection	France	yes	5	5	2.6	0.0	0.0
Europa Callable Protect Anleihe	Jpmorgan Chase	Germany	yes	5	4	2.6	1.5	0.0
Cs Memory Express Zertifikat 6	Credit Suisse	Germany	yes	6	5	2.6	2.5	0.0
Autofocus 9%	Credit Mutuel Arkea	France	no	5	3	2.6	2.0	3.5
Europa Garant Plus-Anleihe	Landesbank Berlin	Germany	yes	6	2	2.7	1.0	3.0
Btv Europa Bonus Garantieanleihe Plus Iii 2009 - 2014/12	Btv Bank	Austria	yes	5.5	4	2.7	0.0	0.0
Dexia Clickinvest B Index Linked 7	Dexia Bank	Belgium	no	5.1	2	2.8	2.5	11.9
Cs Top Bonus Chance 3	Credit Suisse	Germany	yes	4.4	2	2.8	1.5	0.0
Eurostoxx 50 Flex-Express 02/09	West Lb	Germany	yes	3	1	3.0	1.0	0.0
Cs Top Memory Express	Credit Suisse	Germany	yes	4	6	3.1	1.0	0.0
Switch To Bond Note	Fortis	Belgium	yes	5	4	3.1	0.0	0.0
Indexanleihe	Nordlb	Germany	yes	1	2	3.1	0.0	0.0
Dexia Clickinvest B Index Linked 8	Dexia Bank	Belgium	no	5.1	2	3.3	2.5	11.9
Unigarant: Europa (2015)	Union Investment	Germany	no	5.9	2	3.3	4.0	6.0
Kbc Clickplus Europe Best Of 42	Kbc Bank	Belgium	no	8.6	3	3.8	2.5	19.1
Centea Fund Click Europe Surplus 10	Centea	Belgium	no	8.6	3	3.8	2.5	17.0
Zanonia-Deep-Zertifikat	Landesbank Bw	Germany	yes	4	3	3.8	1.0	0.0
Buono Fruttifero Postale 16D	Bancoposta	Italy	yes	5	2	3.9	0.0	0.0
Eurostoxx Fast 7%	Swiss Life Banque Privee	France	yes	8	4	4.0	0.0	0.0
Dz Bank Extrachance Pro V 09/13	Dz Bank	Austria	yes	4	2	4.3	2.3	0.0
Dz Bank Extrachance Pro 5 09/13	Dz Bank	Germany	yes	4	2	4.3	2.3	0.0

Table A.5: . Details of the retail structured product issued in July 2009 (4/4)

Product Name	**Provider Name**	**Country**	**Credit Risk**	**Maturity** in years	Number Payoffs	Markup in %	**Entry fees** in %	Mana. fees in %
Dz Bank Vr Extrachance Iii 09/13	Dz Bank	Germany	yes	4	2	4.3	2.3	0.0
Express Zertifikat	Hypovereinsbank	Germany	yes	2	4	4.4	0.5	0.0
Bono Autocancelable 8% Cupon	Citi	Spain	yes	5	3	4.4	3.0	0.0
Wgz Garant-Zertifikat 22	Wgz Bank	Germany	yes	6	2	4.5	2.0	0.0
Emtn Memory Express-Zertifikat 4	Societe Generale	Germany	yes	6	5	4.7	2.0	0.0
Bonus Control Iv	Dz Bank	Austria	yes	4	2	4.8	2.5	0.0
Seguro Recuperacion Eurostoxx Db	Deutsche Bank	Spain	no	3	1	5.3	0.0	1.0
Bankinter Eurostoxx 2012 Garantizado	Bankinter	Spain	no	3	3	5.4	5.0	6.8
Euro Memory	Nortia	France	yes	8	5	5.5	0.0	0.0
Reference 8,5%	Adequity	France	no	8	4	5.5	4.5	2.0
Optimiz 7%	Societe Generale	Italy	yes	8.2	2	5.6	0.0	0.0
Step Dj Eurostoxx 50	Banca Aletti	Italy	yes	3	3	5.8	0.0	0.0
Phoenix Memory	Adequity	Belgium	yes	4	5	5.8	0.0	0.0
Zanonia-Plus-Zertifikat	Landesbank Bw	Germany	yes	4	4	6.0	1.0	0.0
Wgz Airbag-Zertifikat Mit Cap	Wgz Bank	Germany	yes	5	4	6.6	2.0	0.0
Wgz Easyexpress-Zertifikat 12	Wgz Bank	Germany	yes	4	2	6.6	2.0	0.0
Buono Fruttifero Postale P22	Bancoposta	Italy	yes	5	2	7.2	0.0	0.0
Fortis B Fix 2009 Best Of Click 6	Bnp Paribas Fortis	Belgium	no	8.5	3	7.9	2.5	0.0
Elixis 2	Credit Agricole	France	no	4.2	4	8.1	2.0	10.0
Cap Garanti 2015	Credit Mutuel	France	no	5.9	2	8.1	3.0	2.5
Sevea	Gestion Privee Indosuez	France	no	5	4	8.8	2.5	12.5
Ing (L) Selectis Euro Equity 1	Ing Luxembourg	Belgium	no	4.5	3	9.2	3.0	6.8
Bif Certi+ 200	Alternea	Belgium	no	6	3	9.4	5.0	7.2
Oriance Epargne 2	Credit Agricole	France	no	6.8	2	11.8	0.0	0.0
Euro Cap 2017 (EUro Cap 2017)	Hsbc Assurances Vie	France	no	6	3	11.9	0.0	0.0
Recovery Note	Abn Amro Bank	Netherlands	yes	5	3	14.8	0.0	0.0

Appendix A.4 - Theoretical Framework (Model)

We develop a model in which firms strategically use financial complexity to mitigate competition. The model is inspired by Carlin (2009), but differs in that consumers are heterogeneously distributed across firms and may face switching costs. For tractability purposes, the fraction of uninformed consumers is taken as exogenous.

Model Setup

Consumers

Consider a market in which n firms produce a homogeneous retail financial product. In this market, there is a unit mass of consumers M who each has a unit demand for the retail good. Each consumer i maximizes the same utility function

$$U_i = v - p_i$$

where v is the fundamental value of the product and p_i its price.

Firms

Firms in this market face the same marginal production cost, which is fixed at zero, but differ in the structure and level of the price that they charge. They can sell the financial product either in a *simple* price structure, thereafter the "package", or in a *complex* one, implying no additive cost. In the complex price structure, the price of the product is not observable by consumers.

Firms also differ in the fraction of consumers in their neighbor. A firm of rank j captures a fraction α_j of consumers, with $0 \leq \alpha_j \leq 1$, $\alpha_{j+1} < \alpha_j$ and $\sum_1^n \alpha_j = 1$.

To simplify the analysis, we restrict the firms to choose prices in the interval $[p; P]$, with $p > 0$ and $P = v$ is the monopoly price.

Financial Sophistication

Consumers are divided into two groups: a fraction μ is uninformed, and a fraction $1 - \mu$ is expert. Expert consumers are knowledgeable about the price structure of a product and face no switching cost. They consequently only buy simple products, whose prices they can observe, at the lowest price available. In contrast, uninformed consumers are uneducated about prices even for a simple package, and face a switching cost $c > 0$. As a result, uninformed consumers purchase the retail financial product from the firm they are already on relationship with, independently of the price package.

Timing

The game is in two periods. In stage one, firms simultaneously set prices and decide if the price structure is going to be complex or simple. In stage two, consumers buy the product with a strategy based on their type.

Results

Consider the price of a simple product. There is free entry of firms. New entrants capture a fraction $\alpha = 0$ of consumers. Free entry implies that the price of a simply structured product is the minimum price, p. If a firm j decides to sell the product with the simple price structure, it receives a fraction $1/n_s$ of the demand from experts - n_s denoting the number of firms with the same strategy - plus the demand from the fraction α_j of captured uninformed consumers. Its profit is

$$\Pi_{j,s} = p\big(\frac{\mu}{n_s} + \alpha_j(1-\mu)\big)$$

Consider now the price of a complex product. By selling the product in the complex package, a firm will receive demand only from uninformed consumers who do not observe prices. It is optimal in this case to sell the product at a maximum price P. The payoff of a firm selling the complex product is

$$\Pi_{j,c} = \alpha_j(1-\mu)P$$

Firm j sells the product in a complex package if and only if

$$\begin{aligned} \Pi_{j,c} &\geq \Pi_{j,s} \\ \Leftrightarrow \alpha_j(1-\mu)P &\geq p\big(\frac{\mu}{n_s} + \alpha_j(1-\mu)\big) \\ \Leftrightarrow \alpha_j &\geq \frac{p\mu}{P(1-p)(1-\mu)} * \frac{1}{n_s} \\ \Leftrightarrow \alpha_j &\geq \frac{A}{n_s} \end{aligned}$$

with $A = \frac{p\mu}{P(1-p)(1-\mu)}$ This leads to the following proposition

Proposition 1 *The tendency of a firm to sell a complex product increases with the share of uninformed consumers it is initially in a relationship with.*

We make the following assumption

Assumption 1

$$\alpha_1 > \frac{A}{n}$$

Assumption 1 implies that it is optimal for the firm of rank 1, namely the one with the biggest market share, to sell the product in the complex package if all other firms in the market choose to sell the simple product.

Lemma 1 *There exists a unique* $\overline{k}$ *such that:*

- *Firms of rank* j*, with* $1 \leq j \leq \overline{k}$*, choose to sell the product in the complex package*
- *Firms of rank* j*, with* $\overline{k} < j \leq n$*, choose to sell the product in the simple package*

Proof.

Let denote f the function defined by:

$$f(k) = \alpha_k - \frac{A}{n-k+1}$$

By definition, α_k is a decreasing function of k, and $-\frac{A}{n-k+1}$ is also decreasing in k. In addition, Assumption 1 implies that $f(1) > 0$ and $f(n) < 0$. Therefore, there exists a unique $\overline{k}$ such that for any $j \geq \overline{k}$ we have $f(j) \geq 0$ whereas for any $j < \overline{k}$ we have $f(j) \leq 0$. ■

Let $\phi(n)$ define the fraction of complex products as a function of the number of competitors. We have

$$\phi(n) = \frac{\overline{k}}{n}$$

Now we make the assumption that we are in a *neck-and-neck* market, in which the distance between two firms, measured by the difference in market share α, is small. It implies

Assumption 2

$$\alpha_{\overline{k}} - \alpha_{\overline{k}+1} < \frac{A}{n-\overline{k}} - \frac{A}{n-\overline{k}+1}$$

We obtain the following proposition

Proposition 2 *In a neck-and-neck market, as competition increases, the fraction of complex products increases as well (ϕ increases).*

Proof. By assumption, for any new entrant $n+1$ we have $\alpha_{n+1} = 0$. We also have

$$\begin{cases} \alpha_{\overline{k}} \geq \dfrac{A}{n-\overline{k}+1} \\ \alpha_{\overline{k}+1} < \dfrac{A}{n-\overline{k}} \\ \alpha_{\overline{k}+1} < \alpha_{\overline{k}} \end{cases}$$

Since the market is *neck-and-neck* we have also

$$\alpha_{\overline{k}} - \alpha_{\overline{k}+1} < \frac{A}{n-\overline{k}} - \frac{A}{n-\overline{k}+1}$$

implying

$$\frac{A}{n-\overline{k}+1} < \alpha_{\overline{k}+1} < \frac{A}{n-\overline{k}} < \alpha_{\overline{k}}$$

A new entrant will make the firm $\overline{k}+1$ change its strategy and switch to a complex package. The fraction of complex products increases

$$\phi(n+1) = \frac{\overline{k}+1}{n+1}$$

■

Appendix B Chapter 2

Appendix B.1 Types of Structured Debt Products and Risk Classification

Products are presented by increasing level of risk according to the Gissler classification (from "Charte de bonne conduite entre les etablissements bancaires et les collectivites locales"). For each type of products, summary statistics are provided in Table A2.

Barriers on Domestic Rate (Underlying Risk Level: 1)
These products lower cost of funding as long as the underlying index is above/under a predefined barrier. Subsidy comes from the premium of the options sold, which could be interest rate caps or floors. An example is the implicit sale of a floor:

$$coupon(t) = \begin{cases} US\ Libor(t) - x\ bps & if\ US\ Libor(t) > 3\% \\ 3\% & otherwise. \end{cases}$$

The underlying index is a very liquid interest rate. Coupon structure does not include any leverage effect. Both the subsidy offered to client and the bank margin are low (<0.50% of notional). Barriers were the first products to enter the market in the late 1990s. Their coupon formula can be broken down into its vanilla loan component and an embedded short put option:

$$Vanilla\ loan\ coupon: \quad US\ Libor(t)$$

$$\begin{matrix} Sale\ of\ a\ put \\ with\ a\ 3\%\ strike: \end{matrix} \quad \begin{cases} -\ x\ bps & if\ US\ Libor(t) > 3\% \\ 3\%\ -\ US\ Libor(t) & otherwise. \end{cases}$$

Inflation Products (Underlying Risk Level: 2):
This type of products is usually based on a barrier, or on an inflation spread. They often include leverage to provide with sufficient subsidy, as inflation volatility is very low. A standard payoff is:

$$Coupon(t) = Midswap(t) - 50\ bps + 2 \times Max(French\ Inflation(t) - Euro\ Inflation(t),\ 0\%).$$

This illustrates the client's view that the French inflation rate should remain below the European inflation rate, which could be caused by entrance of new EU members from

Eastern Europe with historically higher inflation.

Steepeners (Underlying Risk Level: 3):
In a Steepener structure, the coupon is indexed to the Constant Maturity Swap (hereafter CMS) curve slope and decreases the cost of funding when the slope of the curve is steep; but increases the cost when the curve is flat or inverted. The CMS curve is built with the equivalent fixed rates obtained when swapping Libor for all possible maturities. They are based on different measures of the slope: [20-year swap rate - two-year swap rate], [30-year swap rate - one-year swap rate], and in most cases [10-year swap rate - two-year swap rate]. An example of payoff is:

$$Coupon(t) = 7\% - 5 \times (CMS\ 10Y(t) - CMS\ 2Y(t)).$$

Entering into a Steepener transaction represents a bet against the realization of forward levels, which typically anticipate a flattening of the swap curve. The risk profile of these products is higher than the one of Barrier products. This is mainly due to the introduction of leverage in the coupon formula, usually without any cap.

Quantos (Underlying Risk Level: 4):
They represent variable interest rate products that are indexed on a foreign interest rate with an affine formula. They exploit low spot rates and higher forward levels. Risk is moderate as leverage is generally low and the underlying foreign interest rate has low volatility. They are mainly structured on indices from countries with low interest rates, such as Japan or Switzerland. A standard Quanto payoff is:

$$Coupon(t) = 2 \times JPY\ Libor(t) \ \ or \ \ Coupon(t) = 1.5 \times CHF\ Libor(t) + 1\%.$$

FX Products (Underlying Risk Level: Out of Scale):
FX products are also based on an implicit sale of options. However FX options premiums are much higher due to the high volatility of foreign exchange rates and remain high even when strike levels are far from spot prices. This comes from the absence of mean-reversion of foreign exchange rates in banks' pricing models. This feature allows to structure products with seemingly unreachable strikes, especially when historical levels bias the client's view. An example of payoff for an FX product is:

$$Coupon(t) = 3\% + 50\% \times Max(1.44 - EURCHF(t),\ 0\%).$$

These products offer very strong coupon subsidy, especially on long maturity loans when they bear no caps. One example is the 0% coupon loan by Depfa with Ville de Saint Etienne on a 32-year maturity loan. The coupon is set at 0% for 9 years and remains at this level afterwards as long as EURCHF is above EURUSD.

Cumulative Structures: (Underlying Risk Level: 1; Structure Risk Level: Out of Scale)
Cumulative structures can be structured on any underlying: domestic/foreign interest rates, FX rates, or inflation rates. They are based on an iterating coupon formula. Coupon degradations therefore add up to each other. The formula often includes a click feature that makes all degradations permanent; hence their nickname: snow balls. Cumulative instrument structuring is based on selling a portfolio of forward-start options. A typical coupon profile is:

$$Coupon(t) = Coupon(t-1) + 2 \times Max(USD\ Libor\ 12M(t) - 6\%,\ 0\%).$$

Due to the iterating definition of the coupon, frequency of coupon payment is key for the risk profile of the product. For a given leverage level, a quarterly cumulative structure is four times more aggressive than an annual one. These products have been dramatically impacted by the increase in volatility during the financial crisis, as they bear no cap. They are usually more sensitive to volatility than to market direction (i.e., vega dominates delta).

Appendix B.2 Tables

Table B.6: Hedging

	Pooled Regression			Individual Regressions			
	Coefficient	St. Err.	P-value	Mean Coeff.	St. Dev. Coeff.	% Coeff > 0 at 10% signif.	% coeff <0 at 10% signif.
Euribor 3m	-0.0162	0.0168	0.436	0.0122	0.047	3.98%	0.00%
CMS 10y - CMS 2y	-0.0601	0.0504	0.355	-0.0193	0.0404	13.72%	1.33%
EURCHF	-0.112	0.0963	0.364	0.237	0.3277	15.49%	3.54%
EURUSD	0.1681	0.1577	0.398	0.0982	0.2713	3.98%	0.00%

Note: This table contains summary statistics on regression coefficients between the annual percentage change in revenues and the percentage change in several financial indices. The pooled regression is run on the four indices, controlling for inflation and with local authorities type fixed effects. Standard errors of coefficients are clustered by type of local authorities. Individual regressions are conducted for each local government on each individual index, also controlling for inflation. Euribor 3m is the 3-month Euro interbank offered rate and CMS stands for Constant Maturity Swap and corresponds to the fixed rate obtained by swapping a Euribor coupon. For CMS 10y - CMS 2y, we use the first difference. The sample includes all French regions, departments, as well as the 100 largest cities (226 French local authorities in total) for which we have revenue data between 1999 and 2010. Index data are from Datastream and local authorities' revenues are from the French Finance Ministry.

Table B.7: Structured-Debt Breakdown

	Notional					Notional / Local Gov. Total Debt				
	All	Regions	Counties	Intercities	Cities	All	Regions	Counties	Intercities	Cities
Aggregate	10429.9	1128.5	4801.9	1334.7	3164.9					
1. Barriers										
Aggregate	4970.7	532.3	1959.8	746.8	1731.8					
Share in %	47.70%	47.20%	40.80%	56.00%	54.70%					
Mean	17	21.3	20.4	9.8	18	10.20%	6.50%	8.80%	9.90%	12.70%
Stdev	33.3	29.2	33.3	24	39.7	14.10%	8.70%	11.90%	17.20%	14.60%
Max	342	99.2	161.7	167.9	342	95.50%	33.30%	67.90%	95.50%	69.90%
% of use	57.70%	56.00%	60.40%	44.70%	65.60%					
2. Steepeners										
Aggregate	2794.8	301.1	1417.5	329.4	746.7					
Share in %	26.80%	26.70%	29.50%	24.70%	23.60%					
Mean	9.5	12	14.8	4.3	7.8	5.20%	3.50%	5.80%	4.90%	5.30%
Stdev	25.4	33.8	33.5	10.1	21	9.70%	11.20%	8.80%	9.30%	10.50%
Max	275.8	162.4	275.8	54.4	151.4	70.50%	54.10%	41.60%	44.70%	70.50%
% of use	39.90%	32.00%	51.00%	31.50%	37.50%					
3. FX										
Aggregate	1543.9	87.2	968.3	152.5	335.8					
Share in %	14.80%	7.70%	20.20%	11.40%	10.60%					
Mean	5.3	3.5	10.1	2	3.5	2.10%	1.10%	2.50%	2.50%	1.80%
Stdev	24.1	11.4	38.4	7.2	14.2	7.40%	3.80%	7.70%	9.40%	6.20%
Max	240.8	52.9	240.8	47.4	112.6	66.70%	17.60%	44.00%	66.70%	36.80%
% of use	14.00%	12.00%	18.80%	13.20%	10.40%					
4. Inflation										
Aggregate	357.8	102.3	120.2	30.7	104.5					
Share in %	3.40%	9.10%	2.50%	2.30%	3.30%					
Mean	1.2	4.1	1.3	0.4	1.1	0.60%	1.40%	0.40%	0.30%	0.70%
Stdev	6.6	12.4	7	2.1	6.4	3.50%	5.50%	1.70%	1.50%	4.90%
Max	64.4	49	64.4	12.9	60	46.10%	27.00%	11.90%	8.70%	46.10%
% of use	7.20%	16.00%	8.30%	3.90%	6.30%					
5. Quantos										
Aggregate	249.4	33.5	89.4	28.6	98					
Share in %	2.40%	3.00%	1.90%	2.10%	3.10%					
Mean	0.9	1.3	0.9	0.4	1	0.50%	0.40%	0.40%	0.30%	0.80%
Stdev	3.5	4.2	3.4	2.4	4	1.90%	1.20%	1.30%	1.20%	2.70%
Max	33.2	15.8	25.6	20.7	33.2	16.40%	1.20%	8.10%	7.80%	16.40%
% of use	12.30%	12.00%	12.50%	6.60%	16.70%					
6. Cumulative										
Aggregate	33.4	13	7.4	0	13					
Share in %	0.30%	1.20%	0.20%	0.00%	0.40%					
Mean	0.1	0.5	0.1	0	0.1	0.00%	0.10%	0.00%	0.00%	0.00%
Stdev	1	2.6	0.8	0	0.8	0.30%	0.40%	0.30%	0.00%	0.30%
Max	13	13	7.4	0	7.1	3.20%	2.00%	3.20%	0.00%	1.90%
% of use	1.70%	4.00%	1.00%	0.00%	3.10%					
7. Others										
Aggregate	300.9	30	143.6	28.9	98.5					
Share in %	2.90%	2.70%	3.00%	2.20%	3.10%					
Mean	1	1.2	1.5	0.4	1	0.80%	0.30%	1.00%	0.50%	1.00%
Stdev	4	4.4	4.6	2	4.5	3.70%	1.00%	3.70%	2.90%	4.50%
Max	35.8	20	23.6	12.9	35.8	36.10%	3.40%	27.90%	22.10%	36.10%
% of use	8.50%	8.00%	11.50%	3.90%	9.40%					

Note: This table contains summary statistics on the different types of structured debt for a sample of French local governments. The data are obtained from a survey conducted by a specialized consulting firm as of December 31, 2007 (Dataset A). The left panel of this table displays statistics on aggregated and local government-level amounts of debt. Figures are in millions of euros, except for share in % and % of use. Aggregate denotes the sum of the debt notional amount over all local governments. Share in % represents aggregated amount of a given debt instrument in the sample divided by aggregated total structured debt of the sample. The right panel displays statistics on the relative breakdown by debt instruments at the local government level. For instance, a local government whose debt consists in EUR70m of vanilla bank loans and EUR30m of FX linked debt will be considered as a local government with 30% of FX linked debt.

Appendix C Chapter 3

Product Example

The repayment postponement option is structured as a perpetual bond with call date to the issuer. The hybrid bond is issued directly by the financial institution, or through an offshore trust in a structure similar to the one used for Trust Preferred Securities in the US. As an illustration, below are the characteristics of an existing hybrid bond.

Issuer:	BNP Paribas
Issue amount:	EUR750m
Issue date:	April 11, 2006
Maturity:	Perpetual
Basel II Tier of Capital:	Tier 1
First call date:	April 12, 2016
Call:	at par
Notice Period:	30 business days
Coupon prior first call date:	4.73%
Coupon thereafter:	Euribor 3m + 1.69%
Ranking:	Deeply Subordinated
Coupon provision:	Non Cumulative
Denomination:	EUR50,000
Structure:	Direct Issuance

Table C.8: Summary Statistics of Bank Financials

	Total Sample	Treatment Group	Control Group		
			Hybrid User	Non Call User	Tender User
Total Assets (in EUR m)	140,462	745,528	101,245	175,182	383,291
RWA / Assets	61.8%	49.0%	62.7%	64.5%	58.7%
Loans (in EUR m)	119,607	277,504	109,130	99,656	197,052
Hybrid Bonds (in EUR m)	2,390	17,100	1,450	2,780	6,570
Tier 1 Ratio	9.1%	7.5%	9.2%	8.2%	7.4%
Deposits / Total Debt	27.8%	23.8%	28.1%	33.0%	30.4%
Net Income (in EURm)	821	4,603	574	1,158	2,872
Return on Assets	1.0%	0.7%	1.0%	0.9%	0.8%
Return on Equity	13.0%	15.3%	12.9%	14.9%	21.0%
Listed	29.6%	78.6%	26.5%	36.5%	62.5%
N	233	16	217	74	16

Note: This table displays summary statistics for key financial variables of the banks analyzed in Section 6. Financials are as of end of 2007.

Bibliography

Acharya, V., Almeida, H., and Campello, M. (2013a). Aggregate Risk and the Choice between Cash and Lines of Credit. *The Journal of Finance*, (June).

Acharya, V. V., Schnabl, P., and Suarez, G. (2013b). Securitization without risk transfer. *Journal of Financial Economics*, 107(3):515–536.

Ackermann, J. (2010). The new architecture of financial regulation: Will it prevent another crisis? *LSE Financial Markets Group Paper Series*.

Admati, A., DeMarzo, P., Hellwig, M., and Pfleiderer, P. (2012). Debt overhang and capital regulation. (114).

Admati, A. R., Demarzo, P. M., Hellwig, M. F., and Pfleiderer, P. (2011). Fallacies , Irrelevant Facts , and Myths in the Discussion of Capital Regulation : Why Bank Equity is Not Expensive. *Stanford Working Paper*.

Allen, F. (2011). Trends in Financial Innovation and Their Welfare Impact An Overview. *Welfare Effects of Financial Innovation Conference*.

Amromin, G., Huang, J., Sialm, C., and Zhong, E. (2011). Complex Mortgages. *NBER Working Paper*, (17315).

Amromin, G., Huang, J., Sialm, C., and Zhong, E. (2013). Complex Mortgages. *Working Paper*.

Anagol, S. and Cole, S. (2013). Understanding the Advice of Commissions-Motivated Agents: Evidence from the Indian Life Insurance Market. *Harvard Business School Working Paper*, 12-055:1–31.

Anagol, S. and Kim, H. H. (2012). The Impact of Shrouded Fees: Evidence from a Natural Experiment in the Indian Mutual Fund Market. *American Economic Review*, 102(1):576–593.

Ang, A., Green, R., and Xing, Y. (2013). Advance Refundings of Municipal Bonds. *Working Paper*.

Baker, M., Ruback, R. S., and Wurgler, J. (2005). Behavioral Corporate Finance: A Survey. *Handbook in Corporate Finance: Empirical Corporate Finance*.

Behn, M., Haselmann, R., Kick, T., and Vig, V. (2014). The Political Economy of Bank Bailouts. *Working Paper*.

Benston, G., Irvine, P., Rosenfeld, J., and Sinkey, J. J. F. (2003). Bank Capital Structure, Regulatory Capital, and Securities Innovations. *Journal of Money Credit and Banking*, 35(3):301–322.

Bergstresser, D. and Beshears, J. (2010). Who Selected Adjustable-Rate Mortgages? Evidence from the 1989-2007 Surveys of Consumer Finance. *Harvard Business School Working Paper*, 10-083.

Bertrand, M., Schoar, A., and Thesmar, D. (2007). Banking deregulation and industry structure: Evidence from the French banking reforms of 1985. *The Journal of Finance*, LXII(2):597–629.

Besley, T. and Case, A. (1995). Does Electoral Accountability Affect Economic Policy Choices? Evidence from Gubernatorial Term Limits. *The Quarterly Journal of Economics*, (August):769–798.

Bhimalingam, M. D. B. and Burns, N. D. B. (2011). Fundamental Credit Special Basel III and Solvency II - Impact on credit markets. (May).

Bolton, P. and Samama, F. (2012). Capital access bonds: contingent capital with an option to convert. *Economic Policy*, (2010):1–46.

Bonaparte, Y., Kumar, A., and Page, J. (2012). Political Climate, Optimism, and Investment Decisions. *Working Paper*.

Boyson, N. M., Fahlenbrach, R., and Stulz, R. M. (2013). Trust Preferred Securities and Regulatory Arbitrage.

Brown, S. and Warner, J. (1985). Using daily stock returns: The case of event studies. *Journal of Financial Economics*, 14:3–31.

Brunnermeier, M., Crocket, A., Goodhart, C., Persaud, A. D., and Shin, H. (2009). *The Fundamental Principles of Financial Regulation*.

Bucks, B. and Pence, K. (2008). Do Borrowers Know Their Mortgage Terms? *Journal of Urban Economics*, 64(2):218–233.

Butler, A. W., Fauver, L., and Mortal, S. (2009). Corruption, Political Connections, and Municipal Finance. *Review of Financial Studies*, 22(7):2873–2905.

Capriglione, F. (2014). The Use of 'Derivatives' by Italian Local Authorities in Public Finance Management. Still an Issue. *Working Paper*.

Carlin, B. (2009). Strategic Price Complexity in Retail Financial Markets. *Journal of Financial Economics*, 91(3):278–287.

Carlin, B., Kogan, S., and Lowery, R. (2013). Trading Complex Assets. *Journal of Finance*, 68(5):1937–1960.

Carlin, B. and Manso, G. (2011). Obfuscation, Learning, and the Evolution of Investor Sophistication. *The Review of Financial Studies*, 24(3):755–785.

Choi, J., Laibson, D., and Madrian, B. (2010). Why Does the Law of One Price Fail? An Experiment on Index Mutual Funds. *Review of Financial Studies*, 23(4):1405–1432.

DeAngelo, H. and Stulz, R. (2013). Why High Leverage is Optimal for Banks. *Fisher College of Business Working Paper*.

Diamond, P. A. (1971). A Model of Price Adjustment. *Journal of Economic Theory*, 3:156–168.

Dinc, S. (2005). Politicians and banks: Political influences on government-owned banks in emerging markets. *Journal of Financial Economics*, 77(2):453–479.

Duffie, D. (2010). Financial Institutions. *Ending Government Bailouts as We Know Them*, pages 109–124.

Dumas, B., Fleming, J., and Whaley, R. (1998). Implied Volatility Functions: Empirical Tests. *The Journal of Finance*, 53(6):2059–2106.

Eckbo, B., Masulis, R., and Norli, O. (2007). Security offerings. *Handbook of Corporate Finance*.

Ellison, G. (2005). A Model of Add-On Pricing. *The Quarterly Journal of Economics*, 120(2):585–637.

Erel, I., Nadauld, T., and Stulz, R. M. (2013). Why Did Holdings of Highly Rated Securitization Tranches Differ So Much across Banks? *Review of Financial Studies*, 27(2):404–453.

Farhi, E. and Tirole, J. (2012). Collective Moral Hazard, Maturity Mismatch, and Systemic Bailouts. *American Economic Review*, 102(1):60–93.

Flannery, M. (2005). No Pain , No Gain ? Effecting Market Discipline via Reverse Convertible Debentures. *Capital Adequacy Beyond Basel: Banking, Securities, and Insurance.*

Flannery, M. (2010). Stabilizing Large Financial Institutions with Contingent Capital Certificates. *CAREFIN Research Paper.*

French, K., Baily, M., Campbell, J., Cochrane, J., Diamond, D., Duffie, D., Kashyap, A., Mishkin, F., Rajan, R., Scharfstein, D., Shiller, R., Shin, H. S., Slaughter, M., Stein, J., and Stulz, R. (2010). Fixing the Financial System. *The Squam Lake Report*, 22(3):8–21.

Gabaix, X. and Laibson, D. (2006). Shrouded Attributes, Consumer Myopia, and Information Suppression in Competitive Markets. *The Quarterly Journal of Economics*, 121(2):505–540.

Gennaioli, N., Shleifer, A., and Vishny, R. (2012). Neglected risks, financial innovation, and financial fragility. *Journal of Financial Economics*, 104(3):452–468.

Ghent, A., Torous, W., and Valkanov, R. (2013). Complexity in Structured Finance: Financial Wizardry or Smoke and Mirrors? *Working Paper.*

Griffin, J., R., L., and A., S. (2013). Complex Securities and Underwriter Reputation: Do Reputable Underwriters Produce Better Securities? *Working Paper.*

Grinblatt, M. and Titman, S. (1994). A Study of Monthly Mutual Funds Returns and Performance Evaluation Techniques. *Journal of Financial and Quantitative Analysis*, 29(3):419–444.

Haliassos, M. (2012). *Financial Innovation: Too Much or Too Little.*

Henderson, B. J. and Pearson, N. D. (2011). The dark side of financial innovation: A case study of the pricing of a retail financial product. *Journal of Financial Economics*, 100(2):227–247.

Hens, T. and Rieger, M. (2008). The Dark Side of the Moon: Structured Products from the Customer's Perspective. *Working Paper*.

Hibbs, D. (1977). Political Parties and Macroeconomic Policy. *The American Political Science Review*.

Hong, H. and Kostovetsky, L. (2012). Red and blue investing: Values and finance. *Journal of Financial Economics*, 103(1):1–19.

Hong, H., Kubik, J., and Stein, J. (2005). Thy neighbor's portfolio: Word of mouth effects in the holdings and trades of money managers. *The Journal of Finance*, LX(6).

Hortacsu, A. and Syverson, C. (2004). Product Differentiation, Search Costs, and Competition in the Mutual Fund Industry: a Case Study of the S&P 500 Index Funds. *The Quarterly Journal of Economics*, 119(2):403–456.

Jensen, M. (1968). The Performance of Mutual Funds in the Period 1945-1964. *The Journal of Finance*, 23(2):389–416.

Jenter, D., Lewellen, K., and Warner, J. (2011). Security issue timing: What do managers know, and when do they know it? *The Journal of Finance*, LXVI(2).

Jiménez, G., Ongena, S., Peydro, J.-L., and Saurina, J. (2013). Macroprudential policy, countercyclical bank capital buffers and credit supply: Evidence from the Spanish dynamic provisioning experiments. *Working Paper*, (October).

Jorgensen, P., Norholm, H., and Skovmand, D. (2011). Overpricing and Hidden Costs of Structured Bonds for Retail Investors: Evidence from the Danish Market for Principal Protected Notes. *Working Paper*.

Jorion, P. and Zhang, G. (2007). Good and bad credit contagion: Evidence from credit default swaps. *Journal of Financial Economics*, (949).

Julio, B. and Yook, Y. (2012). Political uncertainty and corporate investment cycles. *The Journal of Finance*, LXVII(1):45–83.

Kashyap, A., Rajan, R., and Stein, J. (2008). Rethinking capital regulation. *Federal Bank of Kansas City Symposium*, pages 431–471.

Kaustia, M. and Torstila, S. (2011). Stock market aversion? Political preferences and stock market participation. *Journal of Financial Economics*, 100(1):98–112.

Krishnan, C. N. V. and Laux, P. A. (2005). Misreaction. *Journal of Financial and Quantitative Analysis*, 40(2):403–434.

Kumar, A. (2009). Who Gambles in the Stock Market? *The Journal of Finance*, 64(4):1889–1933.

Landier, A., Sraer, D., and Thesmar, D. (2011). The Risk-Shifting Hypothesis: Evidence from Subprime Originations. *TSE Working Paper*.

Longstaff, F. A. and Schwartz, E. S. (2001). Valuing American Options by Simulation: A Simple Least Square Approach. *Review of Financial Studies*, 14(1):113–147.

Loutskina, E. (2011). The role of securitization in bank liquidity and funding management. *Journal of Financial Economics*, 100(3):663–684.

Lusardi, A., Mitchell, O., and Curto, V. (2010). Financial Literacy among the Young. *Journal of Consumer Affairs*, 44(2):358–380.

Lusardi, A. and Tufano, P. (2009a). Debt Literacy, Financial Experiences and Overindebtedness. *NBER Working Paper*, (14808).

Lusardi, A. and Tufano, P. (2009b). Debt Literacy, Financial Experiences, and Overindebtness. *NBER Working Paper*.

MacKinlay, A. (1997). Event studies in economics and finance. *Journal of Economic Literature*, XXXV(March):13–39.

Martynova, N. and Perotti, E. (2012). Convertible bonds and bank risk-taking. *Available at SSRN 2176191*, 31(September):1–43.

Moody's (2009). Moody's Guidelines for Rating Bank Hybrid Securities and Subordinated Debt. (November).

Morgan Stanley (2012). European Banks Creeping Non-Calls : Who's Next ?

Novy Marx, R. and Rauh, J. (2011). Public pension promises: how big are they and what are they worth? *The Journal of Finance*, LXVI(4).

Pennacchi, G., Vermaelen, T., and Wolff, C. (2011). Contingent capital: the case for COERCs. 33(February).

Perez-Gonzalez, F. and Yun, H. (2013). Risk management and firm value: Evidence from weather derivatives. *The Journal of Finance*.

Pérignon, C. and Vallée, B. (2014). Political Incentives and Financial Innovation : The Strategic Use of Toxic Loans by Local Governments. *Working Paper*.

Posner, E. and Weyl, E. (2013). An FDA for Financial Innovation: Applying the Insurable Interest Doctrine to 21st Century Financial Markets. *Northwestern University Law Review*, 1307.

Rajan, R. G. (2006). Has Finance Made the World Riskier? *European Financial Management*, 12(4):499–533.

Robert, J. and Stahl, D. (1993). Informative Price Advertising in a Sequential Search Model. *Econometrica: Journal of the Econometric Society*, 61(3):657–686.

Salop, S. and Stiglitz, J. (1977). Bargains and Ripoffs: A Model of Monopolistically Competitive Price Dispersion. *The Review of Economic Studies*, 44(3):493–510.

Sato, Y. (2013). Opacity in Financial Markets. *Working Paper*.

Scharfstein, D. and Stein, J. (1990). Herd Behavior and Investment. *The American Economic Review*, (June):465–479.

Stahl, D. O. (1989). Oligopolistic Pricing with Sequential Consumer Search. *The American Economic Review*, 72(4):700–712.

Sun, Y. (2014). Investor Selection and the Asymmetric Effects of Index Fund and ETF Innovations. *Working Paper*.

Sundaresan, S. and Wang, Z. (2013). On the design of contingent capital with market trigger. *Journal of Finance, Forthcoming*.

Tufano, P. (2003). Financial Innovation. *The Handbook of the Economics of Finance*.

Varian, H. R. (1980). A model of sales. *The American Economic Review*, 70(4):651–659.

Zeng, J. (2012). Contingent Capital Structure. *Working Paper*, pages 1–34.

Abstract

Abstract
This dissertation is made of three distinct chapters that empirically investigate financial innovation in different fields: household finance, public finance and financial institutions. The first chapter presents a work joint with Claire Célérier, analyzing the growing complexity of retail structured products, and how bank use complexity to mitigate competitive pressure. The second chapter, joint with Christophe Pérignon, studies how local governments strategically use toxic loans according to their political incentives. The third chapter explores the effects of exercising contingent capital, and how these instruments can contribute to solving the bank leverage dilemna.

Keywords: Financial Innovation, Financial Complexity, Household Finance, Derivatives, Public Finance, Contingent Capital, Financial Institutions.

Résumé
Cette dissertation est constituée de trois chapitres distincts, qui visent à analyser empiriquement l'innovation financière dans des champs différents: la finance des ménages, la finance publique, et le secteur financier. Le premier chapitre, effectué en collaboration avec Claire Célérier, analyse la complexité croissante des produits financiers offerts aux investisseurs particuliers et suggère que cette complexité est utilisée par les banques pour réduire la pression concurrencielle. Le deuxieme chapitre, écrit avec Christophe Pérignon, porte sur les emprunts toxiques émis par les collectivités locales, et comment leur utilisation s'inscrit dans un système d'incitation politique. Le troisieme chapitre étudie en quoi l'adoption d'un type d'obligations innovantes représentant un capital conditionnel, peut contribuer à solutionner le dilemne sur le levier bancaire.

Mots-Clefs: Innovation Financière, Complexité financière, Finance des ménages, Produits dérivés, Finance publique, Capital Conditionnel, Institutions Financières.