Essais en Finance d'Entreprise

David Sraer

To cite this version:

David Sraer. Essais en Finance d'Entreprise. General Finance [q-fin.GN]. Ecole des Hautes Etudes en Sciences Sociales (EHESS); ENSAE ParisTech, 2007. English. NNT : . pastel-00003820

HAL Id: pastel-00003820

https://pastel.hal.science/pastel-00003820

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Ecole des Hautes Etudes en Sciences Sociales

Année 2007 Numéro attribué par la bibliothèque

Essais en Finance d'Entreprise

THESE POUR LE DOCTORAT EN SCIENCES ECONOMIQUES
DE L'ECOLE DES HAUTES ETUDES EN SCIENCES SOCIALES

Présentée et soutenue publiquement par

David SRAER

le 29 Juin 2007

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Remerciements

J'ai à l'égard de Jean Tirole un dette incommensurable : pour l'accueil chaleureux dont il m'a fait bénéficier à chacune de mes venues à Toulouse, pour l'incroyable richesse des discussions que nous avons pu avoir tout au long du développement de cette thèse, pour le soutien qu'il m'a toujours apporté et pour l'extraordinaire qualité de ses conseils scientifiques, je luis suis infiniment gré.

David Thesmar m'a fait découvrir ce qu'était réellement la recherche en économie et surtout, a su m'ouvrir les yeux sur ce qu'était la bonne recherche en économie. Sans lui, et à de très nombreux égards, cette thèse n'existerait pas. Sa créativité, son enthousiasme, sa curiosité tout comme son amitié ont été un moteur formidable, aussi bien au quotidien que sur le long terme. Ma dette à son égard est immense. J'espère profondément que notre collaboration pourra se prolonger aussi longtemps que possible !

Je réalise pleinement la chance que j'ai pu avoir de travailler, sur les chapitres 2 et 3 de cette thèse, avec Augustin Landier. Augustin est certainement le chercheur le plus inventif avec lequel j'ai pu travailler jusqu'ici : avec lui, l'inspiration n'est jamais très loin... Je tiens également à remercier chaleureusement Thomas Chaney pour sa collaboration sur le chapitre 4. En plus d'être un ami fidèle depuis de nombreuses années maintenant, Thomas est devenu ce professeur d'économie brillant avec lequel je suis chanceux de pouvoir travailler : j'espère que nous n'allons pas nous arrêter en si bon chemin... Philippe Février doit enfin être associé à cette liste de mes co-auteurs préférés, même si notre travail commun ne figure pas dans cette thèse.

J'ai également bénéficié, tout au long de ces quatre années qu'ont duré ma thèse, d'un environnemnt intellectuel incroyablement favorable à l'élaboration de tous ces projets de recherche. Pour les innombrables discussions, débats, lectures partagées, controverses, etc... que j'ai pu avoir avec eux, je tiens à remercier Nicolas Coeurdacier, Emmanuel Farhi, Francis Kramarz, Pierre Cahuc et Guy Laroque (et plus généralement, le laboratoire de Macroéconomie du CREST et ses groupes de travail), et Laurent Linnemer (les jeudi au LEI restent parmi les moments les plus agréables de ces années de thèse).

Je tiens galement à remercier Denis Gromb et Ulrike Malmendier pour avoir tous deux accepté très gentiment de participer au jury de cette thèse.

Je souhaite enfin associer à ce travail ma famille, que je n'ai que rarement l'occasion de remercier pour tout ce qu'elle m'apporte et me permet de réaliser : mes parents, évidemment, et mon frêre Joël ainsi que ma soeur Judith. Enfin, comment exprimer ma gratitude à Cécile, notamment pour m'avoir supporté pendant ces années où les discussions économiques ont certainement été plus nombreuses que de raison ? Depuis de nombreuses années déjà, son soutien est ma meilleure arme.

Résumé

Cette thèse comporte quatre essais en finance d'entreprise. Le premier chapitre porte sur le lien entre comportement de l'entreprise et structure de son actionnariat et de son management. L'attention est plus particulièrement portée sur les différents styles de management qu'implique la présence de la famille du fondateur de l'entreprise dans l'actionnariat ou dans l'équipe dirigeante.

Nous montrons ensuite comment des mécanismes de gouvernance interne peuvent supplanter les dispositifs traditionnels de gouvernement de l'entreprise pour exercer une discipline efficace sur les dirigeants de l'entreprise. Cette étude empirique, menée sur un large panel d'entreprises américaines, est soutenue par une analyse théorique qui s'intéresse plus généralement au rôle de l'indépendance des préférences au sein des organisations.

Le dernier chapitre de cette thèse vise à comprendre empiriquement les liens entre valeur du collatéral détenu par les entreprises et politique d'investissement. L'analyse se concentre particulièrement sur les actifs immobiliers que possèdent les grandes entreprises américaines.

Discipline : Sciences Economiques (05).

Mots-clés :

Finance d'Entreprise ; Structure du Capital ; Styles de Management ; Gouvernement de l'Entreprise ; Théorie des Organisations ; Indépendance des Préférences ; Contraintes de Crédit ; Politique d'Investissement ; Collatéral.

Intitulé et adresse du laboratoire :
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Introduction

La révolution de l'"économie de l'information", dès la fin des années 70, a permis un profond renouveau de la littérature de finance d'entreprise. La prise en compte des asymétries d'information entre investisseurs et entrepreneurs a mis fin à un monde dans lequel le financement de l'entreprise était un sujet "non pertinent" (Modigliani et Miller (1958)) : désormais, l'organisation de l'entreprise, la structure et la nature de son actionnariat, le fonctionnement de son conseil d'administration ou la spécificité de ses actifs devenaient autant de facteurs susceptibles d'affecter le montant des fonds disponibles pour le financement de nouveaux projets et donc d'influer sur son comportement dans l'économie réelle. Cette thèse s'inscrit dans le prolongement de cette évolution de la finance d'entreprise. Elle s'intéresse en particulier à trois questions fondamentales qui trouvent leur origine dans cette révolution de l'"économie de l'information", mais auxquelles seules des réponses incomplètes ont été apportées jusqu'à présent.

Performance et Comportement des Entreprises Familiales en France

Dans le chapitre 1[1] de cette thèse, je commence par explorer le lien entre la nature de l'actionnariat, l'identité des dirigeants et le comportement de l'entreprise. Alors que depuis Berle et Means, les économistes ont porté principalement leur attention sur les grandes entreprises cotées à l'actionnariat diffus, il se trouve que la plupart des entreprises autour du monde ont un actionnaire dominant, qui se trouve être très souvent la famille du fondateur de l'entreprise (La Porta, Lopez-de-Silanez et Shleifer (1999)). En outre, les familles des fondateurs se trouvent souvent être impliquées dans le management quotidien des entreprises. Ainsi, dans l'échantillon construit pour ce premier chapitre (qui rassemble des données sur l'intégralité des entreprises cotées à la Bourse de Paris entre 1994 et 2000), plus de 60% des firmes sont encores dirigées par la famille de leur fondateur. Même au sein des plus grandes entreprises cotées américaines, Anderson et Reeb (2003) montrent que près de 16% des entreprises du S&P500 sont encore aux mains de leur fondateur ou de leurs héritiers. Ainsi, les prémices du modèle de l'entreprise selon Berle

[1] Le chapitre 1 est tiré d'un article écrit en collaboration avec David Thesmar : "Performance and Behavior of Family Firms: Evidence from the French Stock Market", à paraitre dans le Journal of the European Economic Association.

et Means où (1) le dirigeant ne possède pas l'entreprise et (2) l'actionnariat est largement dispersé ne semble pas pouvoir s'appliquer à la plupart des entreprises.

Une vision plus pertinente du capitalisme mondial serait donc plutôt qu'une grande entreprise cotée est typiquement détenue, et fréquemment dirigée, par une famille. Cette nouvelle perspective appelle donc un nouvel agenda de recherche sur les caractéristiques spécifiques du management et du contrôle dans un cadre dynastique. Le premier chapitre de cette thèse cherche donc à aborder, parmi d'autres, les questions suivantes : les familles maximisent elles le profit de leur entreprise ? Sont-elles plus promptes à construire des empires au détriment des actionnaires minoritaires ? Sont-elles trop prudentes, trop conservatrices ? Au contraire, bénéficient-elles d'un horizon d'investissement de plus long terme, qui leur permet d'éviter de succomber aux phénomènes de mode ? Plus généralement, se comportent-elles de façon différente de ces grandes firmes à l'actionnariat diffus que les académiques connaissent si bien ?

Pour répondre à ces questions, notre article s'appuie sur le cas des entreprises familiales cotées sur la Bourse de Paris. L'exemple français nous parat être un cas intéressant à deux titres. En premier lieu, la France est un pays d'Europe continental, si bien que ces institutions financières et son histoire diffèrent fortement des pays anglo-saxons, dans lesquels la plupart des études sur les entreprises familiales ont été conduites jusqu'à présent ; en particulier, les entreprises familiales y représentent une part bien plus importante de l'économie dans son ensemble. En second lieu, contrairement à de nombreux autres pays d'Europe continental, la France possède un nombre important de grandes entreprises à l'actionnariat diffus, qui tendent à ressembler aux entreprises managériales observées aux Etats-Unis – sans actionnaire dominant et avec un management protégé. Cela nous permet d'avoir accès à un groupe de contrôle suffisament large auquel comparer les entreprises familiales.

Nous avons ainsi collecté des données sur près de 1,000 entreprises cotées à la Bourse de Paris sur la période 1994-2000. Notre panel dispose d'informations détaillées sur les entreprises (l'emploi, les comptes sociaux, les acquisitions effectuées, les rendements boursiers principalement) ainsi que sur la famille fondatrice (notamment sa participation à l'actionnariat et au management). Dans un premier temps, nous nous intéressons à la corrélation entre performance de l'entreprise et présence d'une famille à l'actionnariat et/ou au management. Ainsi, en se concentrant sur les performances comptables, nous mettons en évidence que la performance des firmes familiales est significativement supérieure à celles des entreprises non familiales. De façon cohérente avec la littérature existante sur l'"effet fondateur" (Adams, Almeida et Ferreira (2005), Fahlenbrach (2005)), nous trouvons que les fondateurs sont à la tête d'entreprises très profitables. Egalement en ligne avec les résultats établis sur données américaines (Anderson et Reeb (2003), Amit et Villalonga (2006)), il apparait que les entreprises familiales dirigées par des managers “indépendants” de la famille sont bien plus performantes que les entreprises à l'actionnariat dispersé. Il semble donc qu'aussi bien en France qu'aux Etats-Unis, les familles en tant qu'actionnaires concentrés permettent, en moyenne, d'améliorer les performances de leur entreprise. De façon bien plus surprenante, notre étude montre que les managers héritiers du fondateur de l'entreprise tendent également à sur-performer non seulement les entreprises non familiales, mais également les entreprises familiales dirigées par des P.D.G. indépendants. Ainsi, même en mettant de côté les fondateurs, les entreprises familiales (qu'elles soient dirigées ou non par des héritiers) ont une performance supérieure aux entreprises non familiales en France. Une interprétation causale de ces résultats “en coupe” est cependant problématique puisqu'il est possible que seules les entreprises les plus performantes soient transmises à des héritiers. Une solution possible consisterait à s'intéresser explicitement aux transmissions (comme dans Pérez-González (2006)). Bien que nous observions trop peu de transitions dans notre échantillon pour pouvoir réaliser des tests statistiques puissants, nous voyons néanmoins que (1) les héritiers n'héritent typiquement pas des meilleures entreprises et que (2) les héritiers dont les entreprises sortent de la Bourse de Paris ne sous-performent pas systematiquement les autres catégories d'entreprises. Il est donc probable que les biais d'endogénéité ne soient pas trop importants dans notre échantillon.

Nous essayons ensuite d'interpréter, à l'aide des données, ces différences de performance, en considérant successivement les différentes caractéristiques déterminant ces performances. Une plus grande productivité du travail semble être l'explication la plus significative pour la performance supérieure des entreprises dirigées par leur fondateur. Quant aux différences de performance entre les entreprises familiales dirigées par des P.D.G. professionnels et celles dirigées par des héritiers, nous regardons successivement les différences en terme de gestion de la main d'oeuvre et gestion du capital.

Tout d'abord, il apparait que les entreprises familiales dirigées par des professionnels et des héritiers versent, en moyenne, des salaires plus faibles. Néanmoins, ce résultat peut n'être que le reflêt de compositions différentes de la force de travail dans ces entreprises familiales, une plus grande fraction de travailleurs non qualifiés par exemple. Afin de prendre en compte une telle possibilité, nous apparions nos données d'entreprises avec des fichiers administratifs employeurs/employés, ce qui nous permet de contrôler pour les effets de composition en terme d'expérience, d'ancienneté et de qualification. Cela nous permet de mettre en évidence que les P.D.G. professionnels ne payent des salaires plus faibles que parce qu'ils emploient des salariés moins qualifiés. Au contraire, même après avoir contrôler pour la structure de qualification des employés, nous continuons à trouver que les héritiers versent des salaires plus faibles. En outre, nous montrons que la demande de travail dans les entreprises familiales dirigées par des héritiers répond significativement moins aux chocs sectoriels de vente, soit, en d'autres termes, que les dirigeants héritiers lissent les effectifs de leur entreprise le long du cycle des affaires. Au total, ces résultats peuvent s'interpréter comme la preuve que les entreprises familiales dirigées par des héritiers fournissent à leurs employés des contrats implicites d'assurance sur le long terme. Ces contrats implicites, crédibles uniquement en raison de l'horizon d'investissement plus long des entrepreneurs familiaux, permettent aux héritiers de verser des salaires plus faibles pour des qualifications plus élevées. En effet, en comparaison des dirigeants professionnels, les héritiers dégagent bien une plus grande productivité du travail.

Pour conclure ce chapitre 1, nous nous intéressons aux différences observables, entre les différentes catégories d'entreprises, en terme de gestion du capital. Les dirigeants professionnels semblent assujettis à des taux d'intérêt plus faibles sur leur dette financière et ils ont tendance à opérer avec des ratios capital/travail plus faibles. En comparaison des héritiers, ou même des entreprises à l'actionnariat dispersé, les grandes acquisitions réalisées par les dirigeants professionnels des entreprises familiales détruisent moins de valeurs dans le long terme. Bien que totalement a-structurelle et donc à interpréter avec précaution, l'image générale qui se dégage de ces résultats semblent indiquer que (1) les dirigeants professionnels apportent une expertise financière à l'actionnariat familial, en particulier, qu'ils sont moins efficaces dans l'utilisation du capital productif alors que (2) les héritiers ont l'horizon managerial nécessaire pour pouvoir s'engager à des politiques protectrices de gestion de la main d'oeuvre, ce qui leur permet de bénéficier d'une plus forte productivité du travail.

Ce chapitre représente donc une contribution à la littérature émergente sur les entreprises familiales. La majeure partie de cette littérature s'est, jusqu'à présent, concentrée sur les entreprises nord américaines et des comparaisons de profitabilité. L'ensemble de ces contributions (Anderson et Reeb (2003), Amit et Villalonga (2006), and Pérez-González (1999) pour les Etats-Unis ; Morck, Strangeland and Yeung (2002) pour le Canada), a permis d'arriver à un consensus sur la plus grande performance des entreprises familiales dirigées par des fondateurs ou des dirigeants professionnels. Ces résultats sont généralement interprétés comme des preuves qu'un actionnaire concentré et de long terme permet d'éviter les coûts associés à l'expropriation potentielle des actionnaires minoritaires. En revanche, la qualité manageriale des héritiers est un sujet bien plus controversé. Deux études "en coupe" portant sur des grandes entreprises américaines cotées dans les années 90 (Anderson and Reeb (2003) and Amit and Villalonga (2006)) trouvent des résultats opposés. Néanmoins, l'approche en "différence de différence" adoptée par Pérez-González (2006) suggère que les héritiers sont de plus mauvais dirigeants que les managers professionnels, au moins au sens de la profitabilité. Ce résultat est confirmé par Bennedsen, Nielsen, Pérez-González et Wolfenzon (2006) qui tirent profit de la richesse des données danoises pour traiter de façon précautionneuse la question de la causalité. Le premier chapitre de cette thèse permet de compléter ces études pour un grand pays d'Europe continentale: nos résultats montrent, au contraire des précédentes études, que les entreprises familiales dirigées par des héritiers présentent une rentabilité supérieure, non seulement relativement aux entreprises à l'actionnariat dispersé, mais également relativement aux entreprises familiales dirigées par des managers professionnels. Cependant, il convient d'insister qu'en plus de l'effet causal du management familial (que nous cherchons à mettre en lumière), des biais de sélection et de simultanéité pourraient également expliquer cette corrélation.

De façon plus intéressante, notre papier complémente la littérature existante sur les entreprises familiales en s'intéressant aux effets d'un actionnariat et/ou d'un management familial sur d'autres dimensions du comportement des entreprises. Notre résultat selon lequel les entreprises familiales versent des salaires plus faibles est, à notre connaissance, une nouveauté pour la littérature. Ce résultat peut cependant être relié à certaines études sur le lien entre politiques salariales d'une part et séparation de l'actionnariat et du management dans l'entreprise d'autre part. Ainsi, une littérature vieille d'une dizaine d'années, récemment résumée et développée par Bertrand et Mullainathan (1999) montre que les problèmes d'agence entre management et actionnariat peuvent effectivement conduire à des niveaux de salaire plus élevés, pour tous les agents de l'organisation. L'autre nouveauté offerte par ce chapitre 1 repose sur l'analyse des différences de "styles de management" entre les managers professionnels et les héritiers : nos données suggèrent que les managers professionnels apportent une certaine expertise financière, qui permet une gestion plus efficace du capital productif, alors que les héritiers, bénéficiant de leur horizon de long-terme, peuvent mettre en place des politiques d'emploi "protectrices" qui leur permettent de négocier des salaires plus faibles. On peut interpréter ces résultats à l'aune de l'article de Bertrand et Schoar (2003) qui met en évidence, parmi les P.D.G. des grandes entreprises américaines, de fortes différences en termes de politique d'investissement, d'acquisition ou de politique financière. En particulier, Betrand et Schoar montrent que les détenteurs de M.B.A. tendent à être plus agressifs en termes de levier financier et de politique d'acquisition. Nos propres résultats suggèrent que le management familial peut être une nouvelle dimension d'hétérogénéité des styles de management, passionnante à explorer.

Gouvernance Interne et Performance des Entreprises

Le chapitre 2[2] de cette thèse plonge dans le débat sur le gouvernement de l'entreprise. Les académiques tout autant que les praticiens ont admis depuis longtemps l'idée qu'en l'absence d'une surveillance rapprochée, les P.D.G. des grandes entreprises cotées pouvaient prendre des décisions allant à l'encontre de l'intérêt de leurs actionnaires : en utilisant les ressources de l'entreprise pour des projets "personnels" destructeurs de valeur, en construisant des

[2] Le chapitre 2 est tiré d'un article écrit en collaboration avec Augustin Landier et David Thesmar : "Bottom-Up Corporate Governance", Document de Travail Stern School of Business, N06-007.

empires non rentables, en empêchant l'acquisition de la firme, ou même, dans certains cas rares mais largement médiatisés, en s'engageant dans des opérations frauduleuses de maquillage des comptes ou de détournement des actifs de l'entreprise. Pour mettre en place des contre-pouvoirs au P.D.G., le consensus dégagé auprès des praticiens et des régulateurs consiste à se reposer sur un conseil d'administration fort et indépendant du management. Dans de nombreux pays, des codes informels de gouvernement d'entreprise ont ainsi recommandé, depuis plus d'une dizaine d'années, la nomination d'administrateurs indépendants.[3] Aux Etats-Unis, la récente vague de scandales financiers a conduit a une importante réponse de la régulation, qui a rendu la nomination d'administrateurs indépendants obligatoire pour les entreprises cotées sur les principales places boursières.

Il est vrai que la recherche académique a démontré depuis la fin des années 80 que les conseils d'administrations sont un outil efficace de gouvernement de l'entreprise. Les conseils d'administration "indépendants" semblent prendre plus en compte la performance de l'entreprise lorsqu'ils doivent décider des rémunérations ou des licenciements des managers (Weisbach (1988), Dahya, Mc Connel and Travlos (2002)). Le marché salue généralement la nomination d'administrateurs indépendants avec des rendements anormaux positifs (Rosenstein and Wyatt (1990)). Il n'y a cependant aucune évidence que des conseils d'administration indépendants permettent une amélioration de la profitabilité ou de la valeur de l'entreprise.[4] Une possibilité, au moins pour les grandes entreprises cotées, est que les conseils d'administration indépendants, bien qu'ils puissent être extrêmement précieux en temps de crise, sont bien trop éloignés de la gestion quotidienne des opérations de l'entreprise pour créer beaucoup de valeur.

En conséquence, les chercheurs intéressés au gouvernement de l'entreprise ont décidé de ne plus se concentrer que sur les seules variables "organisationnelles", comme la composition du conseil d'administration, et d'examiner d'autres dimensions de la gouvernance, essentiellement à travers les statuts de l'entreprise. Les principales découvertes de cette littérature récente tendent à prouver que des provisions favorables aux investisseurs inscrites dans les statuts de la firme augmentent la valeur des actifs de l'entreprise, en les rendant plus vulnérables aux acquisitions (Gompers, Ishii and Metrick (2003), Cremers, Nair and John (2005),Bebchuk and Cohen (2004)).

Ce chapitre de ma thèse propose d'étudier une nouvelle mesure de la qualité de la gouvernance d'une entreprise, fondée sur une information purement "organisationnelle". Notre intuition est qu'il est possible de récupérer

[3] D'ailleurs, de nombreuses entreprises ont été ravis de se soumettre à ces recommandations. Par exemple, le Cadbury Report émis en 1992 en Grande Bretagne recommande que "la majorité des administrateurs non cadres de l'entreprise devraient être indépendant". Le rapport Viénot, fait en France en 1998, propose que "les administrateurs indépendant devraient représenter au moins un tiers du conseil d'administration". Le suivi de ces recommandations n'étaient pas obligatoires, mais fut pourtant largement répandu. Ainsi, en 1996, plus de 50% des entreprise anglaises examinés par Dahya, Mc Connel et Travlos (2002) déclarait s'être soumis aux recommandations du Cadbury Report.

[4] En réalité, la corrélation semble même être légèrement négative. Une raison probable pour ce résultat est que les firmes en difficulté ont tendance à engager plus d'administrateurs indépendant (Kaplan et Minton (1994)). En filtrant ce biais d'endogénéité, il ne semble pas y avoir de corrélation systématique entre la profitabilité de l'entreprise et l'indépendance de son conseil d'administration (Baghat et Black (2003) et Hermalin et Weisbach (2003)).

de l'information sur le bon fonctionnement d'une entreprise en examinant la composition de l'équipe dirigeante. Après tout, les P.D.G. doivent faire face à leurs directeurs quotidiennement, alors qu'ils ne rencontrent leur conseil d'administration que quelques fois par an.

Plus précisément, nous développons une mesure de "gouvernance interne" qui capture le degré d'"indépendance" des cades dirigeants vis à vis du P.D.G.. Utilisant un panel d'entreprises cotées américaines, nous calculons la fraction de cadres dirigeants qui ont rejoint la firme *avant* que le P.D.G. ne soit nommé à son poste. Notre hypothèse de travail est que ces cadres dirigeants sont "indépendants" du P.D.G. de l'entreprise. En effet, comme les P.D.G. sont très souvent impliqués dans le recrutement de leur cadre dirigeant, il est probable que les exécutifs engagés par un P.D.G. partagent les mêmes préférences que ce P.D.G. et/ou qu'ils aient des incitations à "retourner la faveur". Parallèlement, il est probable que les exécutifs qui ont connu un autre leadership dans l'entreprise ne soient pas prêts à considérer tous les ordres comme légitimes, simplement car ils viennent d'un individu hiérarchiquement supérieur.

Notre étude fournit tout d'abord des preuves qu'une bonne gouvernance interne (i.e. des exécutifs indépendants) prédit une plus forte profitabilité future de l'entreprise, et ce en utilisant différentes mesures de profitabilité. Par ailleurs, de mauvaises performances ne conduisent *pas* à une diminution de la gouvernance interne, ce qui suggère un effet causal de la gouvernance interne sur la performance. Nos résultats restent similaires même lorsque nous contrôlons pour des mesures traditionnelles de gouvernance "externe". Nous montrons également que ces résultats ne sont pas simplement la conséquence de départs de cadres dirigeants anticipant de mauvaises performances à venir.

La deuxième partie de ce chapitre 2 concerne l'impact de la gouvernance interne sur la qualité des acquisitions réalisés par les entreprises : une plus faible fraction de cadres dirigeants indépendants est associée à des rendements plus faibles pour les actionnaires de l'entreprise, suite à une grande acquisition. Il est important de remarquer néanmoins que les indices standards de gouvernance externe ne sont pas, quant à eux, corrélés aux pertes réalisées par les actionnaires d'une entreprise suite à une acquisition. Ainsi, le conseil d'administration, la pression des acquisitions hostiles ou le contenu des statuts de l'entreprise semblent être moins efficaces pour éviter de mauvaises acquisitions que la pression exercée par une équipe dirigeante indépendante.

Une contribution importante de ce chapitre de ma thèse est d'exhiber une variable "organisationnelle", définie au niveau de la firme, possédant un pouvoir prédictif puissant sur les performances futures. Une interprétation alternative consisterait à dire que notre indice de gouvernance interne n'est qu'une mesure de l'étendu du pouvoir d'un P.D.G. sur sa firme : les "P.D.G. puissants" pourraient être ceux les plus susceptibles de réaliser des acquisitions inefficaces et de remplacer les cadres dirigeants sans qu'il n'y ait un lien clair entre ces deux comportements. Néanmoins, nous prouvons que la gouvernance interne n'est que très faiblement corrélée aux mesures traditionnelles du “pouvoir des P.D.G.” (comme, par exemple, le fait que le P.D.G. occupe la place de président du conseil d'administration). Une autre interprétation de nos résultats, développée dans le chapitre 3, revient à dire que des cadres dirigeants indépendants peuvent agir comme un méchanisme de “gouvernance par le bas”, rendant plus coûteux au P.D.G. la prise de mauvaises décisions.

Deux implications normatives pour les praticiens méritent d'être retenues de cette étude. Tout d'abord, notre analyse statistique montre que l'intensité d'une telle “gouvernance interne” peut être, au moins partiellement, observée et pourrait donc être intégrée dans les différents indices de qualité de gouvernance d'entreprise. Cette remarque est indépendante de l'interprétation que l'on voudra bien faire des résultats: qu'elle ne soit qu'un signal que les cadres dirigeants anticipent les mauvais résultats ou bien qu'elle mesure l'étendu de la discipline imposée par des cadres indépendants, notre mesure prédit fortement la performance future. En revanche, la seconde implication que nous souhaitons mettre en lumière repose, elle, sur notre interprétation favorite, celle d'une “gouvernance par le bas” : en plus de surveiller le management et de le conseiller, un rôle clé du conseil d'administration devrait consister à mettre en place un équilibre des pouvoirs au sein de l'entreprise. Dit autrement, le rôle du conseil d'administration en tant que gérant des ressources humaines ne devrait pas être limité au seul problème de succession du P.D.G..

Indépendance Optimale au sein des Organisations

Le chapitre 3[5] de cette thèse est inspiré des résultats mis en avant dans le chapitre 2. Dans ce chapitre, nous essayons de comprendre le rôle joué par l'indépendance des préférences entre un décideur (par exemple le P.D.G. d'une entreprise) et la personne en charge de l'implémentation des décisions (par exemple un cadre dirigeant de l'entreprise). En effet, si un rôle clé des managers au sein d'une organisation consiste à décider de la nature des projets à mettre en oeuvre, l'implémentation des projets n'est que rarement effectuée par les managers qui les ont sélectionnés. Cette “séparation de l'implémentation et du contrôle” n'est pas sans conséquence sur le processus de prise de décision. Les “implémenteurs” peuvent avoir des préférences intrinsèques sur certains projets relativement à d'autres ou ils peuvent simplement ne pas adhérer à la vision managériale de l'entreprise. Cette propension à ne pas vouloir effectuer les projets sélectionnés ne se manifeste paas nécessairement par un conflit ouvert entre un “implémenteur” et le décideur (ie entre le P.D.G. et le cadre dirigeant de l'entreprise): elle peut tout aussi bien conduire à une sous-provision d'effort au cours de l'implémentation du projet. Notre étude explore théoriquement l'existence d'une telle “contrainte d'implémenentation” et cherche à comprendre son impact sur l'efficacité de l'organisation.

[5] Le chapitre 3 est tiré d'un article écrit en collaboration avec Augustin Landier et David Thesmar : “Optimal Independence in Organizations”, Document de Travail Stern School of Business, N06-008.

Le fait que les décideurs doivent internaliser les préférences des implémenteurs est largement reconnu dans la littérature de management. C'est, par ailleurs, un des messages principaux de l'autobiographie de Sloan (1963), "Mes Années chez General Motors". Dans le chapitre 5 de ce livre, Sloan raconte l'histoire de la "machine à refroidissement à cuivre", un projet qui avait suscité l'enthousiasme des managers de GM mais n'avait pas réussi à entrainer l'adhésion des ingénieurs en charge de l'implémentation du projet. Leur manque de motivation lors de la mise en oeuvre mena à un echec très coûteux pour l'entreprise. Sloan détaille sa propre analyse de la situation en 1923, en plein coeur de la crise: "Nous comprenons bien que [...] forcer les divisions à entreprendre un projet auquel elle ne croit pas ne nous mène nulle part. Nous avons essayé et nous avons échoué".

De façon surprenante, le rôle des "implémenteurs" comme contrainte à la prise de décision n'a pas encore été exploré dans la théorie des organisations. Bien évidemment, l'idée que les managers et leurs subordonnées puissent avoir des préférences conflictuelles n'est certainement pas nouvelle. Un nombre important de travaux de recherche s'est concentré sur l'analyse de situations où les implémenteurs ont de l'information privé sur l'effort qu'ils doivent faire pour exercer une tâche spécifique (Calvo et Wellisz (1979)). Une autre partie de la littérature s'est interessée à des problèmes de prise de décision dans un cadre principal-agent où l'agent a de l'information privé sur la "bonne" décision à prendre (Simon (1957) et plus récemment Aghion et Tirole (1997) ou Dessein (2002)). Enfin, une dernière partie de la littérature a cherché à mettre en place des méchanismes permettant de réduire directement ces divergences dans les préférences (par exemple en définissant une stratégie d'entreprise simple, comme dans Rotemberg et Saloner (1994) ou une vision manageriale claire comme dans Van den Steen (2004)). Toutefois, qu'elle s'intéresse à des problèmes de prises de décision ou d'implémentations, cette littérature partage la vue selon laquelle l'hétérogénéité de préférence au sein d'une relation principal-agent est, presque par définition, mauvaise pour l'efficacité de l'organisation : une organisation efficace devrait toujours être constituée de "clones" du principal.

Cependant, l'hétérogénéité dans les préférences peut s'avérer utile dès lors que l'on prend en compte l'existence d'une "division du travail" entre (1) les agents qui prennent des décisions et (2) ceux en charge de les implémenter. Nous considérons donc une organisation constituée de deux employées : un Décideur en charge de sélectionner les projets et un Implémenteur en charge de leur exécution. Les deux agents ont des préférences intrinsèques, potentiellement conflictuelles, sur les différents projets que l'organisation peut effectuer. De plus, l'organisation doit faire face à des problèmes d'asymétrie d'informations : d'un côté, le Décideur possède de l'information sur la nature du projet le plus profitable *à priori* (parce qu'il va, par exemple, à des meetings, des conférences et a accès à des mémos confidentiels) ; de l'autre côté, l'effort réalisé par l'Implémenteur n'est pas observable. La clé de notre cadre d'analyse est que le Décideur doit anticiper l'effort qu'est prêt à consentir l'Implémenteur sur chacun des projets. En moyenne, un Implémenteur indépendant (ie, un implémenteur dont les préférences intrinsèques ne sont pas reliées à celles du Décideur) a moins d'incitations à fournir un effort d'implémentation important sur le projet préféré du Décideur que ne pourrait avoir un implémenteur partageant les préférences du Décideur. Anticipant cela, le Décideur est incité à utiliser plus d'informations objectives dans sa prise de décision et à moins prendre en compte ses propres préférences, ce qui augmente la profitabilité de l'organisation.

Cette "contrainte d'implémentation" a en retour d'importantes conséquences sur la motivation de l'Implémenteur. Parce que le succès du projet est important pour l'Implémenteur, il est disposé à fournir plus d'effort lorsque qu'il croit que le Décideur a choisi le "bon" projet, c'est à dire celui ayant le plus de chances objectives de réussir. Un Implémenteur indépendant – qui sait que sa simple présence dans la chaîne de commande augmente l'information "objective" utilisée dans le processus de prise de décision – a de fortes croyances sur la profitabilité du projet, ce qui l'incite à faire plus d'effort dans l'implémentation.

Cependant, l'indépendance le long de la hiérarchie vient à un coût. Comme le Décideur est plus incertain des préférences d'un Implémenteur indépendant, il peut plus souvent choisir des projets qui se trouvent, *ex post*, être les projets les moins aimés par l'Implémenteur. Ainsi, un Implémenteur indépendant se voit plus souvent confronté à la mise en place de projets pour lesquels il n'a aucune préférence intrinsèque, ce qui détruit sa motivation à réaliser le projet. L'arbitrage que nous mettons en lumière dans cet article oppose donc (1) des projets objectivement profitables et (2) des agents avec une plus faible motivation intrinsèque *ex post*. Comme nous le montrons, quand l'information privée du Décideur est suffisamment précise, l'organisation optimale met en scène des Implémenteurs indépendants afin d'inciter le Décideur à utiliser cette information privée.

Dans notre cadre hiérarchique, l'hétérogénéité dans les préférences peut être bénéfique pour l'organisation mais pour des raisons différentes de celles qui sont généralement mises en avant dans des structures "horizontales", comme des commités ou des parlements. Dans de telles structure, la diversité peut être désirable, dans la mesure où elle permet aux biais individuels de se "neutraliser". Dans l'organisation hiérarchique que nous étudions, l'indépendance optimale émerge comme un mécanisme qui rend la "contrainte d'implémentation" plus contraignante, ce qui, sous certaines conditions, peut améliorer l'efficacité de l'organisation. Cette interaction entre la prise de décision et l'implémentation est au coeur de l'arbitrage que nous mettons en lumière dans ce chapitre 3 et il nous permet ensuite de dériver des comparatives statiques intéressantes qui ne pourraient être obtenus dans un modèle plus "horizontal".

Ce chapitre de ma thèse est à relier à certains travaux récents sur le design des organisations, notre principale innovation étant l'étude de l'indépendance des préférences dans un cadre de "division du travail". Zabojnik

(2002) est le seul papier intégrant explicitement cette séparation entre la prise de décision et l'implémentation, mais l'organisation qu'il considère est constituée seulement d'agents motivés extrinsèquement et son étude porte spécifiquement sur le rôle de la délégation de l'autorité au sein de la hiérarchie. Dessein (2002) présente un modèle de communication entre un principal et son agent dans un pure cadre de prise de décision. A cause de cette "homogénéité" dans les tâches effectuées par l'organisation, Dessein obtient que la communication est très inefficace dès lors que les préférences entre le principal et l'agent sont suffisamment indépendantes, ce qui contraste fortement avec nos propres résultats. Dewatripont et Tirole (2005) introduise un modèle de communication coûteuse où l'homogénéité dans les préférences peut diminuer l'efficacité de l'organisation. Alors que Dewatripont et Tirole se concentrent, comme nous le faisons, sur le lien entre congruence et qualité de la prise de décision, leur théorie repose sur les problèmes de "free-riding" qui apparaissent entre le principal et l'agent, dès lors que tous deux doivent faire des efforts pour communiquer. Une autre caractéristique de notre modèle est qu'il permet d'endogénéiser la crédibilité du Décider vis à vis de l'Implémenteur. Dans les modèles de "signaling" (par exemple Hermalin (1997) en théorie des organisations ou Cukierman et Tomasi (1998) en économie politique), un principal informé peut souvent envoyer des messages crédibles en utilisant des outils du type "money burning". Dans notre modèle, la capacité à s'engager repose sur la forme organisationnelle à l'équilibre : un Implémenteur indépendant aide le Décideur à augmenter le contenu informationnel dans son processus de prise de décision, ce qui, en retour, augmente la crédibilité des décisions prises.

Ce chapitre 3 permet finalement d'éclairer le débat sur le degré d'indépendance optimal des agences gouvernementales relativement au pouvoir politique. La littérature de management suggère que les agences gouvernementales devraient être aussi indépendantes que possible du pouvoir politique (voir, par exemple, Horn (1995)). De telles recommandations pourraient être largement soutenues par notre modèle, dans lequel le politicien (le Décideur) est biaisé mais a de l'information privé sur la demande sociale. L'implémenteur – l'agence publique – peut être soit affilié au pouvoir politique, soit constitué en organisation indépendante. Notre théoriue suggère que lorsque la demande sociale est fondamentale pour le bien-être social, une bureaucracie non affiliée au pouvoir politique aide à la mise en place de réformes moins "biaisées" de la part des politiciens.

Investissement des entreprises et collatéral : le rôle des prix de l'immobilier

Le dernier chapitre de cette thèse, le chapitre 4[6], nous conduit au coeur d'un débat empirique qui traverse la finance d'entreprise depuis près de 20 ans : la mise en évidence empirique de l'existence et de l'ampleur des contraintes de

[6] Le chapitre 4 est tiré d'un article écrit en collaboration avec Thomas Chaney et David Thesmar : "The Corporate Wealth Effect: From Real Estate Shocks to Corporate Investment", Mimeo

crédit. En effet, en présence de frictions financières, la valeur du collatéral détenu par une entreprise peut avoir un impact fondamental sur le montant que cette entreprise peut emprunter et conséquemment sur la nature des projets dans lesquels la firme peut investir. Barro (1976), Stliglitz and Weiss (1981) et plus récemment Kiyotaki and Moore (1997) ont montré qu'en la présence d'aléa moral ou de sélection adverse, le collatéral pouvait améliorer les capacités d'endettement d'une firme, et donc augmenter ses investissements. En dépit d'une recherche théorique abondante, il n'y a que peu d'évidences empiriques du rôle du collatéral sur l'investissement des entreprises. La littérature existante s'est plutôt concentrée sur la corrélation empirique entre les disponibilités de l'entreprise et l'investissement. Pourtant, ces disponibilités ne sont pas le seul actif qu'une entreprise peut utiliser pour financer de nouveaux investissements. Par exemple, les détentions immobilières, mais également les créances commerciales, les stocks ou même certains équipements productifs servent couramment de collatéral pour garantir de nouveaux emprunts (Davydenko et Franks (2005)).

Le chapitre 4 fournit une étude empirique détaillée sur les effets de certains chocs exogènes de la valeur du collatéral disponible pour les entreprises. Nos données suggèrent que les entreprises transforment les appréciations de capital immobilier en investissement supplémentaire. En d'autres termes, les entreprises investissent plus lorsque la valeur de leurs actifs immobiliers s'apprécie. Au lieu de vendre ces actifs, les entreprises financent les investissements additionnels en émettant des nouvelles dettes. L'apréciation de valeur des actifs immobiliers diminue le risque et les asymétries d'information associés à ces nouveaux emprunts. Les nouveaux contrats de dette sont par conséquent de plus longue maturité, sont en général plus syndiqués et contiennent moins de convenants protégeant les créanciers. Une telle relaxation des contraintes de crédit réduit la profitabilité moyenne pour les firmes dont la gouvernance est la plus faible, tandis qu'au contraire, elle augmente la profitabilité des entreprises dont les actionnaires sont forts.

Ce chapitre est important pour au moins deux raisons. La première est positive : nos résultats suggèrent en effet que de forts mouvements exogènes dans la valeur des fonds propres de l'entreprises – les actifs immobiliers dans notre cas – ont des effets majeurs sur la demande des entreprises en bien d'équipement. Un tel "effet richesse pour les entreprises" permettrait d'expliquer comment des chocs purement financiers génèrent des fluctuations macroéconomiques persistantes, à la façon de Bernanke et Gertler (1989). Notre article dévoile ainsi les micro-fondations de tels modèles macroéconomiques. La seconde implication de notre analyse est normative. Comme les chocs sur les prix de l'immobilier permettent d'atténuer les contraintes de crédit, la détention d'actif immobilier peut servir d'instrument de couverture efficace contre le risque de crédit. Fondés sur l'analyse de Holmstrom et Tirole (2000,2001), nos résultats suggèrent que les entreprises devraient bénéficier d'autant plus de la détention d'actifs immobiliers que leurs besoins de liquidité sont peu corrélés au rendement de l'immobilier.

La première raison pour laquelle nous nous concentrons sur des chocs spécifiques de la valeur de l'immobilier tient essentiellement à la facilité avec laquelle on peut mesurer ces chocs. Par ailleurs, l'immobilier est un type de collateral dont l'usage est largement répandu, aussi bien dans les pays développés (Davydenko et Franks (2005)) ou dans les pays en voie de développement (World Bank Survey (2005)). La troisième vertue de l'immobilier pour notre étude est que son prix fluctue largement, si bien que la valeur du collatéral détenu par les entreprises et qui peut être mobilisé pour garantir de nouveaux emprunts varie d'une année sur l'autre. Une part au moins de ces fluctuations peut être considéré à priori comme exogène aux variations des opportunités d'investissement des entreprises hors des secteurs de la finance, de l'assurance, de la construction et de l'immobilier. Toutes ces caractéristiques des actifs immobiliers nous permettent d'identifier proprement l'effet du collatéral sur l'investissement.

En premier lieu, nous nous intéressons à la sensibilité de l'investissement aux prix locaux de l'immobilier. Bien évidemment, une telle corrélation devrait être en général positive, tout simplement parce que les prix de l'immobilier sont fortement corrélés aux chocs de demande locaux, et que les entreprises ont tendance à construire des capacités afin de pouvoir servir ces chocs de demande. Pour éviter ce biais d'endogénéité, nous comparons les entreprise qui possèdent de l'immobilier avec celles qui n'en ont pas, ce qui nous permet d"interpréter cette sensibilité différentielle comme l'effet de la fluctuation de la valeur de l'immobilier sur la politique d'investissement. Notre stratégie empirique repose donc sur deux sources d'identification. La première vient de la comparaison, *au sein d'une même région*, des réponses de l'investissement entre les firmes détentrices d'immobiliers et les autres. La seconde source d'identification consiste à comparer, *pour les entreprises possédant de l'immobilier* l'investissement dans les régions où l'inflation immobilière est élevée et les régions où elle est faible. C'est une approche similaire à celle utilisée, par exemple, par Case, Quigley et Shiller (2001).

En dépit de toutes ces précautions, imaginons que la différence entre les entreprises possédant de l'immobilier et les entreprises n'en possédant pas est que les premières tendent à être plus "locales" que les dernières. Alors, et hors de toute considération liée au collatéral, les entreprises détenant de l'immobilier pourraient être plus sensibles aux variations dans les prix de l'immobilier simplement car les prix de l'immobiliers reflêtent les fluctuations de demande locale. Nous prenons au sérieux cette possibilité et soumettons nos résultats à différents tests de robustesse. En particulier, nous identifions une source de variation des prix de l'immobilier qui est orthogonale aux chocs de demande locale. Nous utilisons pour cela des restrictions régionales dans l'offre de terrains constructibles (régulations municipales, contrôle des loyers, etc. . .) afin de prédire la réaction des prix locaux de l'immobilier à des chocs de taux d'intérêt. De telles restrictions vont affecter la détermination des prix de l'immobilier sans être pour autant corrélé à des chocs de demande locaux. En utilisant ces restrictions comme instrument pour les prix de l'immobilier, nous trouvons des estimations très proches de celles obtenues en utilisant des procédures standards.

En nous appuyant sur cette stratégie empirique, nous trouvons tout d'abord un effet causal robuste de l'inflation immobilière sur les décisions d'investissement des entreprises. L'estimation suggère que, pour chaque dollar additionnel dans la valeur des actifs immobiliers, les entreprises investissent près de 60 cents de plus. Au total, quand l'immobilier s'apprécie d'une déviation standard, les entreprises avec des actifs immobiliers augmentent leur niveau de dépenses d'investissement de près de 2%, relativement aux entreprises n'ayant pas d'immobilier : compte-tenu du fait que ces actifs immobiliers ne représentent en général qu'une très faible fraction de l'actif total des entreprises, cette effet est qualitativement important. Ainsi, bien que l'immobilier soit un actif bien moins liquide que le cash, il n'en reste pas moins que les entreprises l'utilisent comme source de collatéral pour financer de nouveaux investissements.

Nous nous intéressons ensuite aux différents mécanismes permettant de transformer l'appréciation de la valeur de l'immobilier en investissement additionnel. Nous trouvons que les entreprises possédant de l'immobilier dans les états où l'immobilier s'apprécie modifient significativement la structure de leur capital, principalement en augmentant la part de la dette long terme relativement à l'actif total. Pour améliorer notre compréhension du phénomène à l'oeuvre, nous regardons en détail la nature des contrats de dettes signés auprès des institutions financières. Il semble que les contrats mis en place par des entreprises détenant de l'immobilier suite à une appréciation de l'immobilier soient moins affectés par les problèmes d'asymétries d'information. Ces contrats sont plus syndiqués, ont une maturité plus longue et possèdent moins de convenants, ie de clauses spéciales imposant des minima de performance afin de protéger les créanciers à la fois de l'aléa moral et de la sélection adverse existant dans leur relation avec l'entreprise.

Ce chapitre 4 conclue en étudiant la profitabilité des investissements réalisés à partir de cette augmentation exogène de la valeur du collatéral. Comme Blanchard, Lopez de Silanes et Shleifer (1994) en discutent, l'investissement peut répondre à de telles augmentations pour deux raisons : parce qu'il y a de la sélection adverse sur les marchés financiers (Myers et Majluf (1984)) ou parce qu'il y a de l'aléa moral chez les managers de l'entreprise (Jensen et Meckling (1976)). Dans le premier cas, une relaxation des contraintes de crédit devrait augmenter la valeur de la firme, alors qu'elle devrait la diminuer dans le second cas. Afin de tester cette idée, nous séparons les firmes dont les actionnaires sont "forts" des firmes dont les actionnaires sont "faibles", en utilisant des indices standards de gouvernement de l'entreprise. Nous trouvons que, pour les firmes dont la gouvernance est bonne, les chocs positifs de collatéral ne conduisent pas à une plus faible profitabilité. Néanmoins, les entreprises dont l'actionnariat est "faible" et qui détiennent des actifs immobiliers voit bien leur profit diminuer quand survient une appréciation de l'immobilier. Ainsi, les chocs de collatéral que nous mettons en lumière dans ce chapitre nous fournissent un moyen efficace d'évaluer certains effets réels du conflit actionnaires-manager. Alors que la plupart des théories existantes relie l'investissement à la capacité d'endettement, et la capacité d'endettement au collatéral, la littérature empirique s'est concentrée sur l'effet direct des bénéfices d'exploitation (les cash *flows*) sur l'investissement (Fazzari, Hubbard, and Petersen (1988)). Erickson et Whited (2000) et Hennessy et Whited (2007) ont critiqué cette approche au motif que, pour des raisons aussi bien théoriques qu'empiriques, de telles coefficients ne peuvent être interprétées facilement. Ces auteurs ont donc préconisé l'usage de méthodes d'estimation du type GMM. Une autre branche de la littérature a tenté d'isoler des chocs de cash flows orthogonaux aux opportunités d'investissement (Blanchard, Lopez-de-Silanes et Shleifer (1994), Lamont (1997), Rauh (2006)). Le chapitre 4 appartient clairement à cette tradition. Encore plus proche de notre article, Almeida, Campello and Weisbach (2004) se sont interessés au rôle des liquidités au bilan sur l'investissement, plutôt qu'aux seuls flux de *cash*. Ces auteurs ont montré que les entreprises contraintes sur le marché du crédit tendent à stocker des liquidités sur leur bilan afin d'être toujours en mesure de financer dans le futur des investissements rentables. Plutôt que de regarder le cash (en flux ou en stock), notre étude considère les variations exogènes dans la valeur du collatéral, et ce sur un large panel d'entreprises. A notre connaissance, les seuls papiers existants sur des chocs de collatéral sont Peek et Rosengreen (2000), Goyal et Yamada (2001) et Gan (2006). Ces contributions se concentrent sur l'investissement dans le contexte très spécifique de la bulle immobilière japonaise des années 80. Le chapitre utilise une stratégie d'identification plus robuste – des différences triples au lieu de simples différences de différence – et examine en détail les mécanismes qui permettent de transformer ce collatéral en investissement.

Chapter 1

Performance and Behavior of Family Firms: Evidence from the French Stock Market

1.1 Introduction

While, since Berle and Means, financial economists have devoted a lot of attention to large, listed and widely held corporations, it turns out that most firms around the world have a dominant owner, in many instances the founding family.[1] In addition, founding families are often involved in the actual management of the firm. In our own sample, which comprises the set of all listed French firms, more than 60% of the firms are still managed by their founding family. Even among the largest US firms, Anderson and Reeb (2003) report that some 16% of their sample of S&P500 firms are still managed by their founders or descendants. Therefore, the premises of the Berle and Means model of the corporation where (1) the CEO is not an owner and (2) ownership is dispersed, do not apply to most firms around the world.

The relevant view on world capitalism is thus that the typical large listed firm is owned, and frequently managed, by a family. This new perspective calls forth a research agenda on the specific features of dynastic management and ownership. Do family firms maximize profit? Are they more prone to building family empire at the expense of minority shareholders? Are they too prudent, slow reacting? On the contrary, are they more cool-headed and better at avoiding fads? More generally, do they behave any differently from the widely held corporations that academics know so well?

To bridge this gap, this paper provides evidence on the performance and behavior of family firms in France.

[1] For example, Laporta, Lopez-de-Silanes and Shleifer (1999) track ultimate ownership of a sample of firms listed in 27 rich countries with more than $ 500m market capitalization. They find that 50% of all firms in their global sample are family-controlled, while only 40% of them are widely held or controlled by widely held entities. In fact, widely held corporations are prevalent in the US, the UK and Japan, while families predominate in most continental European countries. Focusing on these countries, Faccio and Lang (2000) find that more than 60% of all listed firms in France, Italy and Germany are family firms.

We believe the French example is of interest for two reasons. First, France is a continental European country, and as a consequence its financial institutions and history differ markedly from English-speaking countries, where most systematic studies on family firms have been conducted so far.[2] In particular, family firms are much more prevalent even among the largest firms and therefore much more representative of the economy than in the US. The second reason is that, in contrast to many continental European countries, France also has a lot of widely held firms, which tend to be very much US-like managerial firms – no dominant owner and an entrenched management. This gives us access to a large enough control group to compare family firms to.

We collected data on some 1,000 corporations listed on the French stock market over the 1994-2000 period. Our panel has information on the firm (employment, corporate accounts, acquisitions, stock returns) and on the founding family (ownership, management). This dataset is supplemented with information on acquisitions, stock returns and detailed information on the wage bill and skill structure.

First, we provide *cross-sectional* evidence on the relative performance of family firms. Looking at accounting profitability, we find that family firms significantly outperform non family firms. Consistently with the existing literature on "founder effects",[3] we find evidence that founder-managed firms are very profitable. Also consistent with available evidence from the US (Anderson and Reeb (2003), Amit and Villalonga (2006)), family firms run by an outside CEO outperform widely held corporations. It thus seems that in France as in the US, families as large shareholders are, on average, good for performance. Much more surprisingly, we find that managers who are descendants of the firm's founder also tend to do better than non family firms, and even marginally better than professional managers in our sample. Therefore, even if we set founders aside, family firms (whether or not run by a descendant) consistently outperform non family firms in France. A causal interpretation of such cross-sectional evidence is difficult since only the best performing firms may be transmitted to heirs. A potential solution involves looking at transmissions of control in our data (as in Pérez-González (2006)). While we may have too few transitions in our sample to do statistically powerful tests, we nevertheless observe that (1) descendants typically do not inherit the management of the best firms and (2) descendants whose firms leave the stock market (de-list) do not systematically underperform. Endogeneity biases are thus not likely to be large in our sample.

We then try to understand these differences in performance by considering the various determinants of corporate performance. Higher labor productivity seems to be the most significant explanation for the higher performance of founder-managed corporations. Turning to the difference in performance between professionally managed and

[2]For two recent exceptions, see Barontini and Caprio (2005) on Italy and Bennedsen, Nielsen, Pérez-González and Wolfenzon (2006) on Denmark.

[3]See, e.g., Adams, Almeida and Ferreira (2005) and Fahlenbrach (2005).

heir-managed family firms, we look separately at the management of labor and capital inputs.

First, family firms run by both professionals and descendants are paying, on average, lower wages. Nevertheless, this result could simply stem from a different workforce composition in these family firms, e.g. a larger fraction of unskilled workers. To account for such a possibility, we match our firm-level data with employee-level social security records, which allows us to control for the labor force composition in experience, seniority and occupations. We find that professional CEOs in family firms pay lower wages because they indeed employ less skilled employees. On the contrary, even after controlling for their firm's skill structure, descendants still pay low wages. We also find that labor demand in heir-managed family firms responds significantly less to industry sales shocks, i.e. that heir managers seem to be smoothing out employment across the business cycle. Overall, these results are consistent with a view of heir-managed family firms as providing their workers with long-term implicit insurance contracts. Such contracts allow them to pay lower wages for better skills. And indeed, heir-managed family firms exhibit, compared to professionally managed corporations, a higher level of labor productivity.

We then investigate differences in the management of capital. Professional CEOs pay lower interest rates on their debt and tend to operate at lower capital to labor ratios. Compared to heir-managed family firms, or even widely held corporations, large acquisitions made by outside CEOs destroy less shareholder value in the long run. Although a-structural and thus to be interpreted with caution, the broad picture emerging from these results indicates that (1) outside CEOs bring financial expertise to family ownership and are keener on avoiding the waste of capital, while (2) descendants have the managerial horizon necessary to commit to a protective employment policy, and are rewarded by a larger labor productivity. We indeed report that, in our data, descendants tend to survive longer as CEOs than professional managers.

Our paper is thus a contribution to the emerging economics literature on family business. Most of this infant literature has, so far, focused on North-American firms and profitability comparisons. Among the various contributions (Anderson and Reeb (2003), Amit and Villalonga (2006), and Pérez-González (1999) for the US; Morck, Strangeland and Yeung (2002) for Canada), the consensus is that founder-managed firms, as well as family firms run by an outside CEO outperform non family firms. This is usually interpreted as evidence that the benefits of a large, long term, shareholder outweigh the costs of potential minority shareholders expropriation. The managerial quality of descendants is, however, a much more debated issue. Two cross-sectional studies on large US corporations in the 1990s (Anderson and Reeb (2003) and Amit and Villalonga (2006)) find opposite results. The difference in difference approach taken by Pérez-González (2006) suggests, however, that heirs may be worse managers than outside CEOs. Such an insight is confirmed by a recent paper by Bennedsen, Nielsen, Pérez-González and Wolfenzon (2006), which takes advantage of the richness of Danish data to carefully study causality. Our paper has the advantage to supplement these studies for a large country of continental Europe: we find that descendants do not do worse – even slightly better – than professional managers of family or widely held firms. As already stressed out, apart from the causal effect of family management, many selection, endogeneity and simultaneity biases could yet be explaining this cross-sectional correlation.

More interestingly, our paper also complements the existing family firms literature by looking at effects of family ownership/management on other dimensions of firm behavior. Our robust finding that family firms pay lower wages is, to our knowledge, new to this literature. It is reminiscent of existing evidence on the relationship between wage levels and the separation of ownership and control in corporations. A decade old literature recently surveyed by Bertrand and Mullainathan (1999), along with their own findings, indeed finds that managerial slack in organizations partly takes the form of higher wages among employees. The other novelty of our paper is the analysis on the difference in management styles between hired CEOs and descendants of the founders: the data are consistent with outside CEOs bringing financial expertise and reducing the waste of capital, while heirs being able to commit to long term employment and therefore obtaining lower wages from their employees. Such results can be related to Bertrand and Schoar (2003)'s analysis of American CEOs' management styles: they find strong differences between individuals in terms of investment policy, acquisition policy and financing policy. In particular, MBA graduates tend to be more aggressive in terms of leverage and acquisition policy. Our own results suggest that family management/ownership might be yet another dimension to explain such heterogeneity in management styles.[4]

This paper is structured as follows. Section 2 presents the data construction and describes its content. Section 3 provides more systematic evidence on corporate performance. Section 4 looks at differences in corporate behavior between family and non family firms and between descendants and professional managers within family firms. Section 5 concludes.

1.2 Data Description

Our dataset is a panel of French listed firms over the 1994-2000 period. We restrict ourselves to non financial, non real-estate firms. The construction of this dataset uses 5 different sources. First, annual corporate accounts are retrieved from the DAFSA yearbooks. These books cover the set of all listed firms in France. These books also provide us with the identity of the management team, and the stakes held by the main shareholders. Second, we hand

[4] In a similar vein, Bertrand et al. (2005) identify on Thai data a relationship between the nature and complexity of the family owning the firm and its performance.

collect information on family management and ownership for most of these firms using various sources (newspapers, firm websites, annual report...). Third, we use social security records to retrieve firm level information on wages, occupational structure, age and seniority structure and gender composition. Fourth, we collect information on the major corporate acquisitions realized by these firms over the 1994-2000 period. To do this, we use the French extract of SDC platinium, a worldwide database on corporate transactions. Fifth, we obtain stock prices for these listed firms from Euronext for the 1991-2002 period.

1.2.1 Family Business on the French Stock Market

Our definition of a family firm is very close to the one used by Amit and Villalonga (2006). We report a firm as a family firm when the founder or a member of the founder's family is a blockholder of the company. We also impose as an additional condition that this block represents more than 20% of the voting rights.[5] We refer to Appendix A.1.2 for more detailed explanations on the construction of our family firm variable.

Following Anderson and Reeb (2003), we then break down our sample of firms into four categories. All firms that are not family firms are called *widely held firms*. The listed firms that are controlled by widely held firms also belong to this category.[6] When a family firm is still managed by its founder, we refer to it as a *founder-managed family firm*. As is detailed in A.1, this category also entails firms owned and managed by a successful raider.[7] *Heir-managed family firms* are family firms where the current CEO is a descendant of the company's founder. Finally, when a family firm is run by an outside, professional CEO, we refer to it as a *professionally managed family firm*.

To be able to compute accounting profitability measures properly, we restrict our study to non financial, non real estate companies. There are 2,973 observations in our panel (some 420 firms each year), for which we were able to retrieve the firm's family status.[8] Table 1 reports the fractions of the various types of firms in our panel. These fractions are computed without weight (line 1), weighted with book value of assets (line 2) and weighted using total employment, as reported in the accounting data (line 3).

As is apparent from Table 1.1, 70% of all firms present in the sample are family firms. This is a very large number, compared to what previous studies found for English-speaking countries. Looking at US listed firms from the S&P500, Anderson and Reeb (2003) find 35% of family-controlled companies, although they use a slightly

[5] As it turns out, this additional condition is not very important as we had very few cases where family shareholders held less than 20% of the voting rights.

[6] As the results in Holderness and Sheehan (1988) suggest, firms controlled by a widely held firm and widely held firms themselves are not different in terms of both Tobin's Q and accounting rate of returns.

[7] This is where our classification differs somewhat from Anderson and Reeb (2003)'s, who focus on founding families. Hence, a successful raider would not count as a founder, and its firm would count as a widely held firm according to their categorization. Casual evidence indicates that in France, these raiders tend to have dynastic concerns, which explains our choice.

[8] Out of a total of 3,522: this means that in 16% of the cases, we were unable to categorize the firm's ownership or management.

Table 1.1: Presence of Family Firms

	All firms	Widely Held Firms	Family Firms, managed by:		
			Founder	Heir	Professional CEO
Fraction (non weighted)	1.00	0.29	0.31	0.24	0.16
Fraction (asset weighted)	1.00	0.65	0.08	0.11	0.16
Fraction (empl. weighted)	1.00	0.55	0.10	0.16	0.19
Observations	2,973	864	922	721	466

Source: panel of French listed firms, over the 1994-2000 period. See A.1 for details and sources. Note: line 1 gives the unweighted fraction of the different family status in our sample ; line 2 gives the same fraction, but weights each observation by the book value of asset ; line 3 weights the observations by total employment, as reported in the accounting data.

different definition of family ownership. Looking at the largest 500 listed Canadian firms, Morck, Strangeland and Yeung (1998) find a share of 50% of family firms. Our sample is more consistent with the investigations of Faccio and Lang (2002), who look at the ultimate ownership of listed firms in continental European countries: using various data sources, they find in 1997, for France, 64% of family firms. Thus, family ownership appears much more pervasive in France than in English-speaking countries, even Canada. The surprising fact is, however, that the bulk of these family firms is still founder-controlled, since these account for 31% of the total. In contrast, only 18% of all firms investigated by Morck et al. (1998) in Canada are still managed by the initial entrepreneur. It seems that the French stock market may display more mobility than the sheer fraction of family firms might suggest. But the family status is also very persistent: heir-managed firms account for a large share of the total (24%) in the same proportion as widely held firms. Last, less than a fourth of all family firms are managed by a professional CEO: hence, even after the founder retires, the norm seems to be that an heir takes over control. Of course, the real importance of family firms is overstated by these figures. Lines 2 and 3 of Table 1.1 highlight the relative small size of family firms. In weighted terms, widely held firms account for almost two thirds of all firms. Founder-controlled corporations are especially small and only account for 10% of total employment.

1.2.2 Do Family Firms Differ from Other Firms?

Table 1.2 allows to look for systematic differences between the four types of firms we have defined in the previous section. First, family firms grow, on average, much faster than non family firms, but this is mostly due to the contribution of founder-managed corporations. For these corporations, sales growth stands around 16%, instead of 9% for the average listed firm. A similar picture arises for the ratio of market to book value of assets.[9]

In contrast, when we look at accounting profitability, all types of family firms do better than widely held firms. Founder-managed firms are the most profitable ones. That founders do better in terms of profits, growth and valuation is consistent with the extensive literature documenting "Founder effects"(see, for a survey, Adams, Almeida and Ferreira (2005), Fahlenbrach (2005)). In a cross section, founders tend to run firms with outstanding performance, the question being whether they are inherently good managers, or whether those founders who manage to keep control are only those who perform well. Using various instruments, Adams et al. (2005) suggest that selection issues are minor, and that almost all of the founder effect may be interpreted in a causal way. Using US data on listed firms, they find a founder effect on ROA of around 3 percentage points in OLS regressions and of around 2 points when using their instruments. Our cross tabulation suggests it might be even larger in the French context, although a multivariate analysis needs to be run to estimate such an effect.

Even when we set founders aside, family firms are still more profitable than widely held corporations, although to a lesser extent. The result is particularly striking for return on equity (ROE[10]), but is also present when we look at returns on assets (ROA[11]). This is not too surprising as far as professionally managed family firms are concerned, as these companies have the advantage of having large, long term shareholders. Anderson and Reeb (2003), and Amit and Villalonga (2006) find similar results in the cross sections of their sample of large US listed firms. For France, the concern could be that large shareholders might be using their voting rights to pursue value destroying projects that grant them private benefits. Results from Table 1.2 suggest that the benefits from monitoring outweigh these potential costs of expropriation. Finally, the main surprise from Table 1.2 is that family firms run by descendants also outperform widely held corporations in terms of profitability. The existing literature on large US firms provides mixed evidence: while Anderson and Reeb (2003) have similar results, Amit and Villalonga (2006) and Pérez-González (2006) exhibit opposite ones. In Canada, Morck et al. (1998) find that heir-managed Canadian firms underperform all other types of firms. Overall, the balance of evidence from North American studies tilts in the

[9] Market to book is measured as the sum of market capitalization and (book value asset minus book value of equity) divided by book value of total assets.

[10] Return on Equity is defined as the ratio of earnings to book value of equity.

[11] Return on Asset is defined as the ratio of EBITDA to book value of total assets.

Table 1.2: Characteristics of Family Firms

	All firms	Widely Held Firms	Family Firms, managed by:		
			Founder	Heir	Professional CEO
Total Assets (bn euros)	2.3	5.2	0.6	1.0	2.3
Total Sales (bn euros)	1.9	3.8	0.4	1.1	2.8
Employment	10,489	22,184	3,845	7,685	14,537
Age (years)	62	66	32	84	70
Former SOE (fraction)	0.09	0.25	0.01	0.01	0.07
ROA	0.12	0.10	0.15	0.13	0.12
ROE	0.19	0.15	0.27	0.20	0.21
Market to Book	1.4	1.3	1.6	1.3	1.4
Sales growth	0.09	0.07	0.16	0.07	0.10
Dividend / profit	0.22	0.26	0.19	0.21	0.21
Debt / Assets	0.38	0.39	0.38	0.38	0.38

Source: panel of French listed firms, over the 1994-2000 period. See A.1 for details and sources. Note: column 1 provides summary statistics for all firms in the sample ; column 2 to 5 detail these statistics by family status. ROA is defined as the ratio of EBITDA to book value of total asset. ROE is defined as the ratio of earnings to book value of equity. Market to Book is defined as the sum of market capitalization and (book value asset minus book value of equity) divided by book value of total assets.

direction of underperforming heir management.

The obvious problem with the univariate approach, however, is that family status in cross tabulations may be a proxy for other variables, notably age and size. That family firms are smaller than non family firms is confirmed by an examination of Table 1.2, which also provides a comparison of the various types of firms in terms of size, age and capital structure. On all accounts, widely held firms are much larger than family firms, and slightly older too. This conceals, however, a great heterogeneity between family firms. For example, family firms run by an outside CEO are those who resemble the most widely held firms, both in terms of age and size. Firms run by descendants are on average smaller, but older than the average corporation in our sample. As expected, firms still run by their founders are young and very small.

1.3 Multivariate Evidence

Given that family firms tend to have a different age and size than widely held firms, it is necessary to conduct a multivariate analysis. Our empirical strategy follows the approach taken by Anderson and Reeb (2003) in their cross-sectional analysis of US family firms.

1.3.1 Empirical Strategy

We estimate the following equation, for firm i at date t:

$$y_{it} = \alpha + \beta_1 F_{1i} + \beta_2 F_{2i} + \beta_3 F_{3i} + \gamma X_{it} + \varepsilon_{it} \tag{1.1}$$

where y_{it} is a measure of corporate performance (based on accounts, market value or dividend pay-out). $F_i = (F_{i1}, F_{i2}, F_{i3})$ is our family status variable, broken down into three dummy variables representing "founder-controlled" (F_1), "heir-controlled" (F_2) and "professionally managed" (F_3), the "widely held" firm being our reference. F_i varies little with time, so we cannot identify firm fixed effects with this equation. As argued above, this is a major concern if we want to interpret our results in a causal way; we will therefore try to avoid it, and will postpone the discussion on endogeneity and selection. Given the absence of firm fixed effects, the best we could do was to allow for flexible correlation across residuals ε_{it} of a given firm, using White's (1980) method.

The X_{it}'s are various, possibly time varying, controls. They include year dummies, 13 industry dummies, the firm's log assets, the firm's log age. As further control, we also add a dummy equal to 1 when the firm has been, at some point, state-owned. As it turns out, 25% of now widely held firms used to be government enterprises (that were nationalized in 1936, in 1945 or in 1981). Privatizations started when the Right came back to power in 1986-1988, and after 1993, under both left-wing and right-wing governments. Many of these privatizations took place through

IPOs on the stock market, in order to ensure political support from the population and to increase the size and depth of the French stock market. As it may be the case that widely held firms underperform because they face difficulties to adjust to privatization, we need to control for this in our regressions.

We also add other controls, which can be both causes and effect of corporate performance. We will thus not comment on them since they are highly endogenous; yet, we include them to replicate the regressions run by Anderson and Reeb (2003) on their US sample, and also because they could be argued to be correlated with both family status and corporate performance. To control for the effect of ownership concentration – which is likely to be correlated with the presence of a family among shareholders – we add the percentage of cash flow rights held by the largest shareholder (and its square, in non reported regressions). Using our data on stock prices, we also include the variance of past stock returns as a proxy for firm specific risk.[12] We also include firm leverage, measured by the ratio of debt to total assets. A theoretical reason for this additional control is, for instance, Jensen (1988)'s theory of free cash flows, which generates a positive correlation between leverage and performance, debt being used as a disciplining device. On the contrary, high debt could also be the result of bad performance. As it turns out, leverage comes out significantly negative in most performance regressions, which lends more credence to the second mechanism.

1.3.2 Family Firms Outperform widely held Firms

We focus on four different measures of corporate performance. We use three measures of accounting profitability : return on assets (defined as EBITDA divided by book value of total assets), return on equity (defined as earnings divided by book value of equity) and the pay-out ratio (defined as dividends divided by pre-tax profit – computed only for firms with positive pre-tax profit). We also look at a measure of market valuation, the market to book ratio (defined as the sum of market capitalization and (book value of asset minus book value of equity) divided by book value of total assets[13]). Table 1.3 reports two sets of regressions. In columns 2, 4, 6 and 8, we report the regressions of corporate performance on the explanatory variables as in equation 1.1. In columns 1, 3, 5 and 7, we group all family firms dummies together into one single "family ownership" dummy. This amounts to assuming that all management arrangements in family firms have an equal effect on performance, i.e. $\beta_1 = \beta_2 = \beta_3$.

We first turn to accounting measures of performance. A quick examination of Table 1.3 shows that family firms outperform non family firms in our sample of listed firms (columns 1 and 3). The difference in ROA is 1.7 percentage points and the difference in ROE is as high as 9.6 percentage points. These differences are both

[12] As, for instance, families could simply be more profitable because they undertake riskier projects.

[13] Market to book is therefore a mesure of the market value of assets, though the lower quality of our consolidated accounts does not allow us to obtain as clean a measure as in US studies using COMPUSTAT.

Table 1.3: Performance of Family Firms

	Return on assets (×100)		Return on equity (×100)		Market to book		Dividend to profit (×100)	
Family firm	1.7***	-	9.6***	-	0.08*	-	-5.5***	-
	(0.6)		(1.7)		(0.05)		(1.8)	
Founder CEO	-	1.8***	-	10.3***	-	0.15***	-	-7.6***
		(0.8)		(2.2)		(0.06)		(2.3)
Heir CEO	-	1.9***	-	9.4***	-	0.04	-	-4.8**
		(0.7)		(1.9)		(0.06)		(2.1)
Professional CEO	-	1.5***	-	9.0***	-	0.06	-	-4.8**
		(0.7)		(1.9)		(0.06)		(2.0)
Log (Assets)	-.3***	-.4***	1.6***	1.7***	0.03**	0.03***	-0.9**	-1.0**
	(0.1)	(0.1)	(0.5)	(0.5)	(0.01)	(0.01)	(0.4)	(0.4)
Log(Firm Age)	-.6**	-.7***	-4.0***	-3.8***	-0.13***	-0.11***	1.9**	1.4
	(0.3)	(0.3)	(0.8)	(0.9)	(0.03)	(0.03)	(0.9)	(0.9)
Former SOE	-0.9	-1.0	1.0	1.0	-0.19**	-0.18**	1.7	1.5
	(0.7)	(0.7)	(2.4)	(2.4)	(0.09)	(0.09)	(2.0)	(1.9)
Fraction equity	0.4	0.4	3.4	3.4	-0.04	-0.04	1.9	2.0
of largest block	(1.0)	(1.0)	(2.8)	(2.8)	(0.08)	(0.09)	(3.1)	(3.1)
Debt / Assets	-9.2***	-9.3***	-15.6***	-15.8***	-0.55***	-0.56***	2.0	2.3
	(1.2)	(1.2)	(4.4)	(4.4)	(0.09)	(0.09)	(3.5)	(3.5)
Stock return	-8.1***	-8.2***	-16.5***	-16.4***	-0.75***	-0.73***	1.6	1.2
volatility	(1.9)	(1.9)	(5.7)	(5.7)	(0.12)	(0.13)	(6.8)	(6.8)
Industry FE	yes	yes	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes	yes	yes
Heir=Professional		.65		.79		.84		.98
Observations	2,325	2,325	2,329	2,329	2,248	2,248	1,138	1,138
Adj.R^2	.22	.22	.13	.13	.24	.23	.09	.10

Source: panel of French listed firms, over the 1994-2000 period. See A.1 for details on data construction and sources. Note: Huber-White-Sandwich estimates, allowing for correlation of all observations of a given firm. Dependent variables are ROA (ratio of EBITDA to book value of asset – column 1 and 2), ROE (ratio of earnings to book value of equity – column 3 and 4), Market to book ratio (market capitalization plus (book value of assets minus book value of equity) divided by book value of total assets – column 5 and 6) and pay-out ratio (dividends divided by pre-tax profits – column 7 and 8). Family firms is a dummy indicating family ownership (column 1, 3, 5, 7). Founder CEO is a dummy indicating that the CEO is the founder of the firm. Heir CEO is a dummy indicating that the CEO is a descendant of the founder. Professional CEO is a dummy indicating that the CEO has been hired by the controlling family. Other explanatory variables are Log(Assets) (logarithm of the book value of total asset), Log(Firm Age) (logarithm of firm age measured in years plus one), Former SOE (dummy equal to 1 if the firm is a former state owned enterprise), Fraction equity of largest block (cash-flow right of the largest identified shareholder), Debt/Asset (leverage ratio), Stock return volatility (standard deviation of the firm's stock price). These regressions control for 13 industry fixed effects (Industry FE) and year fixed effects (Year FE). Line "Heir=Professional" provides the p-value of an equality test between the coefficient "Heir CEO" and "Professional CEO". Standard errors are in parenthesis. *, ** and *** mean statistically different from zero at 10%, 5% and 1 % level of significance.

statistically significant and economically large, since the sample standard deviation is 8 points for ROA and 23 points for ROE. Looking at columns 2 and 4, we see that the over-performance of family firms is present for all types of management. Both founders and outside CEOs working in family firms outperform widely held companies by respectively 1.8 and 1.5 points of ROA and 9.4 and 9.0 points of ROE. More surprisingly, heir-managed family firms are also more profitable than widely held companies, by 1.9 percentage points of ROA. So all sub-categories of family firms outperform to a similar extent a benchmark of widely held firms. As it turns out, a test of equality is far from being rejected (F-probability = 0.81). These results are extremely robust and hold in front of various specification checks, like removing various subsets of the control variables (not reported), running the regressions separately for each year (Table B1), and controlling for firm diversification (Table B2).

Our results are strikingly consistent with what Anderson and Reeb (2003) found for the US. Looking at ROA, they find that founder-controlled firms outperform widely held firms by 3.5 percentage points – compared to 1.8 in our sample. Secondly, in their study, heir-controlled firms outperform widely held corporations by 2 percentage points, exactly like in ours. Last, and still in line with our results, professionally-run firms only outperform the control group by 1 point of ROA, which is not statistically significant in their analysis. In contrast to Anderson and Reeb, we thus find that professional managers are really similar to the rest of the family group. Last reference to the cross-sectional analysis in the literature, our results are completely at odds with Morck et al. (1998)'s evidence from Canadian firms although they adopt a similar sample construction. Indeed, Morck et al (1998) find that heirs are the worse performers of all firms, whether family-controlled or widely held. Moreover, in their sample, even founders are outperformed by widely held corporations. This very last result in their study is surprising in light of the extensive "founder effect" literature mentioned earlier.

We then ask how, in the French context, the stock market prices the overperformance of family firms. As it turns out, not much (see columns 5 and 6). The difference in market to book ratios between family and non family firms is not statistically significant, and economically small (0.08 for a sample standard deviation of 0.7). This result does, however, conceal some heterogeneity between family firms. Founder-managed firm have higher Market to Book ratio than widely held and other family firms: their MB ratio is 0.15 above widely held companies, and significantly so. Family firms managed by a descendant of the founder or outside CEO do as well as the benchmark, neither better nor worse. This result stands in sharp contrast with our robust findings from accounting measures of performance.

A potential reason for this insignificant difference may be that family firms tend to pay less dividends. One reason why this should be the case is that families seek to keep more internal funds to fund their pet projects (the expropriation hypothesis).[14] We thus run in columns 7-8 similar regressions using the ratio of dividend to earnings as a dependent variable (defined only when corporate pre-tax profits are positive). The pay-out ratio is indeed significantly lower by almost 6 points for all family firms taken together. This is economically sizeable given that the sample average pay-out ratio is 20 points. When we look at all three subcategories of family firms separately, we see that they all tend to pay a significantly lower proportion of their profits as dividends. The extent to which they do so is similar (a formal F test cannot reject equality), but it seems that founders tend to pay out less than other types of family firms. This may be due to growth opportunities, but when we include sales growth as a control, this difference remains unchanged.[15]

Another possible reason is the difference in how returns covary with the market return, i.e. that family firms have higher betas. It is often argued that family firms have a "long term" management policy. Such a view would state that, compared to non family firms, family companies invest less in booms, more in recessions and, for instance, commit to job preservation, such that they hoard labor in bad times, and hire less in good times. Therefore, the amount of money distributed to shareholders of family firms would be lower in downturns, and larger in upturns, implying a larger beta for family firms. Because they pay more when other assets have large returns, they are less valuable, which depresses the market to book ratio of family firms. Using our monthly stock returns data, we estimated, on the 1991-2002 period, betas for firms which do not change family status over the 1994-2000 period. We then regressed these estimated betas on family status, controlling for size, age, industry and book leverage (results available from the authors). Apart from founders, who tend to have higher betas, other family firms do not show systematic differences with widely held corporations. Differences in betas are, apparently, not the explanation to the low valuation of family firms.

A last, more daring, explanation for this discrepancy between profitability and stock market valuation could be that the market has been mistakenly punishing family firms over the period. This would be consistent with the stock market returns evidence by Van Der Heyden et alii (2004) on the largest listed firms: he finds excess returns for a buy-and-hold portfolio of family stocks as large as 10% over the 1994-2000 period. So either the market has misunderstood the potential held by family firms at the time, or it overestimated future returns of non family firms, many of them recently privatized by the government. Given that Van der Heyden does not use the same breakdown as we use, nor the same sample, this remains, however, a conjecture.

[14] Since 1967, the French tax system is *a priori* neutral with respect to dividend taxation. A complex system of tax credit makes the tax rate on corporate profits equal to income tax for shareholders. Also, capital gains are taxed like income. So there is no obvious fiscal reason for which family firms would want not to pay dividends to themselves.

[15] Regressions not reported here but available from the authors.

1.3.3 Discussion on Endogeneity Biases

The cross sectional evidence presented above, though robust and compelling, cannot be interpreted as evidence of a causal effect of family ownership/management on performance. A first, obvious, reason is that family status depends itself on performance. The performance of professionally managed firms – be they widely held or family-controlled – could be underestimated in a cross section if it were easier to transfer corporate control to a descendant when the firm performs well. This would create a simultaneity bias. To address this concern, we look at firms who are transmitted to descendants, two years *before* this transmission. Due to the limited time frame of our panel, we only find 30 such events. Nevertheless, these firms do *not* outperform their industry prior to transmission (see Table 1.4). Thus, descendant managers do not seem to inherit the best firms in our sample. Then, we focus on family firms that were transmitted to professional managers (21 events). They tend to slightly, but not significantly, underperform their industry benchmark prior to transmission (see table 1.4). Thus, it does not appear obvious that only the best firms remain managed by the family, although the number of transitions we base our analysis on is too small to obtain a sufficient statistical power.

A more straightforward way to control for firm unobserved heterogeneity and its possible correlation with family status would be to look at the change in performance when the firm is transmitted to an heir and when it is transmitted to a professional manager, and to compare the difference in performance changes. This is the approach taken by Pérez-González (2006) in his study on US firms. In our sample, it turns out that both heirs and professional CEOs tend to reduce the firm's ROA to the same extent (around -.01, as is obvious from Table 1.4). Consequently, the difference in difference estimator of the effect of heir management upon firm performance is nearly zero, and statistically insignificant. Once again, the number of transitions is likely to be too small to make realistic statistical statements.

A second source of upward bias is endogenous sample selection. Assume for example that heir-controlled firms who do badly have a higher tendency to go bankrupt, or to be sold out to a large group or private equity investors. In this case, the only heir-managed firms who would survive would be those who do relatively well, which would lead us to overestimate their performance. To check if this is the case, we look at the profitability of all types of firms prior to de-listing. From 1994 to 1999, we observe 142 de-listings in our data: 25 founder-controlled, 26 heir-controlled and 22 professionally managed family firms de-listed over the period. Prior to de-listing, exiting firms have in general a level of profitability very similar to that of remaining firms. The only sizeable difference comes from heirs: staying heirs *under*perform those who go private by 3 percentage of industry adjusted ROA. This

Table 1.4: Management Transitions

Industry adjusted ROA	Before transition	After transition	Change in adj. ROA
Firms transmitted to Heir CEO			
Mean	-0.00	-0.01	-0.01
Student's t	(.01)	(.01)	(0.61)
Number of observations	30	30	30
Firms transmitted to Professional CEO			
Mean	-0.03	-0.04	-0.01
Student's t	(.02)	(.02)	(0.44)
Number of observations	21	21	21

Source: panel of French listed firms, over the 1994-2000 period. See A.1 for details on data construction and sources. Note: this table displays the evolution of industry-adjusted performance for family firms whose control is transmitted to heir or professional CEO. "Before transition" represents two years before the transition, "After transition" stands for two years after the transition.

is economically significant and almost statistically so. This suggests that endogenous attrition, if anything, leads to *underestimating*, rather than overestimating, the performance of heir-managed firms.[16]

1.4 Management Styles in Family Firms

This section seeks to explain how different types of family firms achieve better performance. We start with a simple breakdown of profitability (ROA) that allows us to attribute differences in ROA to (1) productivity, (2) wage or (3) capital intensity differences. We find that founders overperform because they are more productive, heirs because they pay lower wages. Professionals seem to operate with less capital.

We then confirm these findings using other sources of data. Even after controlling for skill structure, it turns out that heirs pay lower wages. This may be due to heirs being able to insure their workers against adverse industry shocks. Indeed, they have, on average, a longer horizon than professional CEOs. Moreover, we also find that sales and employment in heir-managed firms adjust less to industry shocks. Professional managers, in contrast, are better in finance: they pay lower interest rates on their debt, and make acquisitions that are more profitable in the long run.

1.4.1 Breaking down Corporate Performance

This section seeks to explain the cross-sectional differences in profitability shown in Table 1.3. To shed light on the determinants of profitability, we first use the following decomposition of ROA:

$$ROA = (L/A) \times (Y/L - w) \tag{1.2}$$

L/A stands for labor intensity and is measured as the ratio of the number of employees to book value of total assets. Y/L stands for labor productivity and is measured as the ratio of value added (i.e. total sales less non-labor costs of inputs) to the number of employees. Finally, w represents the average wage paid to employees and is measured as total labor costs divided by the number of employees. Unsurprisingly, firms are more profitable when other things equal, (1) their production process uses less capital, (2) labor productivity is higher and (3) wages are lower. Of course, all these variables are jointly determined: capital intensity depends on the relative prices of labor and capital, labor productivity depends on organization, on the amount of capital per workers, and on the skill composition of the workforce. Finally, w is the outcome of a bargaining process involving capitalists and workers,

[16] A similar bias could be that the exchange authorities require a better performance - or a more transparent governance - from family firms when they want to go public. Hence, entry in our sample would induce an upward selection bias: only the best family firms are listed. We looked at the first-year-of-listing profitability of heir-managed firms, compared to an industry benchmark. It was not any different from the first performance of other categories.

both of them considering their outside options on the capital and labor markets respectively, but also corporate performance as a whole. Therefore, we are not attempting here to perform a structural estimation of the behavior of family firms, but simply taking a first step at understanding the causes of family firms' greater profitability.

We use equation (1.2) to break down the conditional difference in ROA between family and non family firms (exhibited in Table 1.3) into conditional differences in productivity, wage, and capital intensity.

Simple algebra (see A.3 - equation A.2) shows that the *unconditional* difference in average ROA between family and non family firms can be re-written as:

$$\begin{aligned} \Delta ROA &= \overline{ROA}_F - \overline{ROA}_{NF} \\ &= \underbrace{\overline{(L/A)}_F \Delta (Y/L)}_{\text{unconditional diff. in productivity}} - \underbrace{\overline{(L/A)}_F \Delta w}_{\text{unconditional diff. in wage}} \\ &\quad + \underbrace{\overline{(Y/L - w)}_{NF} \Delta (L/A)}_{\text{unconditional diff. in capital intensity}} + \underbrace{\Delta \left[cov \left((L/A), (Y/L) - w \right) \right]}_{\text{diff. in covariance}} \end{aligned} \tag{1.3}$$

Thus, the unconditional difference in mean ROAs can be exactly re-written as the sum of four terms. In addition to the three obvious effects (labor productivity, wage and labor intensity differences), we need to include the difference in the covariance of L/A (i.e. labor to capital ratio) and $Y/L - w$ (i.e. value added per worker minus average wage) for family and non family firms. This last term is a direct by-product of the non linearity of equation (1.2).

Equation 1.3 provides us with a simple relation between the *unconditional means* of the different ratios to explain the unconditional difference in performance. However, the differences in profitability observed from Table 1.3 are computed *conditional on observables*. Moreover, we are interested in the contribution of *conditional* rather unconditional differences in labor productivity, wage and labor intensity to total performance, as we do not want to capture effects stemming from differences in observables. To make the link between the estimates of Table 1.3 and these conditional differences, we show in A.3 that we need to include a fifth term to equation 1.3, which indeed captures the effect of differences in observable characteristics across types of firms. We then obtain a simple relationship between the performance coefficients estimated in Table 1.3 and the conditional differences in labor productivity, wage and labor intensity. The detail of this derivation is given in A.3.

Table 1.5 reports, for each family status, the contributions to corporate performance of all five effects (productivity, wage, capital intensity, covariance, effect of observables). The first line looks at the components of the difference in ROA between founder-run firms and non family firms. As it turns out, the difference (2.6 percentage points out of 2.1) can be mostly explained by a difference in productivity. The second line looks at the spread between

Table 1.5: Contributions to Firm Performance

ROA coming from...	Higher L/K Ratio	Lower wage	Higher Labor Productivity	Diff. in Observables	Low Covariance	TOTAL
Founder CEO	-.003	0.4	2.6	-0.2	-0.7	2.1
Heir CEO	-.002	2.7	-0.6	-0.6	1.0	2.2
Professional CEO	.015	3.6	-4.7	0.2	1.4	1.7

Source: panel of French listed firms, over the 1994-2000 period. See A.1 for details and sources. Note: this table breaks down the difference in performance between family firms and widely held firms, using the decomposition presented in equation A.2 in A.3. Each column presents one of the coefficients of equation A.2, for each family status.

heirs and widely held firms: in this case, the bulk of the effect is accounted for by differences in wage levels (2.7 percentage points out of 2.2). Finally, the third line of Table 1.5 compares professional CEOs in family firms to non family firms. Here the picture is a little more complex: professional CEOs pay lower wage, but the benefit to investors is more than compensated by a lower productivity. We will make sense of this pattern in the next section. In fact, professional CEOs achieve superior performance because they run their operations with lower capital to labor ratios, not because they pay lower wages.

The broad picture emerging from Table 1.5 seems to indicate that (1) founders tend to display a larger productivity of labor than non family firms (2) both hired and descendants CEOs in family firms pay wages that are sizeably lower than widely held firms (3) the productivity of labor is much lower in firms run by professionals but (4) professionals compensate somehow by running operations with higher labor to capital ratios. These results are fully confirmed both quantitatively and statistically, when we run separate regressions of labor productivity, average wage and capital intensity on family status and controls. These regression results are not reported to save space.

In the following sections, we seek to go deeper in our understanding of these differences, by looking more precisely at both employment and investment policies.

1.4.2 Family Firms Pay Lower Wages

The main feature of Table 1.3 is that heir and professionally managed family firms pay wages that are lower by 10% than those paid by widely held firms. A potential explanation for these lower wages could be that family firms simply hire less skilled employees, but pay the market wage. Part of this effect is likely to be captured by industry effects, but there may be intra-industry variations in the skill structure of firms. To check this, we matched our dataset of listed firms with employer tax files which report, in theory, limited information on each employee, of each company (for a thorough description of these files, see Abowd, Kramarz and Margolis (1999)). In fact, the matching is far from perfect for three reasons. First, given that the French workforce has some 25 million employees, and our limitations of computing power, we use an extract of the whole database (4%). Secondly, many employees are likely to work for a subsidiary of the listed firm present in our data. We thus need to track ownership relation between various subsidiaries of a same group in order to "consolidate"employment and wages. We do this with a survey (LIFI, INSEE), which is, by design, far from being exhaustive below a given threshold, in particular for new firms. Third, the data was available only until 1998 included.

Thus, when the information is available, the employer tax files provide us, for each firm, with the average annual wage and measures of the skill structure that would normally take place in individual wage regressions. We use: the share of male employees, their mean seniority and age, and finally the fractions of managers, supervisors, skilled employees and unskilled workers. We then regress this new measure of mean wage, at the firm level, on our family variable, on the firm level controls of Table 1.3 and on these additional controls of skill structure.

Table 1.6 reports the estimates of such regressions. In column 1, we simply use aggregate wage bill and employment figures from our accounting data and report an estimated wage discount in both professionally and heir-managed family firms of around 10%. In column 2, we run the same regression, using the average wage from the tax files instead of accounting data. We obtain similar estimates for descendant and professionally managed firms (10%), but a lower estimate for founder managed firms. The reason for such a discrepancy comes from a different size-wage relation in founder firms : in unreported regressions,[17] we see that wages in large founder firms are significantly lower than in small founder firms, whereas such a relation does not hold for other types of firms. Considering the fact that the DADS files over-represent the importance of large firms,[18] this explains why the founder coefficient in column 2 differs from the one in column 1.

In columns 3 and 4, we include the skill structure controls progressively. As is apparent from these two columns, the wage discount of professionally managed firms progressively vanishes, which suggests that family firms run by outside CEOs pay lower wages mostly because they have younger and less skilled workers. The discount remains, however, significantly different from zero for heir-managed firms. It thus seems that descendants manage to pay wages lower by 4%-5%, even after controlling for the firm skill structure. In column 5, we run the same regressions as in column 4, except that we now weight observations by the number of workers retrieved in the tax files. The reason

[17]These regressions are available from the authors upon request.

[18]This over-representation of large firms in the DADS sample comes from the LIFI files (see Appendix A.1.3), which mostly tracks ownership for large firms.

Table 1.6: Wages in Family Firms: Accounting for Skill Structure

	log(wage bill / empl.) (×100)				
	Acc. Data	Employer Tax files			
	(1)	(2)	(3)	(4)	(5)
Founder CEO	-0.3	-10.6***	-6.4***	-2.8	-7.8***
	(4.8)	(4.2)	(2.3)	(2.2)	(2.4)
Heir CEO	-10.0**	-14.0***	-5.2***	-4.3**	-3.8**
	(4.5)	(3.7)	(2.0)	(1.9)	(1.6)
Professional CEO	-9.4**	-10.3***	-4.1*	-2.5	-1.9
	(4.7)	(4.0)	(2.3)	(2.2)	(1.6)
Fraction of managers	-	-	110.8***	107.7***	111.7***
			(7.6)	(6.1)	(5.4)
Fraction of supervisors	-	-	35.3***	36.2***	47.6***
			(5.8)	(5.6)	(7.1)
Fraction of skilled empl.	-	-	-7.9	4.0	14.9***
			(4.9)	(5.0)	(5.7)
Mean age	-	-	-	1.2***	0.2
				(0.2)	(0.2)
Mean seniority	-	-	-	0.5**	1.9***
				(0.2)	(0.3)
Fraction of	-	-	-	8.4**	2.0
male employees				(4.2)	(5.7)
Log(Assets)	1.72*	1.88***	2.12***	1.52***	-.14
	(1.00)	(.77)	(.43)	(.42)	(.35)
Log(Firm Age)	-1.35	.16	2.78***	.93	-.04
	(1.80)	(1.32)	(.94)	(.94)	(.84)
Former SOE	13.7***	5.45	4.64**	2.39	4.24***
	(5.64)	(4.04)	(2.37)	(2.09)	(1.53)
Industry FE	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes
Observations	1,351	1,427	1,427	1,427	1,427
Adj R^2	.29	.25	.64	.68	.85

Source: panel of French listed firms, over the 1994-2000 period. See A.1 for details on data construction and sources. Note: Huber-White-Sandwich estimates allowing for correlation of all observations of a given firm. Column 1 regresses, on the sub-sample for which the employer tax files are available, the log of the average wage as measured with the DAFSA Yearbooks on family status and various controls (i.e. Log(Asset), Log(Firm Age) and Former SOE defined in table 1.3). Columns 2 performs the same regression using the measure of wage given by the employer tax files. Column 3 adds variables controlling for the skill structure of the workforce (fraction of managers, fraction of supervisors, fraction of skilled employees). Column 4 controls additionally for mean age, mean seniority and the fraction of male employees. Finally, Column 5 weights observations by the number of workers retrieved in the tax files. All the regressions control for 13 industry fixed effects as well as year fixed effects. Standard Errors are in parenthesis. *, ** and *** mean statistically different from zero at 10%, 5% and 1% level of significance.

why we do this is that the average wage is more precisely estimated when more workers are tracked using the tax files. As it turns out, the significant wage discount in heir-managed firms sustains. As one can also notice, the coefficient on founder managed firms becomes significantly lower than it was in column 4. This is not surprising since, as we mentioned earlier, large founder-managed firms pay significantly lower wages than small founder-managed firms.

That outside CEOs in family firms hire lower skilled workers may explain why, in these firms, labor productivity is much lower than in widely held corporations and other family firms (as is apparent from Table 1.5). Another possibility is that professional CEOs substitute unskilled labor to capital, to make invested capital more profitable. It is indeed obvious from Table 1.5 that outside CEOs appear to have a much lower capital to labor ratio than that of other types of firms. Such evidence is consistent with professional CEOs in family firms making a more parsimonious use of capital than descendants or widely held companies.

This preliminary analysis suggests that family firms may be achieving higher profits by two different means: (1) descendants manage to pay lower wages for similar skill and productivity and (2) outside CEOs make a more parsimonious use of capital. We provide further evidence consistent with these two hypotheses in the following sections.

1.4.3 Descendants Can Commit on Long Term Employment

How do descendant CEOs succeed in paying lower wages, without recruiting low skill workers, and still obtain a high level of labor productivity? We explore here a lead inspired from Shleifer and Summers (1988): dynastic management endows the family with enough credibility to enforce implicit contracts. Under implicit labor contracts, the firm promises that most workers will keep their jobs even if total sales decrease. The firm thus provides employment insurance to its employees. In exchange for this, workers accept a lower wage, or to work harder for the same wage. Since the employee is risk averse - his labor supply is not diversified - and the firm is risk neutral - in the absence of credit constraints, the arrangement is ex ante value creating. The problem with this theory is that usually, firms are not credible when making such promises. Their incentive to renegotiate ex post is too strong, in particular when the firm can easily be taken over by a management which is bound by such a commitment (Shleifer and Summers (1988)). Families might have an advantage in enforcing this type of contract. First, they have a longer horizon than salaried managers: dynastic management can therefore create value that would be destroyed – both ex ante and ex post – by delegated management. Second, provided the family is involved in management, a culture irrationally tying top management to employees might prevent job losses in bad time, even if they were dynamically optimal. While this destroys ex post profit, it creates value ex ante (Kreps (1990)). Third, since families own the firm, they may be able to commit without fear of being taken over ex post. Professional managers who are not owners completely lack this ability to commit.

We test this by looking at the sensitivity of firm employment to industry sales shocks. A possible concern with this approach is that our sample period is short (1994-2000). It contains only one cycle, with 1994-1996 being downturn years, and 1997-2000 being expansion years. Therefore, industry level sales shocks, because they are partly determined by aggregate shocks, will capture the upward trend of the economy over the period. If family and non family firms turn out to follow different trends of growth over this short period, we might attribute this movement to different responses in sales shocks.

To avoid this, we control for aggregate shocks, and allow firms to vary in their responses to economy wide shocks. More precisely, we estimate the following model:

$$\log Y_{it} = \alpha_i + \beta\left(X_{it}\right) \log sales_{st} + \gamma\left(X_{it}\right) \delta_t + \varepsilon_{it} \tag{1.4}$$

where Y_{it} stands for firm i's total employment or sales at date t. α_i is a firm fixed effect. $\log sales_{st}$ is the log of total sales of the industry the firm i is in. δ_t is a year dummy indicating economy wide sales shocks.[19] $\beta(X_{it})$ and $\gamma(X_{it})$ are elasticities to industry and economy wide shocks, which are supposed to depend on firms observables. We posit:

$$\begin{aligned} \beta\left(X_{it}\right) &= a + b.F_i + c.\log \text{age}_{it} + d.\text{SOE}_i \\ \gamma\left(X_{it}\right) &= a' + b'.F_i + c'.\log \text{age}_{it} + d'.\text{SOE}_i \end{aligned}$$

where F_i is the set of our family dummies, age_{it} is the firm's age and SOE equals 1 when the firm has been state-owned.

As recalled above, because $\log sales_{st}$ partly depends on the overall state of the economy, it may well be that $\log sales_{st}$ and δ_t are correlated. If we omit $\gamma\left(X_{it}\right).\delta_t$ in equation (1.4), we may capture a part of $\gamma\left(X_{it}\right)$ in the estimate of the sensitivity of employment to shocks (the βs). If for some other reason, family firms have grown faster over the late 1990s, and therefore have a larger γ, then the estimate of β for family firms will be upward biased. This is why we control for aggregate shocks.

[19] We choose not to run directly a difference on difference equation because the fixed effect specification allows us to be much more agnostic on the timing of response of employment growth to sales growth. Assume for example that our model is slightly mis-specified in the following way: employment does not react to contemporary sales, but to sales lagged by one year. In this case, the fixed effect estimate is going to capture most of the effect by comparing the firm's average employment before and after the sales shock. In contrast to this, the difference estimate is not going to see any correlation given that in the very year sales change, employment remains fixed. Hence, while we prefer the fixed effect estimate of equation (1.4), it must be clear that what we have in mind is the response of employment *changes* to industry shocks.

Table 1.7: Do Family Firms Smooth Employment Shocks?

Dependant variable	$\text{Log}(\text{sales}_{it})$		$\text{Log}(\text{employment}_{it})$	
	(1)	(2)	(3)	(4)
$\text{Log}(\text{sales}_{st})$	0.20	0.17	0.36^{*}	0.34^{*}
	(0.15)	(0.16)	(0.20)	(0.21)
$\text{Log}(\text{sales}_{st}) \times$ Founder CEO	-0.05	-0.08	-0.12	-0.20
	(0.08)	(0.08)	(0.13)	(0.13)
$\text{Log}(\text{sales}_{st}) \times$ Heir CEO	-0.17^{**}	-0.21^{***}	-0.22^{**}	-0.27^{**}
	(0.07)	(0.07)	(0.11)	(0.11)
$\text{Log}(\text{sales}_{st}) \times$ Professional CEO	0.04	0.04	0.07	0.01
	(0.11)	(0.12)	(0.14)	(0.13)
$\text{Log}(\text{sales}_{st}) \times$ Former SOE	-0.18^{**}	-0.21^{**}	-0.22^{**}	-0.16
	(0.09)	(0.09)	(0.11)	(0.11)
$\text{Log}(\text{sales}_{st}) \times$ Log(Age)	0.00	0.01	-0.05	-0.03
	(0.03)	(0.04)	(0.03)	(0.04)
Firm FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Year FE × Founder	no	yes	no	yes
Year FE × Heir	no	yes	no	yes
Year FE × Professional	no	yes	no	yes
Year FE × SOE	no	yes	no	yes
Year FE × Log(age)	no	yes	no	yes
Test Heir=Professional	$.04^{**}$	$.04^{**}$	$.01^{***}$	$.01^{***}$
Observations	1,977	1,977	1,898	1,898
Adj. R^2	.97	.98	.97	.97

Source: panel of French listed firms, over the 1994-2000 period. See A.1 for details on data construction and sources. Note: Huber-White-Sandwich estimates allowing for correlation of all observations of a given firm. Dependent variables are log of sales (column 1 and 2) and log of employment (column 3 to 4). $\text{Log}(\text{sale}_{s,t})$ is the log of average sales in industry s at date t. Column 1 and 3 estimate equation (4) assuming that $c' = d' = 0$. Column 2 and 4 relax all the constraints. All regressions control for firm fixed effects as well as industry fixed effects. Line "Heir=Professional" provides the p-value of a test of equality between the coefficients "Heir CEO" and "Professional CEO". Standard errors are in parenthesis. *, ** and *** mean statistically different from zero at 10%, 5% and 1% level of significance.

Estimation results are shown in Table 1.7. Columns 1 an 2 study the response of firms' sales to industry shocks, while columns 3 and 4 look at employment. For industry s at date t, log sales$_{st}$ uses average sales for all companies in the industry, except firm i. We take average sales, instead of total sales, in order to account for attrition: if an average firm in the industry de-lists, our measure of industry sales will not be affected. Finally, we restrict ourselves to industries where at least 20 firms are present, to have a precise estimate of average sales. Columns 1 and 3 assume that $c' = d' = 0$, and columns 2 and 4 relax these constraints.

A look at columns 2 and 4 shows that indeed, employment reacts less to industry shocks in heir-managed firms. The result is not present unless we control for firms' characteristics and especially the "Former SOE" dummy. This is not very surprising as there are reasons to believe that former SOEs also exhibit this pattern of labor hoarding and less volatile activity. Since most widely held firms are former SOEs, not including a control for Former SOE creates a composition effect that brings the reference group (widely held firms) artificially close to the group of interest (heir managed firms).

Heirs may be able to smooth out employment over the industry cycle, either (1) by choosing less risky projects or (2) by modifying their own mark-up across the cycle. Columns 1-2 suggest that the first explanation might be true, as firms' sales are much less sensitive - not at all, it turns out - to industry shocks in heir-managed firms. In fact, if we use firms' profitability as a dependent variable (Y_{it}), we find - in non reported regressions - that firms' profitability is not more sensitive to industry shocks in family firms managed by a descendant.

Results from Table 1.7 could also be explained by the fact that heir-managed firms tend to operate in "niches"that are relatively sheltered from competition. The argument is a selection effect. Founders start firms in any kind of industry, but their descendants have lower than average managerial ability. If product market competition is soft, descendants can continue to run the firm. If the environment is competitive, descendants, with their lower than average managerial ability, cannot survive. They have to hire professional managers, sell their firms altogether to public or private investors. Because they self select into niche markets, descendants thus run more stable firms, both in terms of employment and sales. Because competition is softer, the firms they run are more profitable. This view has two consequences: (1) heir-managed firms should be less present in competitive industries and (2) heir-managed firms should underperform in more competitive industries.

We look at these two empirical implications. First, we investigate whether family, in particular heir-managed, firms tend to operate in less competitive industries. We measure competition by computing an index of sales concentration at the industry level (an Herfindahl index). Due to data limitations, this measure is very crude as it uses a rough industry classification (14 categories) and sales of listed firms. Using this measure, we found that over

Table 1.8: Performance of Family Firms and Competition

	Return on assets (×100)			
	Competition above median		Competition below median	
Family Firm	1.6**		2.1**	
	(1.9)		(2.4)	
Founder CEO	-	1.4	-	2.3*
		(1.5)		(1.8)
Heir CEO	-	2**	-	1.8*
		(2.1)		(1.7)
Professional CEO	-	1.2	-	2.2**
		(1.1)		(2.1)
Observations	1,235	1,235	1,090	1,090
$Adj.R^2$	.18	.18	.25	.25

Source: panel of French listed firms, over the 1994-2000 period. See A.1 for details on data construction and sources. Note: Huber-White-Sandwich estimates, allowing for correlation of all observations of a given firm. Dependent variable is ROA (ratio of EBIT to book value of asset). The specification used in this table is similar to Table 1.3. Column 1 and 2 are estimated on industries with a 1994 herfindahl below median (competitive). Column 3 and 4 are estimated on industries with a 1994 herfindahl above median (non competitive). Standard Errors are in parenthesis. *, ** and *** mean statistically different from zero at 10%, 5% and 1% level of significance.

the 1994-2000 period, 32% of non family firms are in industries where competition is above median. The fraction raises to 52% for descendant-run family firms, and 51% for those run by a hired CEO. Using our crude measure of competition, there is slight evidence that descendants tend to operate *more* in competitive industries.

We then test whether heirs do worse in competitive industries, by comparing the heir effect in performance regression in competitive and in non competitive industries. In Table 1.8, we present the ROA regressions on family status, as specified in Table 1.7, columns (1) and (2). We split our sample into two parts: (1) industries whose 1994 herfindahl is below median (competitive) and (2) industries whose 1994 herfindahl is above median (non competitive). We find no difference: whatever the degree of competition, heirs outperform their competitors by approximately the same margin. All in all, the data provide little support for the fact that descendants only survive in “niche” markets, and that this relative protection from competition explains their performance. Both pieces of evidence should, however, be interpreted with caution, given the noisiness of our competition measure.

Although imperfect, these tests lend further credence to the first, slightly different, interpretation of Table 1.7: descendants “smooth out”industry shocks as part of their labor management policy. One possible reason why they could commit to long term labor contracts is that they, as managers, have a much longer horizon than professional CEOs. To see this, we look at CEO turnover, and ask if it is lower in heir-managed family firms. We measure CEO turnover as a dummy equal to 1 if the current CEO does not run the company in the coming year. We then regress it on our family status variables and on usual determinants of CEO turnover such as corporate performance (measured as ROA or annual stock return), ownership concentration, firm size, age, year and industry dummies (for a typical study of CEO turnover see for example Weisbach (1988)). We also add, as their governance is likely to be different, a dummy for former SOEs.

Linear regression results are reported in Table 1.9. Column 1 simply compares CEO turnover in family and non family firms, accounting for year and industry fixed effects. As it turns out, CEO turnover is much lower when the family is still in the management. In founder and heir-managed firms, the probability of changing CEO is lower by some 9 percentage points than in widely held firms. This is a huge difference, given that the mean probability of CEO turnover is equal to .10 in our sample. When an outsider runs the family business, its chances to leave the job are lower by only 3 percentage points than if it ran a widely held company. The difference is not significant ; it is, however, significant when we compare heirs and professional managers in family firms. In this simplified regression, we can reject with 95% confidence that heirs and outside CEOs in family firms face the same probability of turnover. The difference, some 5 percentage points, corresponds to some 4 years of additional tenure. Finally, columns 2 and 3 then ask whether this significant difference can be explained by differing firm characteristics. Including ROA as a right hand side variable reduces the difference between heirs and professionals a bit, and renders its estimate noisier and insignificantly different from zero. In this context, it is thus likely that slightly larger ROA within heir-managed firms (see Table 1.3) explains why CEO turnover is less frequent in these firms.

1.4.4 Outside CEOs Are More Financially Literate

We have seen previously that outside CEOs operate at lower ratios of capital to labor. We present here two further pieces of evidence consistent with the fact that professional managers make a more efficient use of capital.

The first piece of evidence is related to the cost of debt. Using very clean data on bond issues, Anderson, Mansi and Reeb (2003) find that, when compared to non family firms, the corporate yield spread on family firms is

Table 1.9: CEO Turnover in Family Firms

Dependent variable	CEO Turnover		
	(1)	(2)	(3)
Founder CEO	-9.8***	-8.7***	-9.3***
	(1.9)	(2.0)	(2.5)
Heir CEO	-7.7***	-7.2***	-9.4***
	(2.1)	(2.2)	(2.5)
Professional CEO	-3.0	-4.4*	-6.4**
	(2.6)	(2.4)	(2.7)
ROA	-	-0.5***	-0.4***
		(0.1)	(0.1)
Log(Assets)	-	-	0.5
			(0.5)
Log(Firm Age).	-	-	1.7
			(1.1)
Former SOE	-	-	-4.1
			(2.9)
Fraction equity	-	-	5.8
of largest block			(4.0)
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Test Heir = Professional	0.05**	0.22	0.22
(p value)			
Observations	2,208	1,930	1,795

Source: panel of French listed firms over the 1994-2000 period. See A.1 for details on data construction and sources. Note: Huber-White-Sandwich estimates, allowing for correlations of all observations of a given firm. CEO Turnover, the dependent variable, is a dummy equal to 1 if the CEO loses his position in the following year. Column 1 simply controls for the family status. Column 2 adds profitability (ROA) as a control. Column 3 adds Log(Assets), Log(Firm Age), Former SOE and "Fraction equity of largest block" as additional controls. All regressions control for 13 industry and year fixed effects. Standard errors are in parenthesis. *, ** and *** mean statistically different from zero at 10%, 5% and 1% level of significance.

Table 1.10: Interest Rate Paid by Family Firms

	Average interest on debt (×100)	
	(1)	(2)
Family Firm	-0.3	-
	(0.6)	
Founder CEO	-	-0.1
		(0.6)
Heir CEO	-	0.5
		(0.8)
Professional CEO	-	-1.6**
		(0.7)
Log(Assets)	-0.5***	-0.4***
	(0.1)	(0.1)
Log(Firm Age)	-0.1	-0.1
	(0.3)	(0.3)
Former SOE	0.1	0.1
	(0.1)	(0.9)
Fraction equity	-0.2	-0.1
of largest block	(1.1)	(1.1)
Debt / Assets	-15.2	-15.3***
	(1.4)	(1.4)
Stock return	3.0*	2.7
volatility	(1.6)	(1.6)
ROA	-4.8	-5.3
	(5.6)	(5.6)
Industry FE	yes	yes
Year FE	yes	yes
"Heir=Professional"		.004***
Observations	2,200	2,200
Adj. R^2	.22	.23

Source : panel of French listed firms, over the 1994-2000 period. See A.1 for details on data construction and sources. Note: Huber-White-Sandwich estimates allowing for correlation of all observations for a given firm. The dependent variable is the average interest rate paid on debt. Column 1 and 2 control for Log(Assets), Log(Firm Age), Former SOE, fraction equity of largest block, leverage, stock return volatility and ROA (defined in Table 1.3). Both regressions also control for 13 industry fixed effects as well as year fixed effects. Column 1 controls for family ownership (Family firm) while column 2 controls for family management status (Founder CEO, Heir CEO, Professional CEO). Line "Heir=Professional" gives the p-value of an equality test between the coefficients "Heir CEO" and "Professional CEO". Standard errors are in parenthesis. *, ** and *** mean statistically different from zero at 10%, 5% and 1% level of significance.

consistently 30-40 basis points lower. They argue that, as family firms are long term shareholders, they can commit more easily not to default, which reduces their risk premium. We run similar regressions to theirs, and present the results in Table 1.10. Our measure of the cost of debt is, however, much noisier: since we do not have data on the bond yield spreads, we have to content ourselves with the ratio of interest paid to financial debt. This measure should be approximately equal to the average of all spreads on all loans and bonds, weighted by the sizes of the various issues. We then regress this average cost of debt on the same controls as Table 1.3, plus the firm's current profitability as measured by ROA. In our sample, we find that the average interest rate paid by family firms is on average lower by 30 basis points, albeit not significantly so. Although imprecise, the order of magnitude is consistent with findings of Anderson, Mansi and Reeb (2003)'s study.[20] When we look at the various subcategories of family firms, we find that those run by professional managers are the ones who pay significantly lower interest rates, by a huge 160 basis points. This is consistent with both the ability to commit of long term shareholders *and* the efficient financial management of professional CEOs.

Secondly, we look at the efficiency of a specific investment project: the acquisition of another firm. First, acquisitions are interesting because their profitability is relatively easy to evaluate. Most of the finance literature measures the profitability of a deal as the returns for long run shareholders of the bidder. These long run returns (3-5 years after deal completion) are then adjusted for risk using different models of expected returns (multi factor models, benchmark firms, industry portfolios). In the past decade, this literature has made large strides in identifying the various biases that arise in such long run studies (for examples of recent contributions, see Lyon, Barber and Tsai (1999) and Mitchell and Stafford (2000)). We will thus be able to build on this literature to compare the efficiency of acquisition policies of family and non family firms.

The second reason why acquisitions are interesting is the large variability of their long run performance. Over the long run, acquisitions are on average value destroying in the 1980s (Rau and Vermaelen (1998)) and in the 1990s (Moeller, Schlingemann and Stulz (2005)). However, these negative long run stock returns are mostly due to large acquisitions (Moeller, Schlingemann and Stulz (2005)), to friendly deals (Rau and Vermaelen) and to operations financed with share issues (Loughran and Vijh (1997)). Hostile bids, small acquisitions financed with cash are in general followed by positive long run returns. These results suggest that some acquisitions - the large, friendly ones, financed with stock - are simply evidence of uncontrolled managerial hubris. Firms where corporate governance is

[20] A careful reader will notice that, in Table 1.10, the sign on leverage is negative. Anderson, Mansi and Reeb (2003), who run similar regressions find a positive correlation with leverage. Theoretically, both directions of correlation are possible: highly levered firms may have a higher cost of debt because of costs of financial distress, but low interest rate firms may wish to take on more debt (us). As it turns out, the difference between both studies can be traced back to the difference in the measure of interest rate. Using the same measure as ours on COMPUSTAT data, we found a negative and robust correlation between leverage and interest.

poor, shareholders passive and managers all-powerful engage in these spectacular deals to build their CEO's empire. In contrast, firms with sound governance, large shareholders and profit maximizing managers may engage in small deals or hostile bids that on average increase shareholder value.

We thus ask whether family firms make better acquisitions than non family firms, by comparing the risk adjusted stock returns of bidders from 0 to 4 years after the deal completion. To do this, we match our dataset with data on monthly stock returns from SDC platinium (see Appendix A.1.4 for further description of this source).

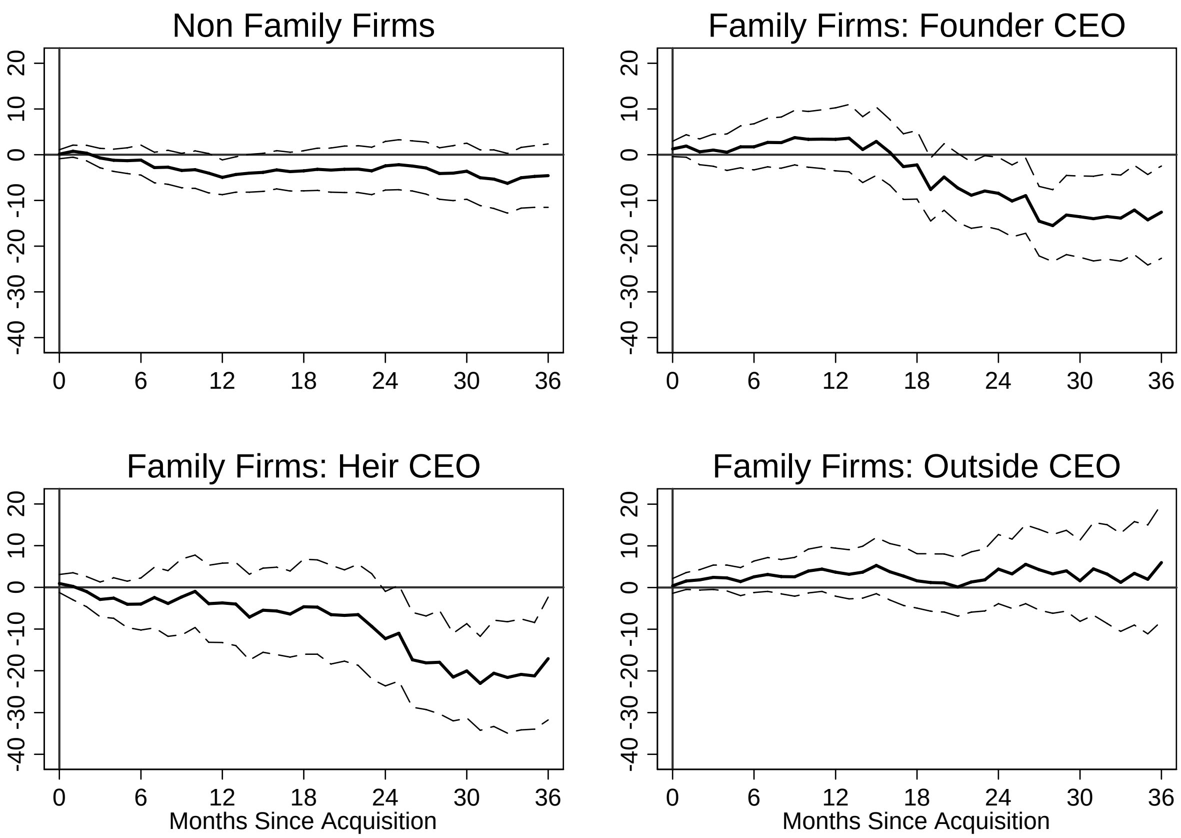
Before comparing the gains from acquisitions, we started by regressing the number of acquisitions made by each firm on our family dummies, along with year and industry controls, and find that descendant-managed family firms indeed make significantly less acquisitions. This effect does, however, vanish once we start controlling for firm size (using log assets). Founders, who tend to run very small firms, become the only ones to make more acquisitions than the other categories of firms. One possibility is that founders make series of value enhancing, small acquisitions. As we will see below, this is not the case.

We then compare the efficiency of acquisitions policies for each type of firm. First, we take a "naive approach". For each date between 1 and 36 months after an acquisition, we compute the buy and hold return of holding the acquirer's stock from deal completion until that date. We then adjust this return for risk, by subtracting the bidder's expected return. Our model for expected returns is taken from Fama and French (1996). For each firm, we regress monthly stock returns on the time series of market return, SMB (the monthly excess return of small firms) and HML (the monthly excess return of value firms). We subtract the monthly rate on 10-year French treasury bills from stock returns and the market returns. These three factors proxy for risk dimensions that investors seem to value. The residual of this regression - the part of monthly return that is not explained by these three factors - is our measure of abnormal return. To estimate our model of expected returns, we use the pre-acquisition period as our estimation period, and then compute residuals on the post period. Given that we require at least 12 months of data before the transaction to estimate our models, we end up with 845 acquisitions for which we can compute abnormal returns in the month of acquisition.[21] After that, given natural attrition and right censorship in the panel (our returns data stop in October 2003), we can follow returns for only 595 transactions after 36 months.

Using our measure of abnormal returns, we then compute, for each deal, the firm's cumulative abnormal returns from 0 month after the acquisition is completed, until 36 months after. Although long run performances of acquisition are highly heterogenous, the vast majority of US studies find that, on average, cumulative abnormal returns are negative in the long run. The same is true for our French sample, where the cumulative abnormal return of buying

[21] All types of firms are well represented: 262 acquisitions have been performed by widely held corporations, 191 by founders, 71 by heirs and 125 by professional CEOs in family firms.

Figure 1.1: Post-Acquisition Abnormal Returns of Acquiring Firms



and holding a bidder's stock is, on average, -7%.

Figure 1 plots average cumulative returns to long-term shareholders who bought the acquirer's stock 12 months before the deal, until 36 months after the acquisition. 90% confidence bands are drawn with dotted lines. We break down acquisitions into those made by non family firms, and those made by our three subcategories of family firms.[22] As it turns out, long-term shareholders of family firms run by professionals do not lose, nor gain, any wealth. Acquisitions made by widely held companies are slightly value destroying, with long-run buy and hold returns averaging -5% after 2-3 years. Then come founder-managed firms, whose acquisitions seem to destroy 15% after 2 to 3 years. The worse acquisitions are performed by descendants, whose long term shareholders lose out a large statistically significant 20% after 2 to 3 years.

Such evidence suggests that, within family firms, professional CEOs are better at making acquisitions than founders or their descendants. We provide the values of mean cumulative returns and formal t-tests in Table 1.11.

[22] Family status of the acquirer for each acquisition is defined at the time of acquisition. If, for instance, an acquisition is disclosed when a descendant is in command, but the firm becomes widely held the year after, the acquisition still counts as "heir-managed".

Table 1.11: Abnormal Returns to Long Run Shareholders of Acquirers

	Widely Held Firms	Family firms, managed by:			T-Prob of Test
		Founder	Heir	Professional CEO	heir=professional
Months since acquisition					
0	0.1	1.3	0.9	0.4	
	(0.2)	(1.5)	(1.1)	(0.4)	0.71
+6	-1.2	1.7	-4.0	2.6	
	(0.7)	(0.7)	(1.3)	(1.3)	0.06*
+12	-5.0***	3.4	-3.7	3.7	
	(2.5)	(1.0)	(0.8)	(1.3)	0.17
+18	-3.5	-2.2	-4.6	-1.6	
	(1.6)	(0.6)	(0.8)	(0.5)	0.32
+24	-3.6	-8.5**	-12.3**	4.4	
	(1.2)	(2.1)	(2.1)	(1.0)	0.02**
+30	-2.4	-13.6***	-20.0***	1.6	
	(0.9)	(3.0)	(3.5)	(0.3)	0.01***
+36	-3.6	-12.6***	-17.0**	6.0	
	(1.2)	(2.4)	(2.3)	(0.8)	0.04**

Source: panel of French listed firms, over the 1994-2000 period. See A.1 for details on data construction and sources. Note: OLS estimates. The dependent variable is cumulative abnormal returns. Explanatory variables are periods after (or before) completion of the acquisition. Column 1 gives long term abnormal returns for widely held firms, column 2 for family firms with a founder CEO, column 3 for heir-managed family firms and column 4 for professionally managed family firms. Column 5 provides an equality test for the coefficient of the regression in column 3 and 4. T-statistics are in parentheses. *, ** and *** mean statistically different from zero at 10%, 5% and 1% level of significance.

As it turns out, post acquisition, the long run returns of founders and descendants are negative and statistically significant. This is not the case for firms run by professional CEOs, be they widely held or family-owned. As a result, within family firms, the performance of acquisitions made by heirs is significantly lower than that of hired CEOs. This confirms our contention that professional CEOs use capital more parsimoniously.

In the finance literature, the computation of mean long run, buy-and-hold, abnormal returns has, however, been criticized by Mitchell and Stafford (2000). They suggest that acquisitions are not independent events (they tend to occur in waves), and that, therefore, innovations on subsequent stock returns are correlated. As a result, standard t-statistics on mean abnormal returns tend to overestimate their precision, and lead to over-rejection of the null that abnormal returns are zero. In addition, the distribution of cumulative returns tend to be non normal (positively skewed), which invalidates standard t-statistics. As a result, Mitchell and Stafford advocate the use of monthly calendar time portfolios. Such portfolios have the twin advantage of (1) aggregating the cross sectional variance of returns, which reduces the correlation problem, and (2) being normally distributed, such that standard t-statistics are reliable. Before proceeding to the results, notice that this approach is generally thought to be conservative; for instance, Lyon, Barber and Tsai (1999), argue that it lacks power to detect long run returns.

We compute the (equally weighted) monthly stock returns of portfolios made of bidders whose last acquisitions took place in the past 1,2,3 or 4 years. We then compute such portfolios for each type of family acquirers. The time window is January 1994 - October 2003. Last, to test whether heirs make worse acquisitions than professional CEOs in family firms, we compute the return of a portfolio that is long in professional CEOs who are past bidders, and short in descendant who are past bidders. These returns (minus risk free rate) are then regressed on the three Fama-French factors. Table 1.12 reports the (monthly) alphas of these portfolios: the first line is for a portfolio containing all past bidders, the second line for all widely held bidders, the third line for founder bidders, the fourth line for all heir bidders and the fifth line is for all professionally managed firms. The sixth line reports the alphas for portfolios long in professionals and short in heirs.

As expected, this conservative method provides results similar to cumulative returns, albeit statistically weaker. Post acquisition returns for founders and descendants are still negative, but not significant any more (some 1%-2% a year for founders, 3%-4% for heirs). Post acquisitions returns of professionally managed family firms are weakly positive. Most importantly, within family firms, acquisitions made by heirs significantly underperform those made by professional CEOs. The "long in professional CEOs– short in heir CEOs" portfolio generate a large and significant 8% annual abnormal return. The last comparative result from table 1.11 is therefore robust to the calendar time portfolio approach, in spite of its conservativeness.

Table 1.12: Monthly Alphas on Calendar Time Portfolios of Acquirers

Years since last acquisition	0-1	0-2	0-3	0-4
Portfolios of past bidders	year	years	years	years
Long all firms	-0.2	-0.1	-0.3	-0.3
	(0.6)	(0.6	(1.2)	(1.4)
Long non family firms	-0.4*	-0.2	-0.3	-0.3
	(1.8)	(1.0)	(1.4)	(1.5)
Long Founder Firms	0.0	-0.2	-0.2	-0.1
	(0.0)	(0.4)	(0.4)	(0.4)
Long Heir CEOs	-0.3	-0.2	-0.5	-0.6*
	(0.8)	(0.4)	(1.4)	(1.7)
Long Professional CEOs	0.2	0.1	0.0	-0.1
	(0.7)	(0.4)	(0.0)	(0.2)
Long Professional CEOs,	0.9**	0.4	0.7**	0.7**
Short Heir CEOs	(2.2)	(1.0)	(2.0)	(2.0)

Source: alphas on monthly calendar time portfolios whose returns are computed over 1994-2003. These portfolios are composed of all past bidders whose last transaction took place in the past 1, 2, 3 or 4 years. They are equal weighted and therefore, re-balanced every month. For each of these portfolios, monthly returns minus risk free rate are then regressed on the three Fama-French risk factors (market return minus risk free rate, small firm premium, the value premium) computed for France. The constants of these regressions are displayed on this table, with t-statistics in parentheses. *, ** and *** mean statistically different from zero at 10%, 5% and 1% level of significance.

1.5 Summary and Leads for Future Research

In this paper, we have sought to understand why family firms outperform non family firms, and whether family firms have distinct "management styles". First, founders simply have larger labor productivity. This founder effect is very large, since it explains nearly all of the difference in profitability between founder firms and widely held corporations. This effect, though large, is very imprecisely estimated in regressions. This suggests that we may not have the most adequate model (or the adequate breakdown) to explain the performance of founder firms. Yet, our results confirm those of existing papers on founder effects. Fortunately, we are able to say more about the management styles of other family firms.

Secondly, we have presented three pieces of evidence consistent with the fact that, thanks to their longer horizons, heirs can manage their *labor force* more efficiently. First, firms managed by a descendant of the founder pay significantly lower wages, for a given skill structure. Second, they provide insurance across the business cycle to their workers. Third, turnover is less likely for heirs than it is for professional CEOs in family firms. These three results are consistent with an implicit insurance story : heir managers, because of their longer horizon, find it easier than professional managers to sustain reputational contracts with their workers, providing them with more insurance in exchange of lower wages. Professional managers, whether in family firms or in widely held firms may lack the credibility necessary to implement such implicit contracts.

Third, professional CEOs in family firms compensate for this lack in credibility *vis à vis* their workers by managing capital more efficiently. First, they pay on average lower interest rates on their outstanding debt. Second, their external acquisitions tend to be, in the long run, more profitable. One plausible explanation is that they were more likely to be trained in finance/economics at the university or in an MBA. Whether acquired by education or by experience, financial literacy seems to be how hired CEOs are as profitable as heirs in our data. We believe these results to be consistent with Bertrand and Schoar (2003)'s finding that there are heterogenous financial management styles across companies. In particular, they show that CEOs holding an MBA degree are more financially "agressive"than others. Here, we presented evidence that professional managers in family firms have a particular style compared to family managers, namely their ability at managing capital efficiently.

This paper has focused on *real* effects of family management. When we look at stock returns, it turns out that family firms, in particular those run by professional managers, have beaten the market over the 1990s, even after taking into account the risk factors that the asset pricing literature considers as important. Our data thus delivered results consistent with Van der Heyden et al (2004). This is not easy to interpret: does this mean that the market has suddenly understood the virtues of family management? Does this mean that non family firms have done particularly badly over the decade? Can this be interpreted as further evidence that professional managers in family firms are good at communicating to (and persuading) analysts and propping up the stock price?

Another possibility would be that family firms are subject to particular risks, because they are more likely to be taken over when market conditions are good. As a result, their beta (correlation with the market return) would be time varying and would covary negatively with the market. This is a question we plan to address in future research.

Chapter 2

Bottom-Up Corporate Governance

2.1 Introduction

Academics and practitioners have known for long that in the absence of tight monitoring, CEOs of large publicly held firms may take actions that are detrimental to their shareholders: They commit the firm's resources to value destroying "pet" projects, build unprofitable empires, prevent valuable takeovers from happening, or even, in some rare yet highly publicized instances, engage in fraudulent window dressing or asset tunneling. To set up counter-powers to the CEO, the consensus among practitioners and regulators has been to rely on a strong board of directors, independent from the management. In many countries, informal codes of corporate governance have been recommending the appointment of independent directors for more than a decade.[1] In the US, the recent wave of corporate scandals has triggered a stronger regulatory response, making the hiring of independent directors mandatory for firms listed on the major stock exchanges.[2]

Indeed, academic research has found boards to be efficient tools of corporate governance. Independent boards of directors seem to pay more attention to corporate performance when it comes to CEO turnover or compensation (Weisbach (1988), Dahya, Mc Connel and Travlos (2002)). The stock market hails the appointment of independent directors with abnormal returns (Rosenstein and Wyatt (1990)). There is no evidence, however, that independent boards improve profitability or even the value of corporate assets.[3] One possibility, at least for large listed firms, is that independent boards, while still extremely valuable in times of crises, are too far away from day to day

[1]As a matter of fact, many large firms have been eager to comply with their guidelines. For instance, the Cadbury Report issued in the UK in 1992 recommends that "the majority of non-executives on a board should be independent of the company" . The 1998 "Viénot II" Report in France proposes that "independent directors should account for at least one-third of the Board of Directors". Compliance with these guidelines was not mandatory, but widespread. For instance, by 1996, more than 50% of the UK firms surveyed by Dahya, Mc Connel and Travlos (2002) claimed to comply with the Cadbury Report recommendations.

[2]The NYSE and the NASDAQ require since 2003 a majority of independent directors on the board of companies listed on their exchanges.

[3]In fact, the correlation might even be negative. A likely reason for this is that poorly performing firms tend to appoint more outside director (Kaplan and Minton (1994)). Filtering out this endogeneity leads to no apparent correlation between profitability and board independence (Baghat and Black (2003), Hermalin and Weisbach (2003)).

operations to add much value to a firm.

As a result, corporate governance scholars have recently shifted their attention away from organizational variables such as board composition towards other dimensions of corporate governance apparent in corporate charters, bylaws or in state takeover laws. The main finding of this recent literature is that investor-friendly corporate governance provisions boost the price of firms' assets by making them more vulnerable to takeovers (Gompers, Ishii and Metrick (2003), Cremers, Nair and John (2005),Bebchuk and Cohen (2004)).

This paper studies a new measure of the quality of corporate governance based on "organizational" information. Our intuition is that there is some information to get on the functioning of a company by focusing attention on the composition of the executive suite. After all, CEOs have to face their subordinates on a daily basis, whereas boards of directors only meet a few times every year.

More precisely, we develop a measure of "internal governance" that captures the degree of "independence" of top executives from the CEO. On a panel of US listed corporations, we compute the fraction of top ranking executives who joined the firm *before* the current CEO was appointed. We think of these executives as "independent". As CEOs are typically involved in the recruting of their subordinates, executives hired during their tenure are more likely to share the same preferences and/or have an incentive to "return the favor". Alternatively, executives who experienced previous leadership are less likely to take orders as legitimate simply because they come from the a superior.

We first provide evidence on corporate performance: We find that high internal governance (independent executives) predicts high future performance, using various profitability measures. Conversely, poor performance does *not* lead to a decrease in internal governance, suggesting a causal effect of internal governance on performance. Our findings are not affected when we control for traditional, "external" corporate governance measures. We also show that our results are not driven by the departure of executives "leaving a sinking boat", i.e. quitting due to the anticipation of the firm's future decline.

Our second piece of evidence is on the long-run value impact of large acquisitions. We show that a lower fraction of independent executives is associated with significantly lower returns for the acquiror's shareholders. Importantly, however, regular indices of *external* governance are not correlated with the long-term shareholders' losses made after an acquisition. The board of director, takeover pressure or the design of corporate charter seem less efficient at preventing bad/expansive acquisitions from happening.

We believe an important contribution of our paper is to exhibit an organizational firm-level variable with strong systematic predictive power on future performance. Our internal governance variable might simply be a measure of the extent of CEO power over the firm: ”powerful CEOs” might be both prone to do inefficient acquisitions and to replace executives with their own friends with no link between the two. However, we find that internal governance is only very weakly correlated with traditional measures of ”CEO power” such as whether the CEO is chairman of the board. Another intepretation of our results is that independent executives may act as a “bottom-up governance” mechanism, making it costly to the CEO to take bad decisions.

Our study may have two normative implications for practioneers of corporate governance. First, we learn from our statistical analysis that the intensity of such internal governance can be at least partly observed and could be included in the various indexes of the quality of a firm's corporate governance. This implication does not depend on our interpretation of our results: be it the sign of executives “leaving the sinking boat”, of an autocratic CEOs, or of the healthy discipline of having to convince one's subordinates, the share of independent executives as we measure it predicts performance. A second implication hinges on our “bottom-up governance” interpretation: in addition to management monitoring and advising, a key role of the board should also consist in designing the optimal balance of power within the firm. Put otherwise, the human resource role of the board is not limited to the usually emphasized CEO succession problem.

The paper has five more sections. Section 2 describes the datasets we use and how we construct our index of internal governance. Section 3 looks at the relationship between internal governance and corporate performance. Section 4 looks at the costs of acquisitions. Section 5 discusses the relation between our internal governance index and usual corporate governance measures. Section 6 concludes on theoretical questions raised by our findings.

2.2 Data and Measurement Issues

We first describe the datasets we use to complete our study. We then discuss the construction of our index of “internal governance” and outline its strengths and weaknesses.

2.2.1 Datasets

We use five datasets. EXECUCOMP provides us with the firm level organizational variables with which we proxy for internal governance. COMPUSTAT provides us with firm level accounting information. IRRC's corporate governance and director dataset allows us to obtain standard measures of external corporate governance. Acquisitions are drawn from SDC Platinium, and stock returns from CRSP.

2.2.1.1 Internal Governance

The first dataset is the EXECUCOMP panel of (at least) the five best paid executives of the largest American corporations. We use this data source to measure the extent of "internal governance" in the firm. We do this by computing the fraction of executives hired *after* the CEO took office (i.e. the fraction of non-independent executives). Thus, internal governance is said to be poor when this fraction is high.

Initially, each observation is an executive (or the CEO) in a given firm in a given year. We focus on years from 1992 to 2002; we start by removing observations for which the executive identifying number is missing. We also exclude duplicate observations. In this (nearly) raw dataset, there are 120,762 observations, which correspond to some 1,840 firms per year (20,230 firm-years) with an average of six executives each (including the CEO). As it turns out, 3,499 firm-year observations have no CEO (using the CEOANN dummy variable indicating which executive is the CEO). In some cases, it is possible to infer the CEO's identity because, for one of the executives, the BECAMECE variable (date at which the executive became CEO) is non missing, even though the CEOANN dummy is missing (misleadingly indicating that the executive is not the CEO). By filling in these gaps, we obtain 2,472 firm year observations, and end up with **19,203** firm-years for which we know the identity of the CEO (a total of 115,933 observations in the executive-firm-year dataset).

To compute the fraction of non indenpendent executives, we will need to compare the CEO's tenure to the executives' seniorities within the company. A first approach - which corresponds to the results listed in the paper - is to rely on the seniority (within the firm) and tenure (within the position) variables reported in EXECUCOMP. The BECAMECE variable gives us, for the current CEO, the precise date at which he(she) was appointed as CEO whether he(she) was hired from inside or outside the firm. Other executives' seniorities can be recovered using the JOINED_C variable, which reports the date at which the executive actually joined the firm. Unfortunately, these variables are often missing: we lose 2,291 firm-years (12,262 executives-firm-years) by focusing on firms where the CEO's date of appointment is non missing. We then lose a further 6,760 firm years (39,695 executives-firm-years) by restricting ourselves to firms where we have non missing seniority for at least one executive. We end up with **11,179** firm-years, from 1992 to 2002, for which we can now compute the fraction of executives hired *after* the current CEO. We call this measure of executive dependence **FRAC1**.

Overall, we lose 19,203-11,179=8,024 firm-year observations in the process of constructing our measure of internal governance, mostly because many executives do not report their seniority within the firm. In 4,307 of our remaining 11,179 firm-years, internal governance is measured by comparing the CEO's tenure with the seniority of only one executive.

This means that FRAC1 will be a very noisy measure of executive dependence; while this does not create an obviously spurious correlation with corporate performance or returns to acquisitions, it is going to bias our estimates of the effect of internal governance downwards, as measurement error often does. A second approach would be to dispense wih the seniority and tenure variables altogether and make direct use of the fact that we can follow individuals in the EXECUCOMP panel. To remove left censorship (the panel starts in 1992), we need to restrict ourselves to firms where we observe at least one episode of CEO turnover. Once the new CEO has been appointed, we can compute the fraction of executives that were *not* listed in the dataset *before* the new CEO started (we name this alternative variable **FRAC2**). The main advantage of this approach is that we can dispense of both BECAMECE and JOINED_C variables, which are often missing. The cost is that the need to observe CEO turnover restricts the number of firm-years to **6,617**. This is less that the 11,179 observations available to compute FRAC1. Also, focusing on firms with at least one CEO turnover over the course of ten years may mechanically overweight firms facing governance problems. Finally, executives enter the panel when they either (1) are hired by the firm, (2) make it into the five best paid people list, or (3) the firm decides to report their pay in its annual report/proxy. Hence, entry in the panel is a very noisy measure of hiring.

In spite of its shortcomings, the second - panel based - variable FRAC2 has a correlation coefficient of 0.41 with the first - seniority based - variable FRAC1. Both approaches led to results very similar in terms of size and significance, so we chose to focus here on the first measurement approach. Of course, estimates based on FRAC2 are available from the authors upon request.

2.2.1.2 Corporate Accounts

Our tests will correlate internal governance with corporate performance. Thus, for each firm-year observation from our EXECUCOMP sample, we retrieve firm level accounting information from COMPUSTAT (we lose only 161 observations, for which we cannot find the book value of assets, in the merging process). We match by GVKEY identifier. We compute profitability as return on assets (ROA).[4] We construct Market to Book as the ratio of the firm's assets market value to their book value, as in Gompers, Ishii and Metrick (2003).[5] We proxy firm size by log(total assets). We proxy firm age by taking the difference between the current year and the first year of presence in the COMPUSTAT panel. We construct the 48 Fama-French industry dummies using the firm's 4 digit SIC

[4]Return on Assets is Operating Income Before Depreciation (item 13) minus Depreciation and Amortization (item 14) over Total Assets (item 6).

[5]Market to Book is the ratio of market to book value of assets (item 6). The market value is computed as Total Assets (item 6) plus the number of common shares outstanding (item 25) times share price at the end of the fiscal year (item 199) minus Common Equity (item 60) minus Deferred Taxes (item 74).

industry code. Finally, we windsorize some variables (ROA, Market to Book) at the 1% and 99% levels.

2.2.1.3 External Governance

We will also look at how our measure of internal governance correlates with traditionnal corporate governance measures. Thus, for each firm year observation, we gather information on corporate governance from IRRC's corporate governance and directors dataset. This dataset provides us with commonly used proxies for corporate governance, namely, the fraction of independent directors, the number of directors sitting on the board and the fraction of former employees sitting on the board. These variables are available for the 1996-2001 period only, and mostly for large firms. Out of 11,179 firm-year observations where we can measure internal governance, only 4,531 observations have information from IRRC.

We will also look at the increasingly popular Gompers, Ishii, and Metrick's (hereafter GIM) index of corporate governance, which compiles various corporate governance provisions included in the CEO's compensation package, in the corporate charter and the board structure. The GIM index is available for 1990, 1993, 1995, 1998 and 2001. In other years, we assume that it takes the value that it had in the most recent year when it was non missing. Again, just over a half (5,872 over 11,179) of our observations have a defined GIM index.

2.2.1.4 Acquisitions

To see if top ranking executives are able to constrain major CEO decisions, we focus on the effect of internal governance on the acquisition performance. We obtain the list of firms who made significant acquisitions from SDC Platinium (deals of value larger than $ 300 million). SDC provides us with the bidder's CUSIP and the transaction value of the deal. We focus on completed deals where the bidder bought at least 50% of the target's shares.

For each firm-year observation in our EXECUCOMP sample, we compute the number of targets acquired during that year and the overall amount spent on the deal(s). In our base sample of 11,179 firm-years where the internal governance measure FRAC1 is available, 22% of the observations correspond to firms making at least one acquisition; 1998 and 1999 are the peak years, with more than 26% of firms making at least one acquisition. Most acquirers make only one deal per year, but there are a few serial acquirers (three percent of the observations correspond to at least five deals carried out during the year).

2.2.1.5 Stock Returns

We are also interested in computing the net benefit of acquisitions. To do this, we compute long run abnormal stock returns following the acquisition, for each acquirer.

We merge the above SDC extract with our base sample from EXECUCOMP. We end up with a list of 818 deals for which we know the acquirer, the date of the acquisition, and FRAC1 (the share of executives appointed after the CEO took office). Serial acquirers are overrepresented. Out of 818 deals, 188 involve one time buyers, while 368 involve firms carrying out at least four large deals. Overall, our sample features 359 different acquirers.

We then match this deal dataset with the acquirer's stock returns as provided by CRSP. More precisely, we retrieve monthly acquirer stock returns from a period extending 48 months prior to each acquisition to 48 months after the deal. We remove deals with less that 48 months of acquirer returns history before the acquisition. This reduces our sample size to 669 deals. We then estimate a three factor Fama-French model *for each acquirer* using the 48 pre-acquisition months available. We use the returns of the MKTRF, SMB, and HML portfolios from Kenneth French's web site. We then use this model to compute abnormal returns both before and after the deal.

2.2.2 Constructing an Internal Governance Index

The assumption underlying the internal governance measure is that the CEO is directly or indirectly involved in the recruitment process of top executives. Hence, executives appointed during his tenure are more likely to be loyal to him and/or share his preferences than executives who were picked by a predecessor.

However, one needs to be careful with the mechanical drivers of FRAC1. As a CEO's seniority increases, a larger fraction of executives have (mechanically) been appointed during his tenure. Conversely, executives who have been with the firm longer are on average more likely to have been hired before the current CEO. This suggests that FRAC1 is positively correlated with CEO tenure, and negatively with executive seniority. Also, externally appointed CEOs often have the mandate to arrange an "executive shake-up." When recruited from the outside, CEOs have enough bargaining power vis à vis the board of directors to bring in their own teams. Hence, FRAC1 should be mechanically larger in the presence of outsider CEOs. Finally, a new CEO's appointment is sometimes followed by immediate waves of executive departures and arrivals that might be unrelated to internal governance (for example, top executives hoping for the top job leave the firm and need to be replaced).

It might be tempting to see these mechanical sources of variation in the proportion of aligned executives as exogenous shocks to internal governance, but they might be related to firm performance for reasons orthogonal to internal governance. Ignoring these sources of variation would thus lead to biased estimates of the effect of internal governance on performance. For example, CEO tenure may directly affect corporate performance simply because experience on the job matters. Also, if the firm is in really bad shape, a new CEO will have to inject more "fresh blood" into the corporate suite (Hayes, Oyer, and Schaefer, 2005), which mechanically increases executive turnover.

We therefore choose be to as conservative as possible and filter out these mechanical effects when we seek to measure "internal governance." Also, we will include them as controls in all performance regressions.[6]

More precisely, our internal governance (henceforth IG) index is defined as the residual of the fraction of "dependent" executives regressed on its expected mechanical correlates:

$$\begin{aligned} FRAC1_{it} &= a + b.CEOTEN_{it} + c.EXECSEN_{it} + d.OUTSIDE_{it} \\ &\quad + e.KNOWN_{it} + f.FRAC1\_1Y_{it} + \delta_t + \varepsilon_{it} \end{aligned} \tag{2.1}$$

where, for firm i in year t, $CEOTEN_{it}$ stands for CEO's tenure (in years), $EXECSEN_{it}$ for average executive seniority within the firm, $OUTSIDE_{it}$ is a dummy indicating whether the CEO comes from outside the firm, $KNOWN_{it}$ is the fraction of executives for which seniority is reported in the data, and $FRAC1\_1Y_{it}$ the fraction of executives that arrived within a year of the CEO's nomination. We also include year dummies δ_t. We define our Internal Governance (hereafter IG) index as the residual ε_{it}. It is larger when more executives than expected were hired after the current CEO was appointed. Hence, *high* values of the IG index mean *poor* internal governance (consistently with the Gompers-Ishi-Metrick external governance index).

The regression results are reported in Table 2.1, which has four columns. Column 1 includes the seniority variables ($EXECSEN$ for executives and $CEOTEN$ for the CEO). Column 2 adds the fraction of executives for which seniority is actually reported in EXECUCOMP ($KNOWN$, which we include to control for potential selection biases), and the fact that the CEO has been appointed from the outside ($OUTSIDE$). Column 3 adds the fraction of executives appointed within a year of the CEO's nomination, to control for management "shake-ups." Column 4 includes firm size, age and industry as additionnal regressors. As it turns out, all these mechanical correlates of $FRAC1$ work as we expected them to. $FRAC1$ is positively and strongly correlated with CEO tenure and negatively correlated with executive tenure (Columns 1 to 4). These two variables alone explain 25% of the variance of $FRAC1$ (column 1). $FRAC1$ is positively correlated with the fraction of executives whose seniority is reported: Hence, more "transparent" firms tend to have executives appointed after the CEO. $FRAC1$ is also strongly associated with the presence of outside CEOs. There are at least two possible interpretations for this. First, outside CEOs are often given a mandate to reshuffle the top management, and as a result the fraction of executives who joined the company with them is large. As it turns out, the coefficient on $OUTSIDE$ is somewhat reduced when we also include $FRAC1\_1Y$ in column 3. But it remains positive and significant, which leaves room for additional explanations: the appointment of outside CEOs triggers the departure of talented executives who were hoping to get the top job.

[6] By virtue of the Frisch Waugh theorem, the two approaches are equivalent. However, our residual approach will be helpful when we look at stock returns following acquisitions, since we will simply compare firms with negative and positive residuals.

Another possibility could simply be that management shake-ups tend to happen when the firm is doing badly, which may also generate departures. In any case, the need to replace the lost executives mechanically increases our index. Finally, firm level variables (industry, age, or even size) are not strongly correlated with $FRAC1$, and accordingly explain little of its variance. Thus, in the following analysis, we use estimates from column (3), i.e., compute IG using CEO and executives' characteristics (which account for 71% of the variance of $FRAC1$), but not the firm level variables (which account for a mere 2%).

Last, one possible concern could be that our internal governance index may be correlated with intense merger activity in the past. After many mergers, top executives from the targets join the executive suite, mechanically increasing our index. If the firm still has trouble "digesting" its past acquisitions, it is likely to underperform on both accounting and stock price measures. To address this concern, we correlated our residual IG index with the number of past acquisitions for a cross section of firms in 2000. We found *no* evidence that high IG index firms had bought a particularly large number of firms in the 1990s. This is robust to various controls and to the year chosen. Our index is thus not a proxy for M&A "indigestion."

2.3 Internal Governance and Corporate Performance

We start by investigating the correlation between internal governance and corporate performance. Figure 2.1 provides a first look at the relationship between our IG index and corporate performance. In this figure, we split the sample distribution of our IG index into five quantiles. Then, for each quantile, we compute the mean industry[7] adjusted performance, as well as the 95% confidence band assuming normality. Performance is measured through ROA (left panel) and market to book value of assets (right panel). Figure 2.1 shows a positive and statistically significant association between good internal governance (low values of our IG index) and corporate performance.

2.3.1 Basic Results

As discussed above, some mechanical correlates of internal governance may be correlated with corporate performance. For example, junior CEOs or executives may be on average worse performers simply because they lack experience. We thus move to a multivariate analysis that allows us to capture these "human capital" effects. We run the following regression:

$$Y_{it} = \alpha + \beta IG_{it-1} + (IG \;\; controls)_{it} + (Firm \;\; controls)_{it} + \varepsilon_{it} \tag{2.2}$$

[7] We used the Fama-French 48 industries (Fama and French (1997)).

Table 2.1: Mechanical Correlates of Internal Governance

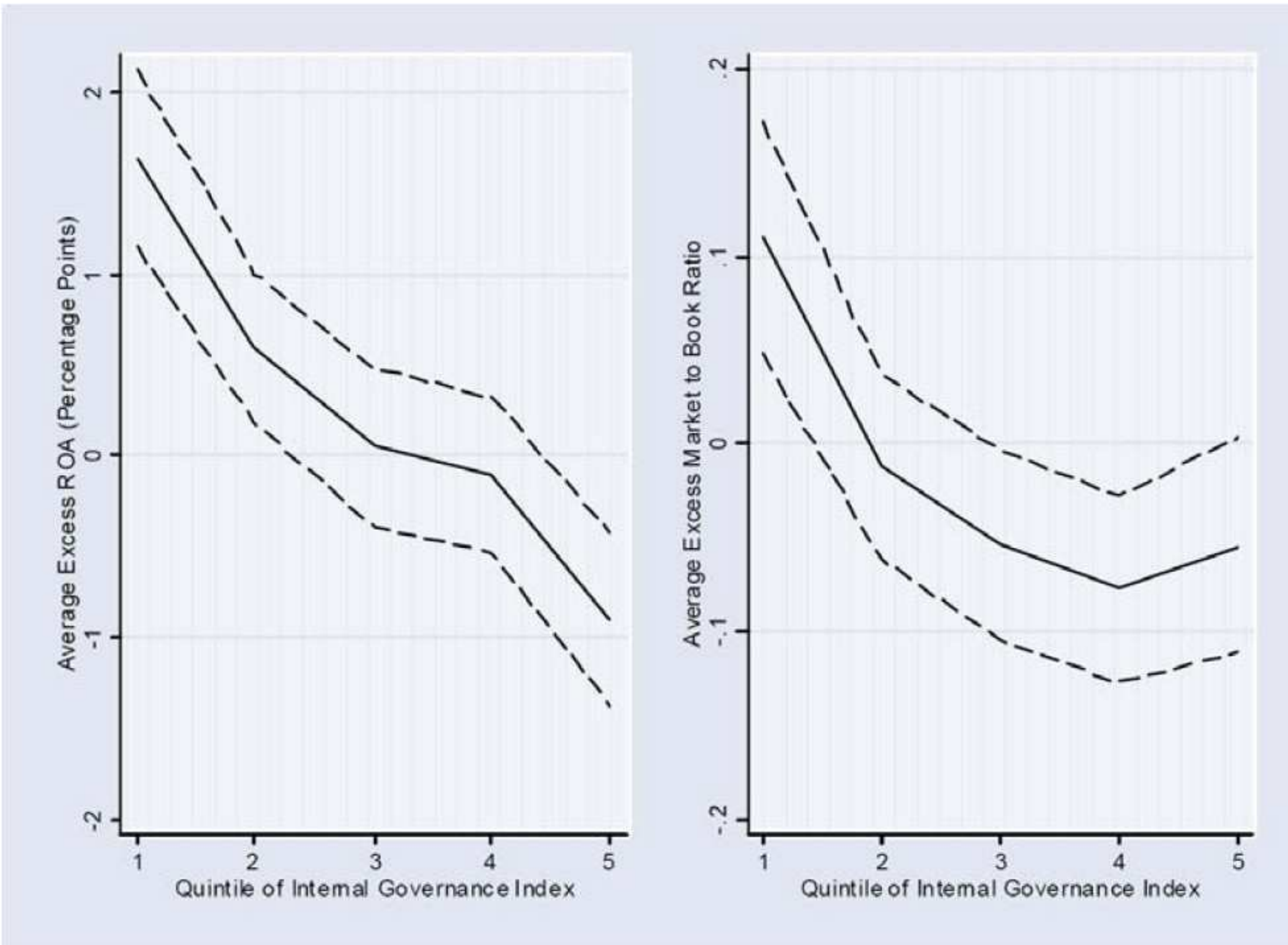
	Fraction of executives appointed after the CEO (×100)			
	(1)	(2)	(3)	(4)
CEO seniority	1.3***	1.3***	1.4***	1.5***
	(0.1)	(0.1)	(0.1)	(0.7)
Executives' mean seniority	-1.2***	-1.0***	-0.9***	-0.8***
	(0.0)	(0.0)	(0.0)	(0.0)
Fraction of executives whose	-	0.6***	0.5***	0.4***
seniority is reported (×100)		(0.0)	(0.0)	(0.0)
CEO from outside	-	9.3***	6.9***	6.3***
		(0.8)	(0.7)	(0.7)
Fraction of executives appointed	-	-	0.5***	0.5***
in the year foll. CEO nomination (×100)			(0.0)	(0.0)
Ln(Firm Age)	-	-	-	-1.0**
				(0.5)
Firm Size	-	-	-	-0.0
				(0.2)
48 industry dummies	No	No	No	Yes
Year dummies	Yes	Yes	Yes	Yes
R^2	0.25	0.62	0.71	0.73
Observations	11,147	8,728	8,728	8,166

Source: OLS estimates, allowing for heteroskdastic residuals, clustered at the firm level. The fraction of executives appointed after the CEO is regressed on various variables suspected to be mechanically correlated: column 1 controls for the fact that the CEO is an outsider, the CEO seniority, as well as for the mean seniority of executives; column 2 adds the number of executives appointed in the first two years following the CEO nomination; column 3 adds firm specific control, namely Firm Size as measured by log of Asset, log of Firm Age and the 48 Fama French industries. *, ** and *** means statistically different from zero at 10,5 and 1% level of significance. Our Internal Governance Index is defined as the residual of column (2) regression.

where Y_{it} measures corporate performance (ROA, market to book value of assets). IG_{it-1} is our measure of internal governance, lagged one period.[8] We include two sets of controls. First, the mechanical correlates of our index are included since it may be argued that they directly affect corporate performance (CEO tenure, mean executive

[8]We seek to partially avoid obvious simultaneity biases, such as the ones we discuss below. As it turns out, our results are insensitive to the time-lag used.

Figure 2.1: Abnormal Economic Performance by Quintile of Governance Index



seniority, share of executive hired right after the CEO, a dummy indicating if the CEO is an insider or not). However, we must bear in mind that, because of the Frisch Waugh theorem, their inclusion does not affect our estimate of β (the IG index is by definition orthogonal to these variables, so they do not create any "omitted variable bias"). Secondly, we add firm level controls that are traditionnally strong correlates of performance: log(firm age+1), log(assets), year dummies, and 48 Fama-French industry dummies. Since we have several observations per firm (corresponding to different years), and because IG_{it} is strongly persistent, it is likely that the ε_{it} are not independent from different observations of the same firm i. Hence, we correct for this form of heteroskedasticity by looking at Hubert-White-Sandwich estimates.

The sample correlation between performance and the IG index is strong and stable across years (results available

Table 2.2: Accounting Performance and Internal Governance

	Return on Assets (×100)			Market to Book		
Explanatory variables	(1)	(2)	(3)	(1)	(2)	(3)
Internal governance index	-7.1***	-7.3***	-3.7***	-0.6***	-0.6***	-0.4**
(delayed by 1 year)	(1.5)	(1.5)	(1.2)	(0.2)	(0.2)	(0.2)
	[-1.1]	[-1.1]	[-0.6]	[-0.1]	[-0.1]	[-0.1]
Controls:						
Firm initial profitability	No	No	Yes	No	No	Yes
CEO, Executive characteristics	No	Yes	Yes	No	Yes	Yes
Firm log(assets), log(age)	Yes	Yes	Yes	Yes	Yes	Yes
Year, Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Source: Huber-White-Sandwich estimates, allowing for correlation of all observations of a given firm. "Internal Governance Index" is the share of EXECUCOMP executives who joined the company after the CEO was appointed, filtered from mechanical effects. It is defined as the residual of the column (3) regression in table 2.1. Corporate performance is measured through Return on Assets (first three columns) and through market valuation of assets (last three columns). All regressions use log(book assets), log(firm age), year dummies and the 48 Fama French industry dummies. In columns 2 and 5, we add the CEO and executives characteristics that serve as regressors in table 2.1. Column 3 (resp. column 6) further adds the firm's ROA (resp. market to book) computed in its first year of presence in COMPUSTAT after 1991, as a limited attempt to control for firm level unobserved heterogeneity. *, ** and *** means statistically different from zero at 10,5 and 1% level of significance. The term reported in brackets is the marginal effect of one standard deviation change in governance index on the dependent variable.

from the authors). Multivariate regression results are reported in Table 2.2. Columns 1 to 3 use ROA as dependent variable in equation (2.2); columns 4 to 6 use market to book value of assets.[9] Columns 1 and 4 report regression results only with firm level controls, and columns 2 and 5 include the mechanical correlates of the index. As expected, the difference is negligible, and stems from the fact that the sample on which the index is estimated (Table 2.1, column 3) is slightly different from the sample used for the performance regressions (2.2). Columns 3 and 6 further control for initial performance, as a limited attempt to control for fixed effects.[10] Each time, our index of governance is significantly and robustly correlated with performance: a one standard deviation increase in IG results in a decrease of about 1.5 ROA percentage point and about 10% of market value of assets. The explanatory power of this effect is not very large (some 10% of standard deviation of the explained variable), but, as we will see, it is consistently significant and easily surpasses the usual "external" corporate governance measures. Also, the small size of our coefficients should not surprise us given the noise of our internal governance measure FRAC1 (see section 2.1).

2.3.2 Robustness Checks and Causality

Table 2.3 checks whether the performance-IG correlation reported in Table 2.2 is driven by any particular subperiod. In this table, we report, for both measures of corporate performance, the point estimate of β in (2.2) where internal governance is measured by IG, including both firm level and mechanical controls as in columns 2 and 5 of table 2.2, except that one regression is run for each year. As it turns out, the point estimate is fairly stable across periods and significant in most years. As a consistency check, we verified that we get similar magnitudes and significance levels by regressing directly on FRAC1, our unfiltered measure of internal governance, rather than on our internal governance index.

There are many stories consistent with the relation between IG and performance found in Tables 2.2 and 2.3. Our favored interpretation is that strong internal governance is a way for shareholders to "hold the CEO on a tight leash" and prevent the CEO from undertaking "crazy" projects or building an empire. One could argue, however, that the causality runs in the opposite direction: declining performance may actually trigger an increase in IG (a drop in our measure of internal governance). One plausible story could be based on management turnover. In most firms, poor performance triggers a change in the management team. In this scenario, internal governance worsens *because* performance declines, not the contrary.

[9] Similar results are obtained with Return on Equity, but we did not report them because of space limitation.

[10] We have also run, but not reported, regressions of corporate performance on FRAC1, the fraction of executives hired after the CEO took office, as well as various controls. FRAC1 turned out to be highly significant in all specifications we tested. This is not surprising by virtue of Frisch Waugh theorem.

Table 2.3: Accounting Performance and Internal Governance - Year by Year Results

	ROA	Market To Book
1993	-9.1***	-0.4
	(3.0)	(0.4)
1994	-9.9***	-0.9***
	(3.5)	(0.3)
1995	-10.3***	-0.5
	(2.7)	(0.3)
1996	-10.6***	-0.5*
	(2.6)	(0.3)
1997	-5.3**	-0.8***
	(2.3)	(0.3)
1998	-9.7***	-1.1***
	(2.4)	(0.3)
1999	-5.9***	-0.9***
	(2.3)	(0.3)
2000	-7.1***	-0.8**
	(2.6)	(0.3)
2001	-3.8	-0.2
	(2.6)	(0.3)
2002	-5.2**	-0.3
	(2.4)	(0.3)
Fama-Mac Beth	-7.7***	-0.6***
	(0.8)	(0.1)

Source: OLS estimates. Regressions of corporate performance on internal governance index and controls are run separately each year. The coefficients on internal governance and their standard error are reported. Each column corresponds to the choice of one corporate performance measure (ROA or M/B). Corporate performance is then regressed on one-year-lagged internal governance index, controlling for CEO and executive seniority, fraction of executives reporting seniority, CEO's origin, log(assets), log(firm age), sales growth and 48 industry-dummies. The specification is identical to the regression presented in table 2.2, columns 2 and 5. The bottom row indicates the Fama-Mac Beth estimate. *, ** and *** means statistically different from zero at 10,5 and 1% level of significance.

While we have no "smoking gun" to assess the causal relation between internal governance and corporate performance, we can at least take two preliminary steps to reduce the likelihood of reverse causation.

First, we look at the joint dynamics of internal governance and corporate performance. Do changes in corporate performance happen before or after changes in internal governance? To test these two hypotheses, we run the following two regressions:

$$Y_{it} = \alpha + \beta IG_{it-L} + \gamma Y_{it-L} + controls_{it} + \varepsilon_{it} \quad (2.3)$$

$$IG_{it} = a + bIG_{it-L} + cY_{it-L} + controls_{it} + \varepsilon_{it} \quad (2.4)$$

where we use one and two year lags ($L = 1, 2$) and Y_{it} is the firm's corporate performance at date t. If changes in corporate performance tend to lead changes in IG, we should not be able to reject that $c > 0$ and $\gamma = 0$. Such a test can be thought of as the panel data version of causality tests *à la* Granger in time series analysis.

Estimates of equations (2.3)-(2.4) are reported in Table 2.4. All regressions include firm level controls (age, size, year and industry dummies). Column (1) reports the estimates of β and γ of equation (2.3), while column (2) reports the estimates of b and c from (2.4). The top panel reports the regression results assuming $L = 1$. The bottom panel assumes $L = 2$. The results suggest that, in general, changes in internal governance happen *before* changes in corporate performance as estimates of c are never significantly different from zero, while estimates of β are.

Another endogeneity concern, which is not ruled out by our time-series evidence is the following: executives might tend to leave companies when they anticipate poor performance (for example because they want to avoid the danger of getting fired). If executives have private information on future performance, IG would rise *before* performance declines, but without being the cause of decline. One justification for such anticipation effects is that executives can observe the CEO's ability, or the evolution of the firm's markets, before they materialize in corporate accounts.

As a consequence, our IG index might be simply proxying for executive turnover, which would itself be a predictor of performance decline. We thus add to equation 2.2 the fraction of executives that left the firm in the previous year as a control. This turnover control is constructed as the fraction of the firm's year $t-1$ executives who are no longer reported as working for the company at year t in the EXECUCOMP data. To be fair, they can drop out of our sample either because they are no longer employees of the company, or because they do not belong any more to the most paid employees of the company. But this is as far as EXECUCOMP allows us to go to measure executive departure. Controlling for such measure of executive turnover means that we compell the identification

Table 2.4: Accounting Performance and Internal Governance - Granger Causality

	Internal Governance	ROA (×100)
One-year-lag specification:		
Internal governance index (-1)	0.8***	-1.8***
	(0.0)	(0.5)
ROA (-1)	-0.5	0.8***
(×100)	(1.3)	(0.0)
Two-year-lag specification:		
Internal governance index (-2)	0.7***	-2.0***
	(0.0)	(0.8)
ROA (-2)	-0.9	0.6***
(×100)	(2.4)	(0.0)
Controls :		
Firm log(assets),log(age)	Yes	Yes
Year, Industry FE	Yes	Yes

Source: Hubert-White-Sandwhich estimates, allowing for residuals correlated across all observations of each firm. In the top panel, column 1 reports the estimate of a regression of internal governance on one-year lagged internal governance and one-year lagged corporate performance. Column 2 reports the result of a regression of corporate performance on one-year lagged internal governance and one-year lagged corporate performance. Both regressions control for firm age and size, industry and year fixed effects. The bottom panel reports the same regression results, taking two-year-lags as explanatory variables, instead of one-year-lags. Corporate performance is measured through Return on Assets. Standard errors are between parentheses. *, ** and *** means statistically different from zero at 10,5 and 1% level of significance.

of the coefficient on our IG index to rely exclusively on the comparison between the year the CEO started his/her tenure, and the year top execs started to work for the firm.

We present the new estimation results in 2.5, using the same firm level controls as in 2.2. As it turns out, executive turnover indeed has a significant negative impact on firm performance, confirming the idea that unexepectedly high executive turnover is an early sign of bad performance. Nevertheless, adding this control does not affect the magnitude and significance of the impact of our internal governance measure on performance, either measured as

ROA or Market to Book. Overall, Table 2.4 and Table 2.5 point toward a causal link going on from high Internal Governance to bad performance.

Table 2.5: Accounting Performance and Internal Governance - Controlling for Executives Turnover

	ROA	Market to Book
Explanatory variables	(1)	(2)
Internal governance index	-2.2^{***}	-0.3^{***}
(delayed by 1 year)	(.56)	(.09)
	[-.4]	[-.05]
Controls:		
Executives Turnover	-3.1^{***}	-0.2^{***}
at year t-1	(.66)	(.08)
	[-.5]	[.-03]
Firm initial profitability	Yes	Yes
CEO, Executive characteristics	Yes	Yes
Firm log(assets), log(age)	Yes	Yes
Year, Industry FE	Yes	Yes

Source: Huber-White-Sandwich estimates, allowing for correlation of all observations of a given firm. "Internal Governance Index" is the share of EXECUCOMP executives who joined the company after the CEO was appointed, filtered from mechanical effects. It is defined as the residual of the column (3) regression in table 2.1. Corporate performance is measured through Return on Assets (first three columns) and through market valuation of assets (last three columns). Executive Turnover at year $t-1$ measures the fraction of the firm's year $t-1$ executives who are no longer reported as working for the company at year t in the EXECUCOMP data. All regressions use log(book assets), log(firm age), year dummies, the 48 Fama French industry dummies, CEO and executives characteristics, and firm's initial ROA (resp. market to book) computed in its first year of presence in COMPUSTAT after 1991. *, ** and *** means statistically different from zero at 10,5 and 1% level of significance. The term reported in brackets is the marginal effect of one standard deviation change in governance index on the dependent variable.

2.4 Internal Governance and Acquisitions

To test whether internal governance increases the quality of the firm's strategy by constraining the CEO in his choices, a natural place to look is at the firm's acquisition policy. There is substantial debate among financial economists as to whether long-run acquisition returns are positive or negative for the acquiring firm. Loughran and Vijh (1997) find that the returns to long-run investors in acquiring firms are on average negative, in particular when the deal is financed with stock issues. Mitchell and Stafford (1999), among others, criticize their estimates, partly because post acquisition returns tend not to be independent events, as acquisitions generally cluster around stock market booms. The main problem with this literature is that there is considerable heterogeneity among types of acquisitions and their performance. Thus, financial economists lose substantial information on their entire distribution by focusing on average returns and average profitability. In attempt to reduce this heterogeneity, some recent papers have outlined the size of acquisitions as a key factor for success or failure (Moeller, Schlingemann, and Stulz (2005), Bradley and Sundaram (2004)). The evidence they present is consistent with "small" acquisitions as value-creating, and large ones as value-destroying. Following up on these papers, we look at the effect of internal governance on shareholder losses (gains) in large acquisitions.

But before looking at gains, we first focus on the relation between internal governance and acquisition *policy*. We find that firms with good internal governance do not make fewer acquisitions and that their acquisitions do not correspond to smaller purchases. We follow Gompers, Ishii and Metrick (2003), and use SDC to compute, for each firm-year of our EXECUCOMP extract: (1) the number of deals of more than $10 million in value and (2) the overall amount of all deals struck within the year (the sum of all transaction values if there are several deals), normalized by the acquirer's market capitalisation. None of these measures of acquisition intensity proved to be correlated with our IG-index. Moreover, we find that the IG index is not correlated with the number of *past* acquisitions, which means that selecting firms with poor internal governance does not select "serial acquirers."

We then turned to the impact of internal governance on acquisition *quality*. As argued above, we focus on large acquisitions (whose value exceeds $300 million $). To measure the performance of acquisitions, we first follow Loughran and Vijh (1997) and focus here on the acquirer's long term abnormal stock returns, which we compute using a four factor pricing model (the Fama-French (1996) three factors plus Carhart's (1997) momentum factor) estimated *at the firm level* in the 48 months preceeding the acquisition. We restrict ourselves to the 1993-2002 period, in order to be able to use EXECUCOMP information.

We split the sample of transactions into two parts (each comprising some 400 deals): deals where the acquirer

Table 2.6: Long Run Abnormal Returns Following a Major Acquisition

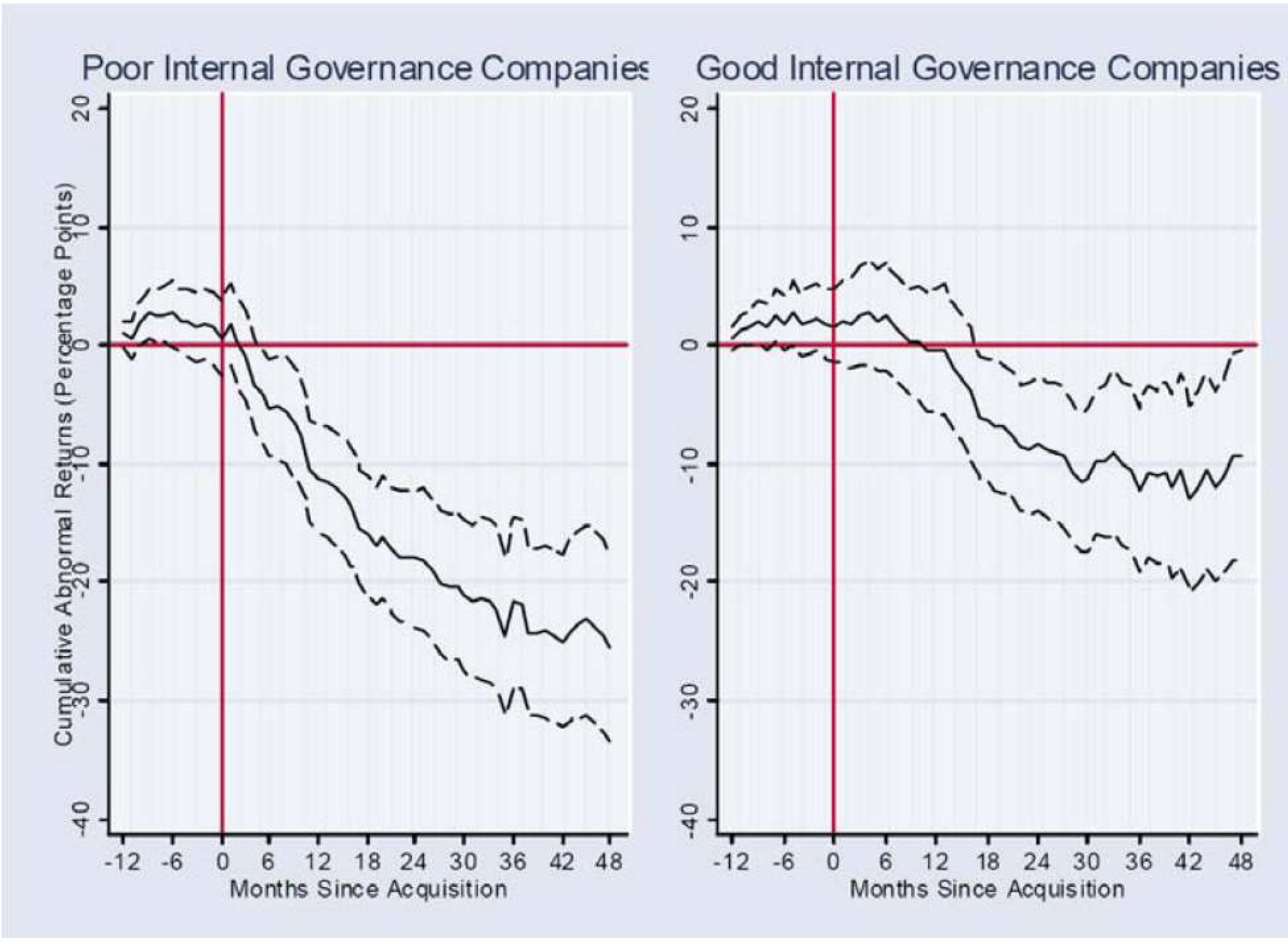
	Internal Governance			External Governance		
	Poor	Good	Difference	Poor	Good	Difference
Months since acquisition						
-12	-	-	-	-	-	-
-6	2.7	1.9	-0.8	1.7	1.6	-0.1
0	0.6	1.6	1.0	1.0	1.2	0.3
+6	-5.3	2.5	7.8***	-3.3	0.6	3.9
+12	-11.4	-0.4	10.9***	-5.5	-2.8	2.7
+18	-16.0	-6.4	9.6***	-11.8	-4.5	7.3**
+24	-18.0	-8.4	9.6**	-15.1	-5.3	9.7**
+30	-21.2	-11.4	9.8**	-14.0	-9.0	4.8
+36	-21.7	-12.3	9.4*	-14.3	-11.3	3.0
+42	-25.0	-12.9	12.0**	-14.2	-14.8	-0.6
+48	-25.4	-9.4	16.2***	-11.8	-15.3	-3.5

Source: 818 acquisitions from SDC Database. Abnormal returns are computed after estimating, for each acquirer, a Fama French 3 factor model + momentum on the 48 months preceeding the acquisition. Cumulative abnormal returns, starting 12 months before the deal, are computed for each firm. Column 1 reports, every 6 months, the average cumulative abnormal returns of acquirers with internal governance lower than median. Column 2 does the same for above median internal governance acquirers, while column 3 reports the difference. *, ** and *** means statistically different from zero at 10,5 and 1% level of significance, using a standard test of equality, assuming away the equality of variances.

has above-median IG index (poor internal governance), and deals where the acquirer has below-median IG index (good internal governance) in the year preceding the acquisition. Columns 1 and 2 of Table 2.6 report, separately for good and poor internal governance acquirers, the average cumulative abnormal returns, starting 12 months before the deal up to 48 months after the deal. Column 3 reports the difference in cumulative returns, and tests for the equality of average returns using a standard t-test, without assuming equality of variances. Figure 2.2 plots cumulative abnormal returns for each month, separately for poor (left panel) and good (right panel) internal governance acquirers.

We find that firms with poor internal governance make largely underperforming acquisitions. Four years after the acquisition, firms with good internal governance have on average lost some 15% of shareholder value, which is significantly different from zero. However, firms with poor internal governance have lost almost 30%, which is both significantly different from zero and from the wealth lost by long term shareholders of well governed firms.

Figure 2.2: Long-Run Returns From Acquisitions: Good vs Poor Internal Governance



This difference is robust to (1) the way we split the sample, on condition that each contains enough observations in each category (good/poor governance) and (2) to the pricing model (results are almost similar when we omit the momentum factor; they are somewhat noisier, but still point in the right direction if we use the CAPM or if we merely substract the market return from stock returns).

As a robustness check, we then look at the significance of our results using a calendar time portfolio method as recommended e.g., by Mitchell and Stafford (1997). This method addresses the critique that, due to their time overlap, post-event returns are not independent. Another problem is that measurement errors inherent in the computation of individual abnormal returns are compounded by calculating cumulative returns.

For our sample of acquisitions, we therefore construct two equally weighted portfolios of firms that completed at least one acquisition within the last n months. The first portfolio is long in acquirers whose internal governance index one year prior to the acquisition is below-median (the "good internal governance" portfolio). The second portfolio is long in acquiring firms with above median IG index (the "poor internal governance" portfolio). Both portfolios are therefore rebalanced each month as acquirers whose deal occurred more than n months ago leave and new acquirers enter. Let $R^P_{n,t}$ (resp. $R^G_{n,t}$) be the monthly return of the poor (resp. good) internal governance portfolios.

We then estimate the abnormal returns of the two portfolios with a four-factor asset pricing model (the three Fama French factors plus the momentum factor, all available from the Kenneth French website). We also estimate the abnormal returns of a portfolio that is long in good internal governance, and short in poor internal governance acquirers, as in equation (2.7):

$$E\left(R^G_{n,t} - Rf_{n,t}\right) = \alpha^G_n + \beta^G_n (Rm_t - Rf_t) + s^G_n .\ SMB_t + h^G_n .\ HML_t + u^G_n . UMD_t \quad (2.5)$$

$$E\left(R^P_{n,t} - Rf_{n,t}\right) = \alpha^P_n + \beta^P_n (Rm_t - Rf_t) + s^P_n .\ SMB_t + h^P_n .\ HML_t + u^P_n . UMD_t \quad (2.6)$$

$$E\left(R^G_{n,t} - R^P_{n,t}\right) = \alpha^{G-P}_n + \beta^{G-P}_n (Rm_t - Rf_t) + s^{G-P}_n .\ SMB_t + h^{G-P}_n .\ HML_t + u^G_n . UMD_t \quad (2.7)$$

The intercepts of these regressions α^G_n, α^P_n, and α^{G-P}_n represent the average monthly abnormal returns, given the model. These "alphas" are reported in Table 2.7, for $n = 12$, 24, 36 and 48 months. First, notice that the long-run abnormal returns of all acquisitions (which we report as a benchmark in the first line of Table 2.7) are slightly positive and marginally significant, in contrast with the results of long run stock returns, which are negative and significant. This discrepancy is at the heart of the methodological controversy on long-run stock return studies.[11]

When we sort by internal governance value, results confirm our cumulative abnormal returns analysis: Abnormal returns to good internal governance firms after major acquisitions are positive and significant (some 0.5% per month) within 1, 2, 3 or 4 years following the deal announcement. They are small and insignificant for poor internal governance firms. Our long-short portfolio's alphas are positive and significant when the selection window

[11] When looking at three year returns on acquiring firms, Mitchell and Stafford (2000) find an equal weighted monthly alpha of -0.2%, which is statistically significant. The difference between our result and theirs may stem from the time period chosen (we look at 1993-2002, while their time frame is 1961-1993). Another possibility is that firms are selected on the basis of their belonging to EXECUCOMP (we will return to this issue below). This, however, should not affect the *comparison* between poor and good governance firms.

Table 2.7: Post Acquisition Alphas of Acquiring Firms: Sorted by Internal Governance

	Equal weights			
	0 - 12	0 - 24	0 - 36	0 - 48
All acquisitions	0.3	0.2	0.3	0.3
	(1.3)	(1.4)	(1.6)	(1.9)
Longs Good IG	0.5	0.5	0.6	0.6
	(2.3)	(2.6)	(3.1)	(3.3)
Longs Poor IG	0.1	-0.0	-0.0	-0.0
	(0.4)	(0.1)	(0.2)	(0.0)
Good IG - Poor IG	0.5	0.5	0.6	0.6
	(1.4)	(1.9)	(2.5)	(2.5)

Source: CRSP, Compustat and Execucomp over 1993-2002. This table reports the monthly alphas, in percentage points, of various portfolios, estimated using the Fama French 3 factor model, augmented with the momentum factor (UMD). The first line presents the monthly alphas of equal-weighted portfolios of firms who made a significant acquisition less than 12, 24, 36 and 48 months ago. The second line looks at the portfolio of past acquirers whose level of internal governance was above median, before acquisition. The third line looks at the portfolio of past acquirers whose level of internal governance was below median, before acquisition. The fourth line looks at the portfolio long in high governance acquirers and short in low internal governance acquirers. T-statistics are between brackets.

is sufficiently large (last 24, 36 or 48 months), and less so in the short run (last 12 months). This is to some extent consistent with evidence from Table 2.6, where the difference in value destroyed widens over time.

2.5 External Versus Internal Governance

We have shown that our measure of "internal governance" correlates well with (1) overall corporate performance and (2) the efficiency of some crucial strategy choices (acquisitions). However, one possible story consistent with such evidence is that we are proxying for corporate governance in the "traditional" sense: firms with weak shareholders, weak boards and imperial CEOs could also be the ones where the CEO has all the power to appoint faithful executives. Hence, a well-entrenched CEO is more likely to replace executives who do not show sufficient loyalty, which makes our IG index rise. At the same time, weak boards do not have the means to oppose large, wasteful acquisitions.

This alternative story puts external governance back to the fore: when "external" governance is poor, the firm performs less well, and most executives have had less time on the job than the CEO. If this were true, however,

Figure 2.3: Cumulative Returns on Portfolios Sorted by Internal Governance Index

the existing literature on “external” governance would have had no trouble in finding a positive statistical relation between corporate performance and measures of governance quality. Existing contributions have repeatedly failed to find a positive correlation between the share of outsiders in the board and profitability (see Baghat and Black (2003), and also Hermalin and Weisbach (2003) for a survey). Using corporate charter-based governance measures, Gompers, Ishii, and Metrick (2003) do not find a consistent correlation between investor-friendly firm-level institutions and operating performance. Thus, the available evidence casts doubts on internal governance as a proxy of external governance in our regressions.

We look directly at the correlations between our measure of internal governance and some measures of “external” governance that are used in the literature. To do this, we regress our internal governance index on (1) the Gompers-

Ishii-Metrick index of governance, which takes large values for management-friendly corporate charters, (2) the fact that the CEO is also the chairman of the board, which measures the CEO's degree of power on the board (see, for example, Adams, Almeida and Ferreira (2004)), (3) the size of the board (Yermack (1996) shows that firms with large boards are less efficient), (4) the share of current employees, and (5) of past employees as corporate directors. The first measure is available for a subset of our main sample - the largest firms. The second measure is available for our whole sample as it is extracted from EXECUCOMP. The third, fourth, and fifth measures are extracted from IRRC's boards and directors database and so available only for a subsample of our main dataset.

Overall, the evidence is not consistent with internal governance being a proxy of external governance. Regression results, controlling for both firm level variables and mechanical correlates of IG, are reported in Table 2.8. Columns 1-3 include the external governance indexes separately, while column 4 combines all of them. Some results point slightly toward a correlation between the two governance measures. Our index is correlated with the charter based GIM index (the coefficient is small and significant at 5%). Also, internal governance is worse when the CEO is chairman, suggesting that CEOs who are powerful inside the firm are also powerful in the boardroom. The only other significant relation is more surprising: internal governance turns out to be better when there are more employees sitting on the board of directors. The literature on independent directors reports this correlation: it is usually interpreted as evidence that bad performing firms tend to appoint outsiders on the board (Hermalin and Weisbach (2003), Kaplan and Minton (1994)). One other, more daring, interpretation of this negative correlation between internal and external governance is the following. The particularity of these board members (employees) is their intimate knowledge of human capital and the power struggles within the firm. Insiders sitting on the board therefore have enough information about the competence of executives to efficiently interfere with the CEO in the nominating process. By preventing the CEO from appointing new subordinates, they enforce a good level of internal governance. This interpretation does, however, reverse the conventional wisdom on employee-directors.

Table 2.8 suggests there might be some weak correlation between internal and external governance. We thus provide new estimates of equation (2.2) in Table 2.9 including an external governance measure as further control. Columns 1-3 focus on ROA as a measure of performance, while columns 4-6 look at the effects on the market valuation of assets. Columns 1 and 4 include the GIM index only, and the firm controls and mechanical correlates of (2.2). Columns 2 and 5 add our internal governance IG index. Columns 3 and 6 include the other external governance indexes.

Consistent with Gompers, Ishii and Metrick (2003), the GIM index is negatively correlated with market to book,

Table 2.8: Are Internal and External Governance Related ?

	Internal Governance Index (×100)			
	(1)	(2)	(3)	(4)
GIM Governance index	0.3**	-	-	0.1
	(0.2)			(0.2)
CEO is Chairman		2.0**	-	0.4
		(0.9)		(1.2)
Board size	-	-	-0.2	-0.1
			(0.2)	(0.2)
Frac directors	-	-	-11.5***	-8.5*
who are current employees			(3.7)	(4.4)
Frac indep. directors	-	-	0.2	1.5
who are former employees			(4.9)	(5.6)
CEO/Firm controls	Yes	Yes	Yes	Yes
48 industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	4,734	7,432	3,447	2,610

Source: OLS estimates, allowing for heteroskdastic residuals. Internal governance index (see table 2.1) is regressed on various corporate governance indicators, controlling for log(assets), log(firm age), sales growth, 48 industry-dummies, year fixed effects, CEO tenure and executive seniority. Columns 1 to 4 add various corporate governance controls. Column 1 uses the (mostly) corporate charter-based corporate governance index from Gompers, Ishii and Metrick (2003). Column 2 uses the number of directors on the board as a measure of board effectiveness. Columns 3 uses two classical measures of board dependence to the CEO: the share of currently employed directors and the share of past employees. Column 4 uses all four measures simultaneously. *, ** and *** means statistically different from zero at 10,5 and 1% level of significance.

Table 2.9: Internal Versus External Governance

	Return on Assets (×100)			Market To Book		
	(1)	(2)	(3)	(1)	(2)	(3)
Internal governance	-	-6.9***	-5.7***	-	-0.87***	-0.88***
(delayed by 1 year)		(1.9)	(2.3)		(0.26)	(0.33)
GIM governance index	-0.1	-0.1	-0.0	-0.02*	-0.02	-0.00
	(0.1)	(0.1)	(0.1)	(0.01)	(0.01)	(0.02)
CEO = Chairman	-	-	0.2	-	-	-0.21*
			(0.8)			(0.11)
Board size (# directors)	-	-	-0.1	-	-	-0.02
			(0.1)			(0.02)
% Directors currently	-	-	7.4***	-	-	-0.49
employed			(2.7)			(0.41)
% Directors previously	-	-	3.3	-	-	-0.51
employed			(3.7)			(0.50)
Firm/CEO controls	yes	yes	yes	yes	yes	yes
Year effects	yes	yes	yes	yes	yes	yes
48 Industry effects	yes	yes	yes	yes	yes	yes
Observations	4,634	3,933	2,274	4,416	3,495	1,977

Source: Huber-White-Sandwich estimates, allowing for correlation of all observations of a given firm. The measure of internal governance is the share of EXECUCOMP executives who joined the company after the CEO was appointed. Corporate performance is measured through Return on Assets (first three columns) and through Return on Equity (last three columns). All regressions use as controls: CEO and executive seniorities, sales growth, log(book assets), log(Firm age), year dummies and the 48 Fama French industry dummies. Columns 1 and 4 use the corporate charter based corporate governance index from Gompers, Ishii and Metrick (2003). Columns 2 and 5 use the number of directors on the board as a measure of board effectiveness. Columns 3 and 6 use two classical measures of board dependence on the CEO: the share of current and past employees serving as directors. The limited availability of corporate governance data is responsible for the drop in observation number. *, ** and *** means statistically different from zero at 10,5 and 1% level of significance.

but not with operating performance. However, this correlation with market to book disappears once we include the index of internal governance. To be fair, the coefficient estimate becomes noisier, but not smaller, partly because the number of observations where our index and the GIM index overlap is less than 5,000. Notice that in columns

2 and 5, the coefficient on internal governance is identical to some results in Table 2.2.

Finally, the inclusion of the other external governance indexes shows that (1) most are not really correlated with corporate performance, which is consistent with the existing literature, (2) the share of inside directors is *positively* correlated with performance and (3) the effect of our index remains unaffected by the inclusion of these controls, even though they considerably reduce the sample size.

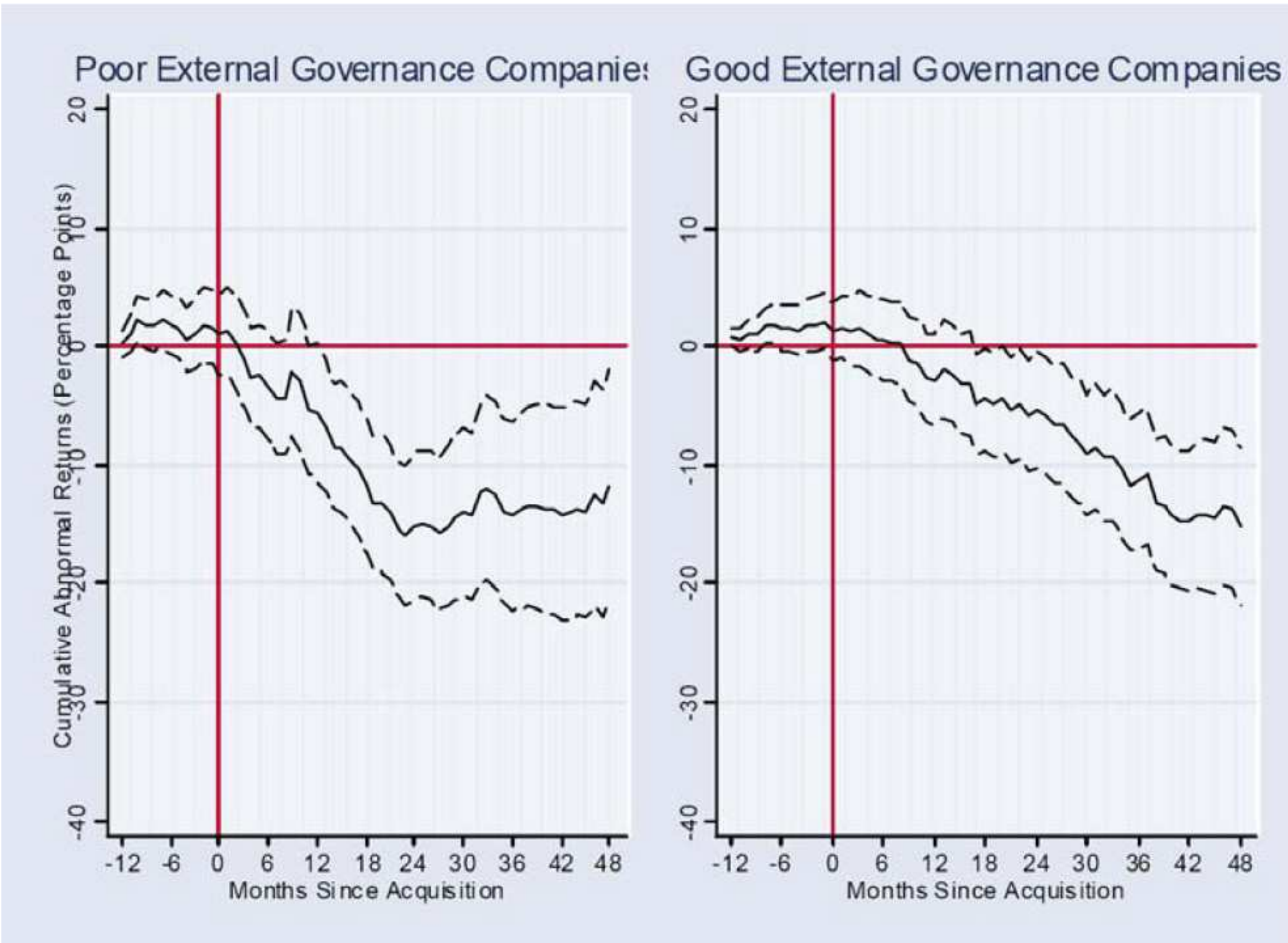
Before concluding, we run a similar horse race between external and internal governance for our acquisition returns results. The simplest way to do this is to ask whether after an acquisition, the long-run stock returns of acquirers with poor external governance underperform those of acquirers with good external governance. To do this, we repeat the exercise in section 2.4 by computing long-run cumulative abnormal returns for acquirers with an above- and below-median GIM index. Average long-run returns are reported in columns 4-6 of Table 2.6, as well as in figure 2.4. Column 4 displays returns to long-term shareholders of management-friendly companies, column 5 does the same for shareholder-friendly companies. Column 6 computes the difference, and tests for equality. As is apparent from both the Table and the figure, the two subgroups display strong negative returns for large acquisitions (10-15% after four years); the difference between them, however, is small and insignificant statistically.

2.6 Conclusion

This paper argues that the careful design of the chain of command *within the firm* affects the efficiency of the decisions that are taken. Our informal argument is that independently-minded executives always impose more constraints on the CEO than executives who owe him their jobs. These constraints may prevent controversial decisions from being taken, and have in general the useful effect of de-biasing the CEO. To do this, top executives do not have to formally disobey, or enter in open conflict with their boss: they may simply choose to be less enthusiastic in their work. Such an argument is explored theoretically in a companion paper (Landier, Sraer and Thesmar (2007)).

We believe an important contribution of this paper is to exhibit an organizational firm-level variable with strong systematic predictive power on future performance. Accordingly, we also believe that our study has important normative implications for practioneers of corporate governance and firm organization. First, our statistical analysis proves that the intensity of internal governance can be at least partly observed in existing datasets and could be included in the various indexes of the quality of a firm's corporate governance. This implication does not depend on our interpretation of our results: be it the sign of executives "leaving the sinking boat", of an autocratic CEOs, or of the healthy discipline of having to convince one's subordinates, the share of independent executives as we measure it predicts performance. Furthermore, our paper suggests that, in addition to management monitoring and advising,

Figure 2.4: Long-Run Returns From Acquisitions: Good vs Poor External Governance



a key role of the board should consist in designing the optimal balance of power within the firm. Put otherwise, the human resource role of the board is not limited to the usually emphasized CEO succession problem.

Chapter 3

Optimal Independence in Organizations

> "*Workers do, and managers figure out what to do.*"
>
> F. Knight (1921)

3.1 Introduction

A key role of managers in organizations is decision making. Yet, as pointed out by Knight (1921), a project is rarely implemented by the manager who has selected it. This "separation of implementation and control" is not innocuous for decision making. "Implementers" may have intrinsic distastes over selected projects or may simply not adhere to the manager's vision for the firm. Such "natural" reluctance to carry out selected projects may not manifest as an open conflict, but rather as an under-provision of implementation effort. This paper explores theoretically the existence of such "implementation constraints" and relates them to organizational efficiency.

The insight that decision makers need to internalize Implementers preferences is well recognized in the practitioner management literature. Arguably, it is one of the key messages of Alfred Sloan's (1963) autobiography, "My Years with General Motors". In chapter 5, Sloan relates the story of the "copper-cooled engine" a project that raised the enthusiasm of GM's managers but failed to raise the support of the line-engineers in charge of implementing it. Their lack of motivation in implementing the innovation resulted in failure, at a very large cost for the company. Sloan quotes his own analysis of the situation in 1923, at the core of the crisis: "We feel that [...] forcing the divisions to take something they do not believe in [...] is not getting us anywhere. We have tried that and we have failed."

Surprisingly, this role of "implementers" as a constraint to decision making has not been explored in the theory of organizations. Of course, the idea that managers and their subordinates may have conflicting preferences is certainly not new to the economic literature. An extensive body of research has focused on the role of moral hazard in organizations, analyzing situations where "implementers" have private information about the effort they provide to exert a specific task (Calvo and Wellisz (1979)). Another strand of the literature has dealt with decision making problems in a principal-agent setting where the agent has private information about the "right" decision to make (see Simon (1957) and more recently Aghion and Tirole (1997) or Dessein (2002)). Finally, a last part of the literature has been trying to design mechanisms aiming at directly reducing the divergence in preferences in such decision making situations (by, e.g. defining a narrow strategy, as in Rotemberg and Saloner (1994), or a clear managerial vision, as in Van Den Steen (2004)). Whether studying decision making or task implementing problems, this entire literature shares the view that preference heterogeneity within the principal-agent relationship is, almost by definition, harmful to organizational efficiency: an efficient organization should always be made of "clones" of the principal.

However, preference heterogeneity may prove useful once one starts to acknowledge the "division of labor" among (1) those who make decisions and (2) those who have to implement them. We thus consider an organization of two employees with different functions: a Decision Maker (she) in charge of selecting a project, and an Implementer (he) in charge of its execution. Both individuals have intrinsic and possibly differing preferences over projects. Furthermore, there is an informational divide within the organization: on the one hand, the Decision Maker has superior information on the most likely successful project (because, e.g., she goes to meetings, conferences, and has access to confidential memos) ; on the other hand, the Implementer's provision of effort is not observable. The key feature of this set-up is that the Decision Maker has to anticipate the effort the Implementer is willing to provide on each particular project. An independent Implementer (i.e. an implementer with intrinsic preferences unrelated to those of the decision maker) is more likely to be reluctant to work on the Decision Maker's preferred project. Anticipating this, the Decision Maker has to use more "objective" information in her decision process and to take less account of her own preferences, which raises the organization's profitability.

This "implementation constraint" has in turn an important consequence on the Implementer's motivation. Because project's success matters for the Implementer, he is willing to provide more effort when he believes the Decision Maker is taking an informed decision and not a self-serving one. An independent Implementer – who knows that his mere presence increases the "objective" information used in the decision making process – holds stronger beliefs on the project's profitability, which makes him spend more effort on the project implementation.

Preferences' independence along the chain of command comes, however, at a cost. As the Decision Maker is more uncertain, by definition, about the nature of the independent Implementer's preferred project, she more often selects projects that are *ex post* disliked by these Implementers. Therefore, an independent Implementer is more often confronted with projects he does not have intrinsic preferences for, harming his motivation to execute the project. The trade-off we exhibit in this paper is therefore one between (1) more profitable, "objective", projects selected and (2) less intrinsically motivated agents *ex post*. As we show, when the Decision Maker's private information is sufficiently precise, the optimal organization features independent Implementers to provide her with incentives to use this information.

In our hierarchical setting, heterogeneity in preferences may therefore be beneficial to the organization, but for different reasons than in "horizontal" structures like committees or parliaments. In such structures, diversity might be desirable, as it allows individual biases to "cancel each others out". In the hierarchical organization we study, optimal independence emerges as a mechanism to make the "implementation constraint" more binding, which, under certain condition, is beneficial to organizational efficiency. This interaction between decision making and implementation is at the heart of the trade-off we highlight and allows us to derive interesting comparative static properties that could not be obtained in a more "horizontal" model.

Our work is related to some recent literature on organizational design, our main innovation being the study of independence in a "division of labor" framework. Zabojnik (2002) is the only paper to acknowledge the separation between decision making and implementation, but the organization he considers is composed with only extrinsically motivated agents and his focus is on the role of delegation of authority within the hierarchy. Dessein (2002) presents a model of communication between a principal and her agent in a pure decision making situation. As a result of this "task homogeneity", he obtains that communication is very inefficient, which stands in sharp contrast with our own results. Dewatripont and Tirole (2005) introduce a model of costly communication where homogeneity in preferences may be detrimental to organizational efficiency. While Dewatripont and Tirole focus, as we do, on the link between congruence and decision making, their theory relies on the potential free-riding issues that may appear between the sender and the receiver along the communication process. Another feature of our model is that it endogenizes the Decision Maker's credibility with respect to the Implementer. In signaling models (e.g. Hermalin (1997) in the organization literature and Cukierman and Tomasi (1998) in political economy), an informed principal often manages to send credible messages using some "money burning" devices. In our model, the ability to engage in credible message sending relies on the equilibrium organizational form: independent Implementers helps the Decision Maker to increase the informational content of her selection process, enhancing in turn her decision's credibility.

We finally discuss at length three applications of our theory. We first explore the current debate on "corporate governance". This debate has, so far, mainly focused on the role of boards of directors in improving corporate decision making. Yet, financial economists have found very little empirical evidence that directors affect firm behavior. Our analysis suggests that preferences heterogeneity within the chain of command – for instance between firm's CEO and its top executives – could be an effective device to improve performance, at least when private information held by the CEO matters for firm profitability.

Our paper also sheds light on the optimal degree of political independence of government agencies. The management literature suggests that government agencies should be as independent as possible from political power (see, for instance, Horn (1995)). Such a recommendation could be easily derived from our model, where the politicians (the Decision Maker of our model) is biased but has privileged information about social demand. The Implementer (the agency) can be either affiliated to the political power or be constituted as an independent organization. Our theory suggests that when social demand is critical to social welfare (e.g. field knowledge about the acceptance of reform), a neutral bureaucracy helps eliciting less biased reforms from the politicians.

We conclude our analysis by investigating the role of uncertainty in the model. This comparative static is motivated by the large managerial literature insisting on the vital need to organize firms for change. We investigate how a firm's optimal strategy relates to its environmental turbulence and whether change should come from the top or the bottom of the hierarchy. We do so by deriving an extension of the model where one of the project (the "status quo") is *a priori* more likely to be profitable than the other (the "change"). In a low-uncertainty environment, we find that firms' optimal organization should be "monolithic", i.e. composed of both pro- "status quo" Implementer and pro- "status quo" Decision Maker.

The remainder of the paper is organized as follows. Section 3.2 exposes the set-up of the model and discusses its different assumptions. Section 3.3 first explores the various equilibria of the decision making game and then turns to the question of optimal organization design. Section 3.4 highlights our key assumptions by doing various robustness checks on our hypotheses. Section 3.5 explores three applications of our theory in corporate governance, bureaucratic organization and product market turbulences. Section 3.6 concludes with leads for further research.

3.2 The Model

3.2.1 Set-Up

The organization belongs to an Owner who seeks to maximize expected profits. It has two employees: a Decision Maker (she) and an Implementer (he). The Decision Maker selects a project and the Implementer implements it.

Project Structure

There are two projects, labeled 1 and 2.[1] There are also two *equally likely* states of nature (θ), also labeled for convenience 1 and 2. Projects can either fail, in which case they deliver 0 to the firm's Owner, or succeed and deliver a profit R. The first condition for a project to be successful is that it is fits the state of nature: to be successful, project $i \in 1, 2$ must be selected when state of nature is i.

Once selected, a project must be implemented by the Implementer. There is moral hazard at the implementation stage: the Implementer has to choose an implementation effort e, which is assumed to be unobservable and discrete ($e \in \{0, 1\}$). Exerting high effort (i.e. $e = 1$) entails a private, non-transferable, cost $\tilde{c}$ to the Implementer. $\tilde{c}$ is random and is a priori distributed according to a c.d.f. $F(.)$. F is defined on $\mathbb{R}^+$ and is supposed to be *strictly increasing and concave* [2][3]. Moreover, as F is a c.d.f. function, we have that $F(0) = 0$. Finally, note that $F(.)$ is common knowledge.

We make the extreme assumption that project selection and Implementer's effort are perfect complements: to be successful, the effort level of the Implementer must be high ($e = 1$) *and* the good project must be selected (i.e., project i in state of nature i). This is done only to clarify exposition and without loss of generality so long as project selection and implementation effort are weak complements in the production function (an assumption similar to that made in Dewatripont and Tirole (2005)).

The Decision Maker has superior information on the state of nature. More precisely, we assume that she receives a binary private signal $\sigma \in \{1, 2\}$ on the state of nature, such that:

$$\mathbb{P}(\sigma = \text{“}i\text{''} | \theta = i) = \alpha > \frac{1}{2}, \text{ for all } i = 1, 2$$

While the signal σ is private information to the Decision Maker, its precision α is common knowledge.

Agents' Utilities

The Owner is risk-neutral and maximizes expected profit. To simplify exposition, we first assume that monetary incentives cannot be offered, because, for instance, agents are infinitely risk averse on the monetary part of their

[1] Our qualitative results do not depend on the number of possible projects. Anticipating our results below, we remark that, if there were more than 2 possible projects, it would still be the case that the Implementer and the Decision Maker may have conflicting intrinsic preferences on the project's set. This discrepancy would still compel the Decision Maker to assign a smaller weight to her own preferences and more weight to objective, private information. Thus, dissent would still foster organizational reactivity.

[2] An alternative modeling choice would consist in assuming that the Implementer exerts a continuous level of effort $e \in [0, 1)$, which yields, when the appropriate project has been selected (i.e. project i in state i), a probability of success e at a cost $C(e)$, where $C()$ is a convex, strictly increasing function defined over $[0, 1)$. Both modeling choice are equivalent. In particular, the assumption that F is concave is exactly equivalent to the assumption that $C'''() > 0$.

[3] The technical assumption that F is concave is not necessary for most of the analysis, but it helps us compute most of the comparative statics of the model (see below).

utility (as in Aghion and Tirole (1997)). Thus, the Decision Maker and the Implementer derive utility only from private benefits attached to the successful completion of a project. Discussion on monetary incentives is deferred to Section 3.4.2.

The Decision Maker obtains private benefit $\overline{B} > 0$ (resp. $\underline{B} > 0$) when her most (resp. least) preferred project is chosen and succeeds (with $\bar{B} > \underline{B} > 0$). When the project fails, *she receives no private benefit at all.* In order to fix ideas, but without loss of generality, *we will assume throughout the paper that the preferred project of the Decision Maker is project 1.* We also assume that it is public information that the Decision Maker prefers project 1.

The Implementer also obtains a private benefit $\bar{b}$ (resp. $\underline{b}$) when his most (resp. least) preferred project is chosen and succeeds. However, in case of project failure, he ends up with no private benefit.

Finally, we define a *congruence* parameter β as the *ex ante* probability that both Decision Maker and Implementer share the same preferred project (i.e. project 1). We interpret β as a measure of organizational homogeneity (or congruence of tastes). Organizational design by the organization's Owner boils down to the choice of β (except in sections 3.4.1 and 3.4.2 where we look at questions of delegation and wage contracting). Throughout the paper, we assume that, at the project selection stage, the Decision Maker ignores the Implementer's preferred project and only know the congruence parameter β.

Sequence of Events and Information Structure

The sequence of events has four stages:

1. **Organizational design**: The Owner of the firm chooses the level of congruence β, defined as the probability that the Implementer will, as the Decision Maker, prefer project 1. β then becomes public information.

2. **Decision making**: The Decision Maker receives her private signal σ, with precision α, about the state of nature. She then selects a project. This choice is assumed to be irreversible.[4] At the time of project selection, the Decision Maker knows β but ignores the Implementer's preferred project.

3. **Implementation**: The Implementer is hired and his preferred project, as well as his implementation cost $\tilde{c}$, are revealed. He has to implement the project selected in period 2, but can decide whether or not to exert effort.

[4]Because of time pressure, for instance, of because a large project-specific investment needs to be made in order to launch the project. The purpose of this assumption is to prevent the Implementer from communicating his preferences to the Decision Maker. It can be shown that such communication weakens, but does not destroy, the role of dissent. We return to this issue at the end of Section 3.3.3.

4. **Outcome**: The project either succeeds (yielding profit R to the organization and private benefits to the agents) or fails (profit and private benefits are then equal to 0).

The corresponding time line is drawn in Figure 3.1.

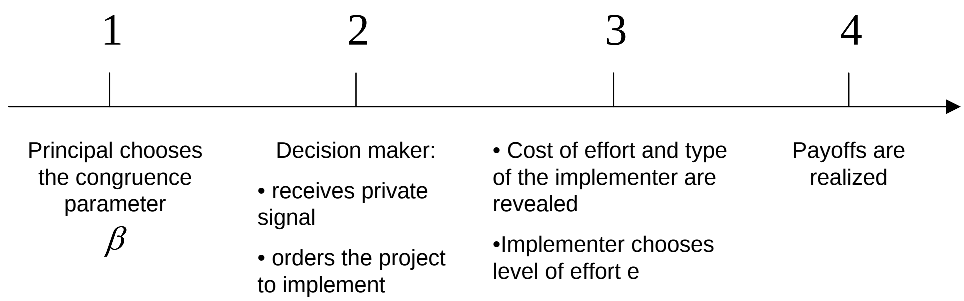


Figure 3.1: Timing of the model

3.2.2 Equilibrium Concept

We look for standard Perfect Bayesian Equilibria of our game. Formally, an equilibrium is defined by two equilibrium strategies (O, μ). $O()$ is the **Decision maker's selection process**, i.e. a function that maps the Decision Maker's private signal $\sigma \in \{1, 2\}$ into the project space $\{1, 2\}$:

$$O : \sigma \in \{1; 2\} \mapsto \{1; 2\}$$

$\mu()$ is the **Implementer's posterior belief function**, i.e. a function that maps the project selected by the Decision Maker into a probability that state of nature is 1:

$$\mu : O \in \{1; 2\} \mapsto \mathbb{P}(\theta = 1|O) \in [0, 1)$$

A perfect Bayesian equilibrium of the game is a couple (O, μ) that verifies:

1. **Individual rationality:** Given the Implementer's posterior belief function $\mu(.)$, $O\,(\sigma)$ maximizes the Decision Maker's utility for all $\sigma \in \{1, 2\}$.

2. **Bayesian updating:** The posterior $\mathbb{P}(\theta = O|O)$ is obtained using the order function $O(.)$, the Implementer's prior about state θ and Bayes' law.

Our model is therefore similar to a standard signaling game (see, e.g., Spence (1973)), with an informed principal (the Decision Maker who knows the true value of the signal) and an uninformed agent (the Implementer who does not observe this signal). As with general signaling games, there are many equilibria in our model if we do not impose any restrictions on the Implementer's ex post beliefs when an "unexpected" project is selected. The standard refinement of beliefs in the signaling literature is the notion of strategic stability, introduced by Kohlberg and Mertens (1986). We will use in this paper a weaker refinement, known as D1 (see Cho and Sobel (1990]), which is sufficient to identify a unique equilibrium in our basic model. Intuitively, the D1 refinement requires that if the Implementer observes an out-of-equilibrium project selection, he should believe this choice came from the type "most eager" to make the deviation. Therefore, our solution concept is Perfect Bayesian Equilibria refined by the D1 criterion.

3.3 Organizational Homogeneity affects Reactivity

This section derives conditions on the congruence parameter β for the existence of the various potential equilibria of our model. As usual in standard signaling games, we first assume equilibrium strategies and then find the conditions under which these strategies define an equilibrium as defined in section 3.2.2

Before turning to equilibrium strategies, we first look at the Implementer's effort choice (section 3.3.1), conditional on a given posterior belief and then derive the different equilibria of the model. Finally, we move to organizational design (section 3.3.4), i.e. we determine the level of congruence β that maximizes the Owner's profit.

3.3.1 Implementer's Effort Choice

In this section, we take as given the Decision Maker's selection process and the Implementer's posterior belief and focus on the Implementer's choice of effort. Therefore, let μ_1 (resp. μ_2) be the Implementer's posterior belief that the state of nature is 1 when the Decision Maker has selected project 1 (resp. 2). Consider the case where the Decision Maker selects project 1. If the Implementer's preferred project is project 1, he will put in high effort (i.e. $e = 1$) whenever:

$$\mu_1 \bar{b} - c \geq 0$$

However, if the Implementer's preferred project is project 2, he only exerts the high level of effort on project 1 when:

$$\mu_1 \underline{b} - c \geq 0$$

From an *ex ante* point of view, the Implementer should prefer project 1 with probability β. Thus, in period 2, at the decision making stage, the Decision Maker knows that high effort will be exerted on project 1 with probability:

$$\mathbb{P}(e = 1|O = 1) = \beta F(\mu_1 \bar{b}) + (1 - \beta)F(\mu_1 \underline{b})$$

High effort on project 1 is more likely to be exerted when (1) the Implementer believes 1 is the state of nature and (2) the Implementer is more likely to prefer project 1.

Similarly, selecting project 2 should result in the following probability of effort by the Implementer:[5]

$$\mathbb{P}(e = 1|O = 2) = \beta F((1 - \mu_2)\underline{b}) + (1 - \beta)F((1 - \mu_2)\bar{b})$$

3.3.2 The Decision Maker's Project Choice

We now derive the different equilibria of our model. As usual in standard signaling games, there are three types of equilibria: (1) a separating equilibrium, where the Decision Maker selects different projects for different signals received (2) a pooling equilibrium, where the Decision Maker selects the same project whatever the nature of her private information and (3) semi-pooling equilibrium, where the project selected only partially reveals the nature of the Decision Maker's private information. This section determines conditions on the congruence parameter β for the existence of these equilibria.

Reactive Equilibria

We start by looking for separating equilibria. In such an equilibrium, the Decision Maker will select a different project for each signal she receives. The natural candidate for such an equilibrium consists in the Decision Maker always selecting the project indicated by the signal, i.e. $O(\sigma) = \sigma$. Conditional on this strategy, the Implementer's equilibrium posterior beliefs are then uniquely determined by Bayes' rule:

$$\mu_1 = 1 - \mu_2 = \alpha$$

For this to be an equilibrium, there are two incentive constraints that need to be satisfied (i.e. the individual rationality constraints in state 1 and in state 2): when receiving signal i, $i \in \{1, 2\}$, selecting project i should maximize the Decision Maker's utility. Consider the first such incentive constraint, imposing that when facing a signal 2, the Decision Maker should prefer to select project 2:

[5] Remember that μ_2 is the posterior belief that 1 is the state of nature when project 2 has been selected, so that $1 - \mu_2$ is the posterior belief that 2 is the state of nature in this same situation.

$$\underbrace{\alpha}_{\text{Proba. of state 2}} \cdot \underbrace{\left(\beta F(\alpha \underline{b}) + (1-\beta) F(\alpha \bar{b})\right)}_{\text{Proba. of effort with order 2}} \cdot \underbrace{\underline{B}}_{\text{Low Decision Maker benefit}}$$
$$\geq \underbrace{(1-\alpha)}_{\text{Proba. of state 1}} \cdot \underbrace{\left(\beta F(\alpha \bar{b}) + (1-\beta) F(\alpha \underline{b})\right)}_{\text{Proba. of effort with order 1}} \cdot \underbrace{\bar{B}}_{\text{High Decision Maker benefit}} \quad (3.1)$$

This incentive constraint involves the following trade-offs. A priori, the Decision Maker's own preferences induce her to select project 1 instead of project 2 (as $\bar{B} > \underline{B}$). However, when the private signal indicates state of nature 2, project 2 becomes more likely to succeed, which makes project 2 more attractive for the Decision Maker (as $\alpha > 1-\alpha$). Finally, a more congruent Implementer will have higher incentives to exert effort on project 1, so that a higher congruence β will make the Decision Maker more likely to choose project 1. We stress that the Decision Maker's incentives to select project 2, conditional on having received signal 2, are always lower than that of the (unbiased) Owner. Indeed, the owner's incentive constraint would be exactly similar to that of an unbiased Decision Maker, i.e. similar to equation (3.1) with $\underline{B} = \bar{B} = R$. Such a constraint would clearly be less binding that constraint (3.1).

Overall, the above condition (3.1) simply states that the Implementer and the Decision Maker should not be too congruent if this "reactive" equilibrium is to hold. This condition is equivalent to:

$$\beta \leq \frac{\alpha F(\alpha \bar{b})\underline{B} - (1-\alpha) F(\alpha \underline{b})\bar{B}}{\left[F(\alpha \bar{b}) - F(\alpha \underline{b})\right]\left[(1-\alpha)\bar{B} + \alpha \underline{B}\right]} = \beta_2^\star \quad (3.2)$$

When congruence β is high, the Decision Maker finds it costly not to select project 1, as she anticipates that the Implementer is very likely to prefer this particular project. Such incentive to "pander" to the Implementer's preferences may be too strong to allow the reactive equilibrium to emerge (i.e. when $\beta \geq \beta_2^\star$). Note that in some cases, $\beta_2^\star$ as defined by equation (3.2) can be either superior to 1 or negative. For instance, when the signal is very informative (i.e. α close to 1), the Decision Maker is never willing to select a project different from the signal she received, as this would lead the organization to a certain failure so that $\beta_2^\star > 1$; similarly, when the low private benefit $\underline{B}$ tends to 0, the Decision Maker has no incentives to ever select project 2, so that $\beta_2^\star < 0$. With a slight abuse of notation, we define:

$$\beta_2^* \equiv \min\{1, \max\{0, \beta_2^*\}\} \quad (3.3)$$

The second incentive constraint is the symmetric of constraint (3.1): facing a signal 1, the Decision Maker must choose project 1 . From this condition emerges a different trade-off. When β is very low, it becomes very likely that the Implementer dislikes project 1 so that he has less incentives to provide effort on this project. Therefore, the Decision Maker may be tempted to ignore both her private signal *and* her own intrinsic preferences, that both provide her with incentives to select project 1, in order to conform to the Implementer's own inclination to project 2. Formally, the second incentive constraint is written as a lower bound on β:

$$\beta \geq \frac{(1-\alpha)F(\alpha\bar{b})\underline{B} - \alpha F(\alpha\underline{b})\bar{B}}{\left[F(\alpha\bar{b}) - F(\alpha\underline{b})\right]\left[\alpha\bar{B} + (1-\alpha)\underline{B}\right]} = \beta_1^\star \tag{3.4}$$

It may be the case that β_1^*, as defined in equation (3.4), is negative, when, for instance, the signal is very informative (i.e. α close to 1) or when the Implementer's bias is moderate (i.e. $\underline{b}/\bar{b}$ close to 1). In such cases, this second incentive constraint is never binding as conforming to the Implementer's preferences either (1) leads the organization to a certain failure (when α is close to 1) or (2) increases only marginally the Implementer's provision of effort (when $\underline{b}/\bar{b}$ close to 1). Note, however, that $\beta_2^\star$ is always inferior to 1: with a perfectly aligned Implementer, the Decision Maker has no reason to ever select project 2 when her private signal is 1, as project 1 is more likely to succeed and is both the Implementer's and the Decision Maker's preferred project. With a slight abuse of notation, we define:

$$\beta_1^* \equiv \max\{0, \beta_1^*\} \tag{3.5}$$

Proposition 1 summarizes the results of this section:

Proposition 1 *There is only one type of separating equilibrium in our model. In this equilibrium, the Decision Maker always select the project indicated by her private signal: this is a* reactive equilibrium. *This equilibrium exists whenever :*

$$\frac{\bar{B}}{\underline{B}} \leq \left(\frac{\alpha}{1-\alpha}\right)\frac{F(\alpha\bar{b})}{F(\alpha\underline{b})}, \tag{3.6}$$

i.e. when (1) the signal is sufficiently precise or (2) the Implementer's bias is high enough or (3) the Decision Maker's bias is low enough.

When condition (3.6) is verified, the reactive equilibrium exists for all values of the congruence parameter β lying in $[\beta_1^\star, \beta_2^\star]$, where $\beta_1^\star$ and $\beta_2^\star$ are two thresholds, defined by equation (3.3) and (3.5), and such that:

$$0 \leq \beta_1^\star \leq \beta_2^\star \leq 1$$

Intuitively, the scope for reactivity (i.e. the interval $[\beta_1^\star, \beta_2^\star]$) is (1) increasing with the signal precision α (2) decreasing with the Decision Maker's bias (i.e. $\bar{B}/\underline{B}$) and (3) decreasing with the Implementer's bias ($\bar{b}/\underline{b}$).

Proof See Appendix B.1.1. ∎

Non-Reactive Equilibria

We now turn to pooling equilibria where the Decision Maker selects the same project, whatever the signal she receives. Our model features two different types of such equilibria: one where the Decision Maker always selects her preferred project, project 1 (i.e. $\forall \sigma \in \{1,2\}, \quad O(\sigma) = 1$); the other where she always selects project 2 (i.e. $\forall \sigma \in \{1,2\}, \quad O(\sigma) = 2$). Both these equilibria lead to an organization that does not react to the Decision Maker's private signal.

We first consider in detail the case where the Decision Maker's decision process simply selects project 1 for each type of signal received (i.e. $\forall \sigma \in \{1,2\}, \quad O(\sigma) = 1$). In this case, on the equilibrium path, the order has no informational content, so that the Implementer's posterior belief on the state of nature is, conditional on project 1 being selected: $\mu_1 = \frac{1}{2}$.

Out of equilibrium, any belief $\mu_2 \in [1-\alpha, \alpha]$ is *a priori* admissible. Indeed, as project 2 being selected is an out-of-equilibrium event, Bayes' law does not constrain these beliefs μ_2. Without further restrictions on these out-of-equilibrium beliefs μ_2, our model will naturally admit a lot of pooling equilibria, supported by different out-of-equilibrium beliefs. To limit the scope for multiple equilibria, we thus use the D1 refinement (Cho and Sobel (1990]) – see section 3.2.2. Intuitively, this refinement requires that if the Implementer observes an out-of-equilibrium order, he infers that this order was triggered by the signal that would have made the type of decision maker the "most eager" to make the deviation.[6] We do show in proposition 2 that Decision Makers receiving a signal 2 are always "more eager" to deviate from the pooling equilibrium we are considering. This is quite intuitive: deviating from the equilibrium implies selecting project 2. Such a deviation is naturally more profitable to a Decision Maker who has received signal 1 rather than signal 2. The only out-of-equilibrium belief satisfying the D1 refinement should thus lead the Implementer to consider that only a Decision Maker having received signal 2 may have deviated from the equilibrium. Formally, this implies that:[7]

$$\mu_2 = 1 - \alpha \tag{3.7}$$

As is the case with separating equilibrium, there are a priori two different incentive constraints that need to be satisfied: the Decision Maker must prefer to select project 1 whether her private signal is 1 or 2. As we show in proposition 2, there is only one relevant incentive constraint: the Decision Maker should select project 1 even when receiving private signal 2. It is easy to show that this constraint is satisfied when β is large enough. For low levels of congruence β, a Decision Maker facing a signal 2 is indeed tempted to deviate from the equilibrium as (1) project 2 is the Implementer's preferred project (2) project 2 is the project with the highest probability of success.

Formally, it is straightforward to show that there exists a threshold $\beta_2^{\star\star}$ above which this pooling, "non-reactive" equilibrium exists:

[6]We refer the reader to the proof of proposition 2 for details on the definition of the D1 refinement.
[7]The reader should remember that μ_2 is the probability that the state of nature is 1 when project 2 has been selected.

$$\beta \geq \beta_2^{\star\star} = \frac{\alpha F(\alpha\bar{b})\underline{B} - (1-\alpha)F(\frac{1}{2}\underline{b})\bar{B}}{[F(\frac{1}{2}\bar{b}) - F(\frac{1}{2}\underline{b})][(1-\alpha)\bar{B}] + [F(\alpha\bar{b}) - F(\alpha\underline{b})]\alpha\underline{B}]} \tag{3.8}$$

This threshold $\beta_2^\star$ can be either strictly superior to 1 (in which case this pooling equilibrium fails to exist – this is for instance the case with a perfectly informative signal (i.e. $\alpha = 1$)) or strictly inferior to 0 (in which case it exists for all values of congruence – this is the case for instance when the Decision Maker is highly biased (i.e. $\overline{B}/\underline{B} \rightarrow \infty$)). Therefore, we define, with a slight abuse of notation, the following threshold:

$$\beta_2^{**} \equiv \min\{1, \max\{\beta_2^{**}, 0\}\} \tag{3.9}$$

Of course, as we already mentioned, another pooling equilibrium is possible, where the Decision Maker always select project 2 (i.e. $\forall \sigma \in \{1,2\}, \quad O(\sigma) = 2$). Using the D1 refinement to restrict the choice of out-of-equilibrium beliefs, we can characterize this second, "non-reactive" equilibrium in a similar and symmetric fashion: there exists a threshold in congruence, $\beta_1^{\star\star}$, *below* which this equilibrium exists. The intuition is the following: as β decreases, the Implementer becomes more likely to exert effort on project 2. When β is very low, the Implementer's preference for project 2 becomes so certain that the Decision Maker must select project 2 if she wants some implementation effort to be exerted. More formally, the relevant incentive constraint of the Decision Maker is equivalent to the following condition:

$$\beta \leq \beta_1^{\star\star} = \frac{(1-\alpha)F(\frac{1}{2}\bar{b})\underline{B} - \alpha F(\alpha\underline{b})\bar{B}}{[F(\frac{1}{2}\bar{b}) - F(\frac{1}{2}\underline{b})][(1-\alpha)\underline{B}] + [F(\alpha\bar{b}) - F(\alpha\underline{b})]\alpha\bar{B}]} \tag{3.10}$$

This threshold $\beta_1^{\star\star}$ can happen to be strictly negative, in which case this pooling equilibrium fails to exist. This is the case, for instance, when the signal is perfectly informative (i.e. $\alpha = 1$), as selecting project 2 after having received a signal 2 would then lead the organization to a certain failure. Note, however, that $\beta_1^{\star\star}$ is always inferior to 1. With a perfectly congruent agent, a Decision Maker facing signal 1 has no incentives to select project 2, as project 1 is (1) more likely to succeed (2) the Decision Maker's preferred project and (3) the Implementer's preferred project.

With a slight abuse of notation, let us define the following threshold:

$$\beta_1^{**} \equiv \max\{\beta_1^{**}, 0\} \tag{3.11}$$

Proposition 2 summarizes the results derived in this section:

Proposition 2 *Our model admits, for each level of congruence, at most one pooling equilibrium. For low values of congruence (i.e. $\beta \in [0, \beta_1^{\star\star}]$) the Decision Maker always selects project 2, while, for high values of congruence (i.e. $\beta \in [\beta_1^{\star\star}, 1)$), she always selects project 1.*

The two thresholds $\beta_1^{\star\star}$ and $\beta_2^{\star\star}$, defined by equations (3.9) and (3.11) verify:

$$0 \leq \beta_1^{\star\star} \leq \beta_1^{\star} \leq \beta_2^{\star} \leq \beta_2^{\star\star} \leq 1$$

The scope for non-reactivity (i.e. $1 - \beta_2^{\star\star}$ and $\beta_1^{\star\star}$) decreases with the signal precision (i.e. α) and increase with the Decision Maker's bias and the Implementer's bias.

Proof See Appendix B.1.2. ▮

The above analysis suggests that for some intermediate values of β (i.e., $\beta \in [\beta_1^{\star\star}; \beta_1^{\star}] \cup [\beta_2^{\star}; \beta_2^{\star\star}]$), neither a "reactive", nor a "non reactive" equilibrium exist. The following section shows that, in these intermediate cases, the equilibrium features a partially informative decision: the Decision Maker selects with a positive probability the project indicated by the signal.

Semi-Reactive Equilibria

This section deals with the conditions of existence of a mixed strategy equilibrium where the Decision Maker is allowed to randomize over the project she selects. We show in proposition 3 that there cannot be an equilibrium where the Decision Maker would strictly randomize, whatever the signal she receives, the project she selects. The intuition is that, because the Decision Maker is biased, she cannot be indifferent between the two projects for all values of the signal, except in the extreme case where the signal has no informational content (i.e. when $\alpha = 1/2$).

There are therefore only two potential candidates for such mixed equilibrium, one where only a Decision Maker receiving signal 2 mixes between selecting project 1 and selecting project 2 and one where only a Decision Maker receiving signal 1 mixes between the two project. Let us focus on the first type of mixed equilibrium.

In such an equilibrium, the Decision Maker's decision process is defined as:

$$O(1) = 1 \text{ and } O(2) = \begin{cases} 1 & \text{with probability } \rho \\ \\ 2 & \text{with probability } 1 - \rho \end{cases}$$

In words, in such an equilibrium, the Decision Maker (1) always select project 1 when signal is 1 and (2) select project 2 with probability $(1 - \rho)$ and project 1 with probability ρ when the signal is 2. Of course, ρ is endogenous and will be determined by equilibrium conditions. In the terminology defined above, $\rho = 0$ corresponds to a reactive equilibrium and $\rho = 1$ to a non-reactive equilibrium.

We now turn to the Implementer's posterior belief. In such a "semi-reactive" equilibrium, when project 1 has been selected, the Implementer updates his beliefs on the probability that signal 1 was received by the Decision

Maker. Ex post, project 1 may have been selected either because (1) signal 1 was observed or (2) the Decision Maker selected her preferred project in spite of having received a signal 2. Bayes' rule imposes that the posterior belief be given by:

$$\mu_1(\rho) = \frac{\alpha + \rho(1-\alpha)}{1+\rho}$$

Of course, when project 2 is ordered, it must be that the Decision Maker observed signal 2, so that:

$$\mu_2(\rho) = 1 - \alpha$$

In this semi-reactive equilibrium, the Decision Maker randomizes between project when the private signal is 2. For such mixed strategies to be sustainable, the Decision Maker must be indifferent between the two options:

$$\underbrace{\alpha\left(\beta F(\alpha \underline{b}) + (1-\beta)F(\alpha \bar{b})\right)\underline{B}}_{\text{Decision Maker expected utility of selecting } 2 \text{ with signal } 2} = \underbrace{(1-\alpha)\left(\beta F(\mu_1(\rho)\bar{b}) + (1-\beta)F(\mu_1(\rho)\underline{b})\right)\bar{B}}_{\text{Decision Maker expected utility of selecting } 1 \text{ with signal } 2} \tag{3.12}$$

This last equation 3.12 pins down the value of ρ as a function of the other parameters of our model. In particular, equation 3.12 defines, for each value of the congruence parameter $\beta \in [\beta_2^\star, \beta_2^{\star\star}]$, a unique $\rho(\beta) \in [0,1]$. When $\beta = \beta_2^{\star\star}$, $\rho(\beta_2^{\star\star}) = 1$: the Decision Maker never reacts to the signal and the equilibrium is non-reactive, as shown above. When $\beta = \beta_2^\star$, $\rho(\beta_2^\star) = 0$. The Decision Maker always reacts to the signal, and the equilibrium is fully reactive, consistent with the above analysis.

A symmetric analysis can be performed for $\beta \in [\beta_1^{\star\star}, \beta_1^\star]$. For each value of β in this interval, there is an equilibrium where the Decision Maker (1) always selects project 2 when the signal indicates 2 and (2) selects project 1 with probability $1-\xi$ when the signal is 1. For lower values of β in this interval, the Decision Maker becomes more likely to select project 2 when receiving signal 1. We sum up the result of this section if the following proposition:

Proposition 3 *The only mixed equilibria of our model involve the Decision Maker randomizing strictly only for a particular value of the signal: randomizing strictly for both value of the signal cannot be an equilibrium strategy. Therefore, there are only two "types" of mixed, "semi-reactive", equilibria:*

1. *When $\beta \in [\beta_1^{**}, \beta_1^\star]$, the Decision Maker always selects project 2 when the signal indicates 2. When private signal is 1, the Decision Maker nevertheless selects project 2 with probability $\xi(\beta)$ and project 1 with probability $1-\xi(\beta)$. $\xi()$ is a decreasing function of β such that $\xi(\beta_1^{**}) = 1$ and $\xi(\beta_1^*) = 0$.*
2. *When $\beta \in [\beta_2^*, \beta_2^{**}]$, the Decision Maker always selects project 1 when the signal indicates 1. When private signal is 2, the Decision Maker nevertheless selects project 1 with probability $\rho(\beta)$ and project 1 with probability $1-\rho(\beta)$. ρ is an increasing function of β, such that $\rho(\beta_2^{**}) = 1$ and $\rho(\beta_2^*) = 0$.*

Proof See Appendix B.1.3. ∎

3.3.3 Summary and Discussion

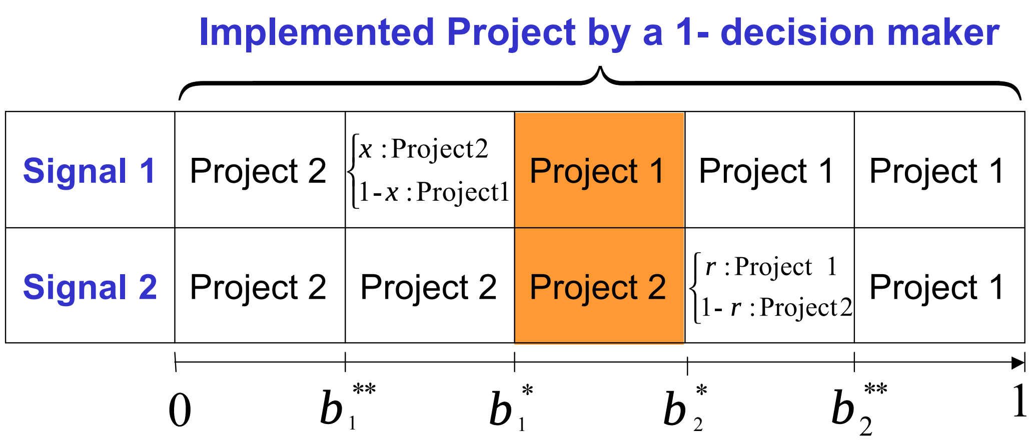


Figure 3.2: Implemented Project of a 1 Decision Maker according to the Signal

Figure 2 summarizes the result of the analysis of section 3.3.2. For each level of diversity, **there exists a unique perfect Bayesian equilibrium satisfying the D1 refinement:** For low levels of the congruence parameter β ($\beta \in [0; \beta_1^{\star\star}]$), project 2, which is the Implementer's most likely preferred project is always selected. As β increases, the order progressively entails more and more informational content, as the Decision Maker uses her private signal more often in her decision process (i.e. for $\beta \in [\beta_1^{\star\star}, \beta_1^{\star}]$). For intermediate values of β ($\beta \in [\beta_1^{\star}; \beta_2^{\star}]$), the Decision Maker always selects the project indicated by the signal. Then, when β further increases ($\beta \in [\beta_2^{\star}, \beta_2^{\star\star}]$), the Decision Maker becomes more reluctant to choose project 2, even in cases where her signal indicates 2, as the Implementer becomes more likely to dislike this project. Finally, when $\beta \in [\beta_2^{\star\star}; 1)$, project 1 is always selected, whatever the value of the signal. Of course, some of these equilibria may not exist, depending on the parameters' value (see proposition 1, 2 and 3 for more details).

This suggests that reactivity is easier to obtain for intermediate levels of congruence, while non-reactivity prevails for large or small values of congruence β. Put differently, uncertainty about the Implementer's taste, i.e. Implementer's independence from the Decision Maker, is key to achieving reactivity in our organization. The reason is the following. There are two forces driving the Decision Maker decision rule: she can choose a project with a high, "objective", probability of success or she can select a project for which the Implementer's motivation is *intrinsically* high. The Decision Maker's incentive to use the signal in her decision rule is all the more important when the Implementer's own preferences are unknown, which happens for intermediate level of congruence. In other words, for intermediate level of congruence, the Decision Maker cannot anticipate what project would please the Implementer and therefore bases her decision only on (1) the objective probability of success and (2) her own bias for project 1. As the Implementer's preferences becomes less uncertain (which happens for congruence level close to 0 or 1), the Decision Maker can now anticipate the effect of her decision on the Implementer's motivation, which makes the objective signal less important in her decision rule.

At this point, we need to stress that reactivity does not just arise because the implementer and the DM's biases cancel each other out. As we just pointed out, taking an implementer with an opposite bias to that of the DM (i.e. $\beta = 0$) is often detrimental to reactivity. As it turns out, it is the *uncertainty* about the Implementer's preferences, not his neutrality between the two projects, that plays a key role in promoting reactivity. This is not obvious in our model because intermediate congruence β (i.e. independence) implies both uncertain Implementer's preferences and an *ex ante* unbiased Implementer. A simple extension of this model highlights the key role played by uncertainty in our model (see Appendix B.3). Assume that there are no longer 2, but N different projects. Also assume that the Decision Maker is unbiased and thus only cares about the probability of success. There are N types of implementers: each type $i \in [1; N]$ gets private benefit $b > 0$ if project i is completed and succeeds, and 0 else. There is a probability β that the implementer prefers project $i = 1$. When the signal is j, the right project is j with probability α. The advantage of such a model is that β parameterizes the uncertainty about the implementer's preferences, not his bias. As we show in Appendix B.3, for high values of β (i.e. low uncertainty on the Implementer's preferences), the DM has a strong incentive to pander to the implementer' preferences and reactivity is impaired.

We also need to emphasize that the main effect in this paper, namely that uncertainty about the Implementer's preferences may enhance organizational reactivity, does not depend on the "signaling" aspect of the model (i.e. the fact that project selection may, or may not, be informative for the Implementer). Indeed, in a model where the Decision Maker's private signal would be public, it would still be the case that the organization be reactive only for intermediate level of congruence, i.e. when the Implementer's preferences are independent of the Decision Maker.[8]

[8]footnotesize Very light calculations reveal that when the signal is public information, the equilibrium features (1) reactivity for $\beta \in \left[\tilde{\beta_1}, \tilde{\beta_2}\right]$ (2) the Decision Maker always selecting project 1 for $\beta \in \left[\tilde{\beta_2}, 1\right]$ and (3) the Decision Maker always selecting project 2 for $\beta \in \left[0, \tilde{\beta_1}\right]$. $\tilde{\beta_1}$ and $\tilde{\beta_2}$ are defined by:

$$\begin{cases} \tilde{\beta_1} = \dfrac{(1-\alpha)\underline{B}F((1-\alpha)\underline{b}) - \alpha\bar{B}F(\alpha\underline{b})}{(1-\alpha)\underline{B}\left(F((1-\alpha)\bar{b}) - F((1-\alpha)\underline{b})\right) + \alpha\bar{B}\left(F(\alpha\bar{b}) - F(\alpha\underline{b})\right)} \\ \tilde{\beta_2} = \dfrac{\alpha\underline{B}F(\alpha\bar{b}) - (1-\alpha)\bar{B}F((1-\alpha)\underline{b})}{(1-\alpha)\bar{B}\left(F((1-\alpha)\bar{b}) - F((1-\alpha)\underline{b})\right) + \alpha\underline{B}\left(F(\alpha\bar{b}) - F(\alpha\underline{b})\right)} \end{cases}$$

3.3.4 Organizational Design

The above analysis suggests that intermediate levels of congruence foster organizational reactivity. Reactivity, however, comes at a cost, as Implementers are more likely to have to implement *ex post* a project they intrinsically dislike and for which they will exert low effort. To study this tradeoff, this section looks for the optimal congruence β from the Owner's perspective. For intermediate levels of congruence (i.e. $\beta \in [\beta_1^\star, \beta_2^\star]$), we know that the Decision Maker equilibrium decision rule is to select the project as indicated by the signal. We can therefore write the expected profit of such an organization as:

$$\forall \beta \in [\beta_1^\star, \beta_2^\star], \quad V^R = \alpha \left(\frac{F(\alpha \bar{b}) + F(\alpha \underline{b})}{2} \right) R \tag{3.13}$$

This value does not depend on β. The reason for this is simple: because the organization is reactive, the *ex ante* probability that either project 1 or 2 is chosen is 1/2. Therefore, on average, whatever his preferred project, the Implementer will face with probability 1/2 a project he likes and with probability 1/2 a project he dislikes. Because in such a reactive equilibrium, posterior beliefs that the selected project is the successful one are always equal to α, this implies that, whatever the congruence level, the Implementer will on average exert the same level of effort, namely the average between high effort $F(\alpha\bar{b})$ and low effort $F(\alpha\underline{b})$. Thus, provided that congruence lies within the reactivity range, there is no particular level of congruence that maximizes the Owner's profit. Of course, we should stress again that, depending on the level of α and on the Implementer's and Decision Maker's bias (i.e. the bs and the Bs), the reactive equilibrium may either (1) fail to exist (when $\beta_2^\star < 0$) or (2) always exist (when $\beta_1^\star \leq 0$ and $\beta_2^\star > 1$).[9]

We now turn to non-reactive organizations where the Decision Maker always selects her preferred project. Such an equilibrium, if it exists, is supported by high level of congruence ($\beta \in [\beta_2^{\star\star}, 1)$). The expected profit of such a non-reactive organization is given by:

$$\forall \beta \in [\beta_2^{\star\star}; 1), \quad V^{NR} = \frac{1}{2} \left(\beta F\left(\frac{\bar{b}}{2}\right) + (1-\beta) F\left(\frac{\underline{b}}{2}\right) \right) R \tag{3.14}$$

Project 1, the Decision Maker's preferred project, is *ex ante* successful with probability 1/2. With probability β, action 1 is also the Implementer's preferred project: in this case, he makes high effort with probability $F(\bar{b}/2)$. With probability $1-\beta$, the Implementer prefers project 2 and makes high effort with probability $F(\underline{b}/2)$ only. In contrast to reactive organizations, the order here never conveys any information. From the implementer's viewpoint, the posterior belief that the ordered project (always 1) is the successful one therefore remains equal to 1/2.

[9] We refer the reader to proposition 1 for details on the existence of the reactive equilibrium.

As one directly sees, the value of a non-reactive organization (3.14) is maximized for perfect congruence between the Decision Maker and the Implementer (i.e. $\beta = 1$). As the organization always implements the same project, here project 1, it is best to ensure maximal implementation effort for project 1, which is best made by hiring a perfectly aligned Decision Maker.

Thus, the optimal non-reactive organization is worth:

$$V^{NR} = \frac{1}{2} F\left(\frac{\bar{b}}{2}\right) R \tag{3.15}$$

As it turns out, the value (3.15) of the optimal non-reactive organization implementing project 1 is similar to the value of the optimal non-reactive organization implementing project 2. The intuition for this is just that in such an organization, as project 2 is always selected on the equilibrium path, it is best suited to have an Implementer that will prefer for certain project 2, which makes him more likely to put in high effort on such a project. The *ex ante* probability of success of this non-reactive, project-2-oriented, organization is therefore just 1/2 times the probability of effort of the implementer (i.e. $F(\bar{b}/2)$), so that the organization's profit is indeed provided by equation (3.15).

As we show in proposition 4, the semi-reactive organizations described in proposition 3 are *never* optimal from the Owner's perspective, provided that a reactive organization can be put in place (i.e. that $\beta_2^\star \geq 0$). The intuition is the following: consider, for instance, a value of β for which the Decision Maker's decision rule strictly randomizes between project 1 and 2 when her private signal indicates 2 ($\beta \in [\beta_2^\star, \beta_2^{\star\star}]$). In this interval, the Decision Maker is, by definition, indifferent between following signal 2 or not. Given that the Decision Maker intrinsically prefers project 1, this must imply that, for such values of congruence β, the *ex ante* unbiased Owner would strictly prefer project 2 to be undertaken. Thus, the shareholder can increase firm value by reducing β, which fosters reactivity, ρ, and thus increases the likelihood of project 2 being selected. Therefore, we can infer from this argument,[10] that in this range of congruence supporting semi-reactive equilibria, organization's value is increasing with congruence, so that the optimal level of congruence in this range is the extreme $\beta = \beta_2^*$, where the probability of no reactivity is zero and the equilibrium becomes fully reactive.

Overall, as long as both types of equilibria exist, the Owner's maximization program boils down to a simple trade-off between a non-reactive organization (obtained with extreme congruence, i.e. β equal to 0 or 1) and fully reactive organizations (obtained with any intermediate $\beta \in [\beta_1^\star, \beta_2^\star]$). The net gain of reactivity over non- reactivity((3.13) - (3.15)) can be broken down into three terms, highlighting the trade-offs between these two organizational forms:

[10] We provide a formal proof along with proposition 4.

$$V^R - V^{NR} = \underbrace{\left(\alpha - \frac{1}{2}\right) F(\alpha\bar{b})}_{\text{Reactivity Gain, } > 0} - \underbrace{\frac{\alpha}{2}\left(F(\alpha\bar{b}) - F(\alpha\underline{b})\right)}_{\text{Cost of Mismatch, } < 0} + \underbrace{\left(\frac{F(\alpha\bar{b}) - F(\frac{\bar{b}}{2})}{2}\right)}_{\text{Credibility Gain, } > 0} \tag{3.16}$$

Let us briefly comment on this tradeoff:

- *Reactivity gain*: This gain comes from the fact that from an *ex ante* point of view, the probability that the successful project is selected is strictly higher in a reactive organization, as the Decision Maker's decision rule in such an organization is driven by her private information. As we noted earlier, such a gain is independent from the signalling aspect of our model.
- *Cost of mismatch*: In reactive organizations, the Implementer must implement, with probability 1/2, a project he dislikes and for which he is more reluctant to exert high implementation effort. This never happens in an optimal non-reactive organizations, as the Decision Maker always selects the Implementer's preferred project. Here again, this cost is independent of the signaling aspect of the model.
- *Credibility gain*: In a reactive organization, project selection perfectly conveys information on the Decision Maker's private signal, whereas in a non-reactive organization, the Implementer can extract no additional information about the true state of nature. Thus, in a reactive organization, the Implementer's faith in the project he's implementing is always higher than with a non-reactive organization. In other words, reactivity gives *credibility* to the Decision Maker's project selection. This effect is a byproduct of the signaling game, and would disappear were the Decision Maker's signal public information.

As is obvious from equation (3.14) and (3.15), the reactive organization's value is strictly increasing in α while the optimal non-reactive organization's value is independent of α. Therefore, as the signal's precision increase, the optimal organization switches from a non-reactive organization where Implementer's preferences are perfectly known to a reactive organization where Implementer's preferences becomes uncertain, i.e. where the Implementer is more independent. While this argument is intuitive, we still have to check that both reactive and non reactive equilibria exist when α varies. This is done in the following proposition:

Proposition 4 *The optimal organizational form goes from non-reactive to reactive as the signal's precision increases. Semi-reactive organizations may be optimal for intermediate level of signal's precision when a reactive equilibrium fails to exist.*

More precisely, define α^0 such as the unique $\alpha \in]1/2, 1[$ such that:

$$\alpha^0 \left(F(\alpha^0\bar{b}) + F(\alpha^0\underline{b})\right) = F(\bar{b}/2),$$

then:

- *If* $\alpha^0 \underline{B} F(\alpha^0 \bar{b}) \geq (1-\alpha^0)\bar{B}F(\alpha \underline{b})$*, then the optimal organization is:*
  1. *a non-reactive organization for all* $\alpha \leq \alpha^0$ *(with* $\beta = 1$*)*
  2. *a reactive organization for* $\alpha \geq \alpha^0$ *(with any* $\beta \in [\beta_1^\star, \beta_2^\star]$*)*
- *If* $\alpha^0 \underline{B} F(\alpha^0 \bar{b}) < (1-\alpha^0)\bar{B}F(\alpha \underline{b})$*, then there exists* $(\alpha_1, \alpha_2) \in]\alpha_0, 1[$*, such that the optimal organization is:*
  1. *a non-reactive organization for* $\alpha \leq \alpha_1$ *(with* $\beta = 1$*)*
  2. *a semi-reactive organization for* $\alpha \in [\alpha_1, \alpha_2]$ *(with* $\beta = 0$)
  3. *a reactive organization for* $\alpha \in]\alpha_2, 1)$ *(with any* $\beta \in [\beta_1^\star, \beta_2^\star]$*)*

Proof See Appendix B.1.4 ▮

3.4 Robustness

This section investigates the robustness of our results in front of three specification changes that we believe shed light on our mechanism. First (section 3.4.1), we allow the Decision Maker to design the organization (i.e. to choose herself for the level of congruence with the Implementer). Second (section 3.4.2), we investigate whether diversity remains useful once we allow the Owner to provide powerful monetary incentives to the Decision Maker

3.4.1 Delegation of Organizational Design to the Decision Maker

In this section, we want to investigate the implication of allowing the Decision Maker to hire the Implementer. This amounts to delegating organizational design (i.e. the choice of congruence β) to the Decision Maker. In such a case, would the Decision Maker choose an optimal organization from the Owner's perspective ? To some extent, the normative implications of our model hinge on the answer to this question, as we want to characterize the situations where the Decision Maker does not choose the efficient congruence level β (efficient from the Owner's perspective) so that it becomes efficient to limit her control over hiring decisions. In the corporate governance application we will explore later on, it would suggest instances where shareholders, instead of the CEO, should hire the company's top executives.

When in charge of choosing the congruence level β, the Decision Maker is facing the following trade-off: on the one hand, she shares part of the Owner's objective, i.e. she wants to maximize the Implementer's effort for all type of selected project. In particular, she wants to increase the credibility of her order vis à vis the Implementer (i.e. the "credibility gain" above) and avoid to have an Implementer implementing a disliked project(i.e. the "cost of mismatch"above). On the other hand, conditional on success, she has intrinsic preferences toward project 1, whereas the Owner is indifferent between the two project. Therefore, even when the signal indicates project 2, given that this signal is imperfect ($\alpha < 1$), she is more willing to experiment project 1 than the Owner would be. Thus, for a given level of signal precision, the Decision Maker is marginally more willing to design a non-reactive organization (i.e. $\beta = 1$ when such a congruence supports a non-reactive equilibrium) than is the Owner. Note though that if the Owner is indifferent between the two potential non-reactive organizations (i.e. one where only project 1 is implemented and one where only project 2 is implemented), this is not the case of the Decision Maker who, because of her intrinsic preferences, strictly prefers the pooling equilibrium where she always selects project 1.

The above discussion suggests that the Decision Maker and the Owner are likely to choose similar organizations when the signal is either very precise or very imprecise. Yet, their choice may differ for intermediate values of α.

The formal analysis confirms this intuition. Consider first the case of a reactive equilibrium (i.e. $\beta \in [\beta_1^\star, \beta_2^\star]$ when this interval is not empty). The Decision Maker's utility is then given by:

$$U^R(\beta) = \underbrace{\frac{\alpha}{2}[\beta.F(\alpha\bar{b}) + (1-\beta).F(\alpha\underline{b})]}_{\text{proba. that project 1 succeeds}}.\bar{B} + \underbrace{\frac{\alpha}{2}\left[(1-\beta).F(\alpha\bar{b}) + \beta.F(\alpha\underline{b})\right]}_{\text{proba. that project 2 succeeds}}.\underline{B} \tag{3.17}$$

which is increasing in β. Because she gets higher utility when she orders action 1, the Decision Maker prefers Implementers who are intrinsically more motivated by project 1 than by project 2: the positive effect of increased motivation on project 1 dominates the negative effect of decreased motivation on project 2[11]. As a result, conditional on choosing to be reactive and conditional on a reactive equilibrium being feasible, the Decision Maker prefers the highest possible level of congruence, $\beta = \beta_2^\star$, while the Owner would be indifferent between all level of congruence β in $[\beta_1^\star, \beta_2^\star]$. Using the definition of $\beta_2^\star$, we can re-write the Decision Maker's utility in a reactive organization with $\beta = \beta_2^\star$:

$$U^R = \frac{1}{2}\left(\beta_2^\star F(\alpha\bar{b}) + (1-\beta_2^\star)F(\alpha\underline{b})\right)\bar{B} \tag{3.18}$$

When she decides to set up a non-reactive organization, provided a non-reactive equilibrium is feasible, the Decision Maker anticipates that she will always select project 1. She thus naturally prefers to hire an Implementer with a certain preference for project 1 (i.e. she sets $\beta = 1$):

$$U^{NR} = \frac{1}{2}F(\frac{\bar{b}}{2})\bar{B} \tag{3.19}$$

Therefore, when the Decision Maker has control over the organizational design, she will hire a non-congruent

[11] These two effects would exactly offset each other from the Owner's perspective.

Implementer (i.e. $\beta = \beta_2^\star$) when:

$$\frac{\alpha}{2}[\beta_2^\star.F(\alpha\bar{b}) + (1-\beta_2^\star).F(\alpha\underline{b})].\bar{B} + \frac{\alpha}{2}\left[(1-\beta_2^\star).F(\alpha\bar{b}) + \beta_2^\star.F(\alpha\underline{b})\right].\underline{B} \geq \frac{1}{2}F(\frac{\bar{b}}{2})\bar{B}$$

Given that, by definition, β_2^* is the level of congruence for which the Decision Maker is indifferent between following a signal 2 and ordering 1, this condition can be rewritten as:

$$\underbrace{\left(F(\alpha\bar{b}) - F\left(\frac{\bar{b}}{2}\right)\right)}_{\text{DM's credibility gain}} \geq \underbrace{(1-\beta_2^*)\left[F\left(\alpha\bar{b}\right) - F\left(\bar{b}\right)\right]}_{\text{DM's cost of mismatch}} \tag{3.20}$$

The Decision Maker thus compares the gains from credible choices (i.e. that the Implementer believes more in the selected project success) to the costs of potential mismatch (i.e. the possibility that the Implementer *intrinsically* dislikes the selected project). As the careful reader will notice, the reactivity gain does not appear in the Decision Maker's trade-off, as she is *ex post* indifferent between selecting project 1 or project 2 after having received a private signal 2[12]. In other words, the Decision Maker does not value reactivity per se. However, she values the credibility that reactivity brings to her decisions as it increases the overall supply of effort by the Implementer. From the Decision Maker's perspective, organizational diversity has the value of a commitment device.

As the gain from credible choices increases with the signal's precision, the Decision Maker will be more willing to hire an independent Implementer (i.e., chooses a level of congruence $\beta = \beta_2^*$) for high levels of signal precision. However, as reactivity, *per se*, is worthless to her, the signal needs to be more precise for her to hire an independent Implementer than it needs to be for the Owner. The proof we have just informally sketched does not take into account the possibility that, for some parameter values, reactive equilibrium may fail to exist and also ignores the semi-reactive equilibria described in proposition 3. The following proposition gives a more formal results on delegation of organizational design to the Decision Maker.

Proposition 5 *Let us assume that:*

$$\alpha^0\underline{B}F(\alpha^0\bar{b}) \geq (1-\alpha^0)\bar{B}F(\alpha\underline{b}) \tag{3.21}$$

In that case, there exists a unique $\alpha_{\frac{1}{2}}$ *such that: (1) for* $\alpha \in]\alpha^0, \bar{\alpha}[$*, the Decision Maker prefers a non-reactive organization while the Owner prefers a reactive organization and (2) for* $\alpha \in [1/2, \alpha^0] \bigcup [\bar{\alpha}, 1)$*, both the Decision Maker and the Owner have the same preferences over organizational design. In other words, for intermediate level of signal's precision, efficiency requires organizational design to be a prerogative of the organization's Owner.*

Proof See Appendix B.1.5. ∎

[12] The reason is that, within the set of reactive equilibria, the Decision Maker always prefers organizations with the most congruent Implementer possible (i.e. $\beta = \beta_2^\star$) and that the definition of this congruence level is that the Decision Maker is indifferent, conditional on signal 2, between project 1 and project 2.

3.4.2 Allowing for Financial Incentives

Our analysis has shown that, in an organization where the only source of motivation is *intrinsic*, organizational design, i.e. the choice of congruence between the Decision Maker and the Implementer, could significantly improve the quality of decision making, by constraining the Decision Maker to use her private information in her decision rule. Is this still true once *extrinsic motivation* is introduced in the organization ? Instead of using independence as a way to constrain the Decision Maker's intrinsic motivation and to relax the "implementation constraint", one may wonder whether extrinsic motivation cannot act as a more efficient device to achieve this goal. We establish in this section that this is not the case. We show that diversity is still valuable to the organization even when "very complete" contracts are used, i.e. wages that are contingent on success or failure and also on preferences of both the Implementer and the Decision Maker. The intuition for this result is simple and relies on the existence of a limited liability constraint for the Decision Maker: with such a constraint, using monetary incentives to alleviate the implementation constraint is costly, while the use of independence in preferences comes for free.

A loose sketch of the proof (see Appendix B.1.6 for a rigorous presentation) goes as follows: it is always the case that for sufficiently high precision of the signal, α, the Owner wants to put in place a reactive organization. Then, assume that the optimal organization is such that the Decision Maker gets a strictly positive monetary reward for selecting action 2 and that congruence is perfect, i.e. $\beta = 1$. This clearly cannot be optimal: the Owner would be better off by decreasing both the Decision Maker's wage and the congruence. Indeed, decreasing the congruence alleviates the Decision Maker's incentive constraint and it also decreases the monetary compensation needed to make her react to her private information. Moreover, it would not affect the Implementer's motivation, as costs from mismatch (i.e. the possibility that the Implementer must implement a project he dislikes) are *ex ante* constant in a fully reactive organization. Therefore, diversity will be a useful tool for the Owner as long as there exists a non-zero measure set of parameters for which (1) the Owner finds reactivity optimal and (2) with no monetary compensation and a perfectly congruent Implementer, the organization is not reactive. In such a case, the Owner will want to maintain a certain level of diversity within the organization, in order to minimize the monetary compensation to give to the Decision Maker.

Unfortunately, the reasoning we just sketched cannot be generalized for all values of α: it may well be the case that for levels of signal's precision α such that reactivity is optimal, reactivity can be implemented even with perfect congruence (in other words, independence, i.e. $\beta < 1$, may not be necessary to make the Decision Maker willing to react to her private information as the signal is already precise enough). As proved in proposition 4, such a case never happens when monetary compensations are not allowed, as the optimal reactive organization always features strict independence(i.e. $\beta < 1$) for some level of signal's precision [13]. When monetary contracts are introduced, the possibility of rewarding the Implementer for success may leave no role for diversity as the optimal Implementer's compensation may decrease his bias (e.g. when the distribution function F is "very" concave) and therefore make the "implementation constraint" less binding, so that even a high level of congruence may support a reactive equilibrium. Fortunately, this is not a general result, and we prove in proposition 6 that at least for a particular distribution (the uniform distribution) strict diversity is still required at the optimum.

Proposition 6 *Consider the special case where F is uniform over some interval $[0, X]$. Assume the Owner can write monetary contracts with both the Decision Maker and the Implementer. Also assume that these contracts are "very complete", i.e. can be contingent on (1) success or failure of the project (2) the Decision Maker's and the Implementer's preferred project.*

In this case, there still exists a range of precision level $[\hat{\alpha_1}, \hat{\alpha_2}]$, such that when $\alpha \in [\hat{\alpha_1}, \hat{\alpha_2}]$, the Owner should hire an independent Implementer (i.e. should optimally set $\beta^\star \in]0, 1[$)

Proof See Appendix B.1.6

3.5 Applications

3.5.1 Bottom-Up Corporate Governance

A first application of our theory is related to corporate governance. Both practitioners and academics have framed the issue of corporate governance as a top-down problem: How can the board efficiently monitor the CEO of a public corporation? What charter provisions and what incentive packages can give a CEO appropriate incentives to maximize shareholder value? By contrast, our theory suggests that bottom-up corporate governance (i.e., diversity within the executive chain of command) might be an important margin to consider in this debate: on a daily basis, the CEO might be more constrained by his executives (and their willingness to implement his choices) than by board members. The mechanism underlying this bottom-up pressure might not only be the "whistle-blowing" effect emphasized by the popular press. [14] After all, cases of fraud are the exception and certainly a minor phenomenon in the aggregate compared to inefficient, but legal, decisions. Our model suggests that the channel of this bottom-up pressure might be the passive resistance of subordinates to orders that they disapprove. Such a need to elicit the top executives' support acts as a disciplining device on the CEO and prevents her from undertaking controversial actions.

[13] Indeed, we showed in proposition 4 that (1) under condition 3.21, reactive organizations are optimal for $\alpha \geq \alpha^0$ and can be implemented only with $\beta < 1$ in the vicinity of α^0 while (2) if condition 3.21 does not hold, then for $\alpha \in [\alpha^1, \alpha^2]$, $\beta = 0$ is optimal (and implement a semi-reactive equilibrium) and in the right vicinity of $\alpha \geq \alpha^2$, reactive organizations are optimal and need a β strictly inferior to 1 to be put in place.

[14] For a rigorous formalization, see Friebel and Guriev (2005).

In a companion paper (Landier, Sraer and Thesmar (2005)), we provide empirical evidence supporting strong performance effects of such a bottom-up governance mechanism. From a panel of US-listed corporations, we define an index of internal governance as the fraction of top-ranking executives who joined the firm before the current CEO was appointed. Our identifying assumption is that, in most cases, top executives hired under a CEO's tenure are more likely to be congruent with him, either because they were hired by him (this is the case where $\alpha \in [\underline{\alpha}, \bar{\alpha}]$ in the model), or due to behavioral reasons such as loyalty feelings.

First of all, we find our index to be robustly and strongly correlated with various profitability measures, such as return on assets, return on equity or market-to-book value of assets. These findings are not affected when we control for traditional, "external" corporate governance measures (based on board independence or takeover defenses). Secondly, it seems that CEOs with independent executives make better acquisitions: the long-run stock returns of acquiring firms with high levels of dissent are larger than those of homogeneous firms.

This suggests that a crucial role for boards of directors is to design the degree of executives' independence from the CEO, rather than simply engaging in active direct monitoring. Our theory suggests that this design of internal dissent is relevant when the extent of private information at the top of the company (α) is high. From a human resource perspective, efficient boards of directors should not only focus on CEO successions issues, as is traditionally the case, but should also be involved in the hiring decisions of top executives. As shown in Section 3.4.1, when this decision is left to the CEO, there is an important risk that he will hire executives congruent with his own preferences, de facto eliminating the counter power of executive independence.

An interesting example of such a phenomenon is the testimony of Jean-Marie Messier (1999), former CEO the French Utility/Telecom/Media Conglomerate Vivendi, written in his (1999) autobiography. This was about three years before the burst of the tech bubble would lead to his fall by revealing the disastrous burden on the firm's financial health of expensive acquisitions. Messier was well aware of the role of top executives as counter-powers: "The danger of my job is isolation: if nobody criticizes you, you end-up making errors. I want top executives that affirm their convictions, not people who say "yes" to get a promotion…But it's difficult to keep contestation alive." A few paragraphs later he also reveals his taste for alignment when it comes to hiring executives: "All the top executives of Vivendi except two have been hired by myself. I chose them because I feel good with them at a personal level. Before nominating them, I check that we share the same vision, the same values."

Not only should the board be involved in recruiting top executives: an implication of the theory is that it might be optimal to shield some key executives from being fired by the CEO. For instance, making the CFO of a company accountable to the board of directors and not the CEO when private information at the top of the company is high would be a normative prescription of our theory.

3.5.2 Public Administration and Ideological Bias

In most democracies, a key constitutional issue is the division of power between elected party politicians and professional bureaucrats. Elected office holders choose reform goals according to their partisan orientation and their understanding of the political feasibility of reforms, while administrators carry the reforms to reality. If they do not actively cooperate, the reforms will fail.[15]

Our model applies quite directly to this context: when the bureaucrats share the partisan preferences of the current policy maker, they are more likely to put forth effort in implementing the attempted reforms. However, a non-partisan bureaucracy might give politicians efficient incentives to adjust policy reforms to the context, even when such reforms go against their political bias. This mitigating effect of bureaucracy on reform choices might be welfare improving, particularly so when the informational context is relevant. When politicians have private information on the feasibility or the suitability of reforms, a non-partisan administration will make them more reactive to information going against their bias. For example, a politician prone to reform social security will be more reactive to private signals suggesting the project is quite unpopular if the social security administration is a non-partisan body. When reactivity to information by the politician is of no importance, it is preferable to have an Implementer (i.e., a bureaucracy) aligned with the Decision Maker (i.e., the political power).

According to our model, if politicians can choose bureaucrats once elected, they tend to choose too often people aligned with their own ideological bias. This may, in some cases, eliminate the "bottom-up" pressure of the bureaucracy. Therefore, our model sheds light on a controversial political topic: to what extent should elected politicians be allowed to fire and hire top-administrators? The efficiency gains from partly shielding bureaucratic careers from political power is stated by Horn (1995): "civil service rules exist to constrain the ability of elected legislators to hire and fire appointed administrators."Such a constraint is valuable to filter decisions from extreme partisan bias and to make it more suited to political demand: "The need to elicit the cooperation of their subordinates creates a strong pressure on Bureau heads to act in a non-partisan way, even when they know their term won't outlast the current administration" (Horn (1995)). The rules establishing employment conditions in the civil service are therefore crucial. Over the course of the XIX*th* century, the US bureaucracy evolved to be more and more indepen-

[15] Albeit with a different model, Persson, Roland and Tabellini (1997) apply a similar insight to the study of the balances of powers in western democracies. In their model, dissent between sources of power increases discipline–they have no proper decision making stage. Discipline arises from a mechanism similar to our "implementation constraint."In their model, the parliament and the executive are the two powers. Some decisions require the approval of both powers, but both powers have conflicting interests because they fight over rents. As a result, the rent extraction of each power is kept in check by the other. This is akin to the constraint the Implementer's effort choice imposes on the Decision Maker's order, except that it goes in both direction. But in the end, the result is a mere improvement of discipline, not better decision making.

dence from elected politicians. Roughly speaking, the US has switched from a "patronage system" where elected politicians could hire, fire, and promote "administrators" as their own private employees, to a "merit system" that restricts their ability to interfere with the administrative career process, including compensation (the Pendleton Act of 1883).

A second feature of governmental organization is in line with our model: Using a large survey on European governments, Aberbach, Putnam and Rockman (1981) report a significant preference polarization of politicians vs. bureaucrats. Bureaucrats exhibit a strong ideological conservatism–they "resist change"–while politicians are attracted by more radical reforms. The idea that administrative conservatism acts as a useful constraint on the political will to reform is explicitly stated by these scholars: " Bureaucratic centrists provide ballast and stability, but they cannot provide direction and innovation." " The merit democracy operates like a brake; it discourages excessive swings of the pendulum" (Morstein-Marx (1959)). This feature is one of the predictions arising when the reactivity equilibrium is optimal: the choice of an implementation body with "independent" preferences is then optimal.

3.5.3 Organizing for Change

Both the recent practitioner-based literature (e.g., Intel's ex-CEO A. Grove (1999)) and the academic management literature (e.g., Utterback (1994), Christensen (1997)) insist on the vital need for companies to organize for innovation and fight inertia. In the face of increased competition and increased volatility (see e.g., Comin and Philippon (2005)), the ability to perform radical innovations and "reinvent" the company is put forth as a crucial purpose of organization design. Scholars such as J. March (1991) and C. Argyris (1990] warn against a natural tendency of organizations to produce resistance to change. In the trade-off between exploration and exploitation staged in March (2001), such resistance to change can be optimally mitigated by the regular hiring of new members coming from outside the organization. This comes at the cost of lower short-term productivity, as the new hires lack experience. But, should this "injection of fresh blood" occur at the top or at the bottom of the organization?

Our model sheds some new light on this issue. Without assuming that exogenous status quo biases fatally have to arise, we show that in order to implement reactivity within organizations, it is optimal to choose a pro-change Decision Maker and pro-status quo Implementers. There are two main reasons for this result. First, as change is by definition the exception and not the rule, it is valuable for the company to have implementers who "enjoy" the status quo project, which is the most likely choice of the organization (even a reactive one). Second, pro-status quo implementers discipline the bias of the Decision Maker towards change. If she were not constrained by the resistance of implementers, a pro-change CEO might be tempted to implement change even when it is not "objectively" efficient. This "change for the sake of change" trap is avoided by the bottom-up pressure imposed by status quo-biased Implementers.

Our model therefore suggests that (1) reactivity becomes optimal when instability increases and that (2) reactivity should be implemented through a "fresh blood at the top" policy rather than a "fresh blood at the bottom" policy. This double result fits quite well with the large increase in the hiring of outside CEOs documented by Murphy and Zabojnik (2003). They find that the fraction of CEOs hired from outside has almost doubled between the 1970s and the 1990s. This trend is parallel to the rise in volatility faced by firms. For example, Comin and Philippon (2005) establish that idiosyncratic volatility (measured as sales volatility or market leader turnover) has also doubled during that period. The management literature explicitly links the hire of outside CEOs to the need to implement change. Khurana (2002) shows (with a critical message) that the mission assigned to externally hired CEOs is often to be the "corporate saviors" reinventing the company by adapting its strategy to a new market context. Schein (1992) also emphasizes the role of leaders in implementing radical changes against the prevailing corporate culture. In his view, organizational change comes from the top against the will of the bottom layers of the hierarchy, as our model predicts.

To formally derive those results, we need to augment our base model to allow for various degrees of uncertainty in the optimality of projects. In this section, we will thus go back to the model and assume away symmetry of the state of nature: state 1 occurs with probability $\theta > 1/2$ and state 2 will now occur with probability $1 - \theta \leq 1/2$ only. State 1 is the "status quo"situation: a large θ means low uncertainty and a higher probability of success from the status quo decision.

To ease the exposition, we will here assume that the effort cost is distributed according to a uniform distribution, i.e., $F(x) = x$. The various equilibria (reactive, non-reactive and semi-reactive) should now be analyzed in two different cases: (1) when the Decision Maker is biased in favor of the status quo and (2) when the Decision Maker is biased in favor of change. We look for the optimal Decision Makerś preferences and the congruence parameter β with the status quo that are optimal. We show in Appendix B.2 how the results of section 2 can be generalized to this extension. The crucial insight brought by this extension is that, for a given level of congruence β that is not too low, reactive organizations are easier to design with a pro-change Decision Maker than with a pro-status quo one. The intuition is obvious: when the Decision Maker is biased toward change, he is less likely to listen to pro-status quo- inclined Implementers, and more inclined to follow his own signal. As a result, a non-reactive equilibrium where the order is always the status quo is less likely to be sustainable.

We now turn to the organizational design problem. Whatever the Decision Maker's bias, the value of a reactive organization is given by:

$$\begin{aligned} V^R(\beta,\theta) &= \theta\alpha\left[\frac{\theta\alpha}{\theta\alpha+(1-\theta)(1-\alpha)}\left(\beta\bar{b}+(1-\beta)\underline{b}\right)\right] \\ &\quad +(1-\theta)\alpha\left[\frac{(1-\theta)\alpha}{\theta(1-\alpha)+(1-\theta)\alpha}\left(\beta\underline{b}+(1-\beta)\bar{b}\right)\right] \end{aligned}$$

which is an increasing function of β. The principal source of this monotonicity is the following: as the status quo is more likely to be the optimal decision ($\theta > 1/2$), it is more efficient to hire an Implementer who is intrinsically motivated by implementing the status quo. This effect was not present in our benchmark model where both states were equally likely to be optimal. A second source of the monotonicity is that the effort gain from alignment between the order and the Implementer's preferences is higher for the status quo project[16], simply because the ex post prior for this state is higher. A third effect is absent here because we assumed F is linear. It is a "saturation effect" that counteracts the first two effects. It is dominated as long as F is not too concave or if θ is large enough. [17]

This effect is dominated by the first two as long as F is not too concave or if θ is large enough.

Reactivity can be sustained for higher levels of β when the Decision Maker is pro-change, as her incentive constraint is slacker than for a pro-status quo Decision Maker (the formal proof is in appendix). As the value V^R of a reactive organization is an increasing function of β, the optimal reactive organization therefore sets the highest sustainable β, $\beta = \beta_2^{**}(\theta)$, with a pro-change Decision Maker.

The value of non-reactive organizations depends on the Decision Maker's bias:

$$V^{NR}(\beta,\theta) = \begin{cases} \theta(\beta(\theta\bar{b}) + (1-\beta)(\theta\underline{b})) \text{ if DM favors "status quo"} \\ \\ (1-\theta)(\beta((1-\theta)\underline{b}) + (1-\beta)((1-\theta)\bar{b})) \text{ if DM favors "change"} \end{cases}$$

where it is obvious that a pro-status quo Decision Maker with perfectly aligned Implementer ($\beta = 1$) strictly dominates. The intuition is, again, that when the status quo becomes more likely to be the optimal decision, it becomes more efficient to hire Implementers favoring this status quo project.

The stage is set to compare the values of reactive and non-reactive organizations in the following proposition:

Proposition 7 *1. The optimal non-reactive organization has (1) a "status quo" -biased Decision Maker, and (2) fully "status quo" -biased Implementers ($\beta = 1$).*

2. The optimal reactive organization has (1) a pro-"change" Decision Maker, and (2) moderately "status quo" -biased Implementers ($\beta = \beta_2^{**}(\theta)$).

[16] $\frac{\theta\alpha}{\theta\alpha+(1-\theta)(1-\alpha)}\left(\bar{b}-\underline{b}\right)$ vs. $\frac{(1-\theta)\alpha}{\theta(1-\alpha)+(1-\theta)\alpha}\left(\underline{b}-\bar{b}\right)$

[17] F concave means that the returns to private benefits of already enthusiastic Implementers is lower than for non-enthusiastic ones. As a result, increasing congruence has a large negative impact on "unpopular" decisions (unenthusiastic Implementers cut down effort a lot), and a small positive impact on popular decisions (enthusiastic Implementers already give all they can). As a result, congruence may destroy value.

3. *The net advantage of reactive organizations,* $V^R(\beta_2^{**}(\theta), \theta) - V^{NR}(1, \theta)$*, increases as* θ *decreases to* $1/2$*. Non-reactive organizations are always optimal in the neighborhood of* $\theta = 1$*. Reactive organizations are optimal in the neighborhood of* $\theta = 1/2$ *as soon as* $\alpha > \sqrt{\bar{b}/\left[2.(\underline{b} + \bar{b})\right]}$

Proof See Appendix B.2. ∎

Hence, our model predicts that firms operating in high-uncertainty environments (θ close to 1/2) tend to have (1) a pro-change Decision Maker and (2) high levels of diversity. Firms operating in relatively safe environments (θ closer to 1) have (1) pro-status quo Decision Makers and Implementers and (2) very low levels of diversity. Result 2 in the above set of results relates to some pieces of the informal management literature that argue that it is best to hire an outsider to implement change. For example, Lou Gerstner (quoted from Khurana (2002), p.65), IBM's retired CEO, states in the following terms the rationale for bringing in an outsider to implement change: "You don't see many examples of internal candidates getting to the top of the system and then laying waste to the existing culture". An outsider is less likely to share exactly the same view as her subordinates. Our model suggests that this is good, as it allows the two parties to communicate more effectively.

3.6 Conclusion

This paper has shown that independence may enhance corporate decision making quality. Because Decision Makers must internalize the motivation of intrinsically motivated Implementers, independence, measured as the congruence of these intrinsic preferences with those of the Decision Maker, may act as a moderating device in the decision making process. This moderating mechanism is different from whistle-blowing or explicit opposition, and relies explicitly on the "separation of implementation and control" that is casually observed in organizations: the mere presence of a potentially independent Implementer along the chain of command compels the Decision Maker to use more private, "objective" information in her selection process. This mechanism is robust: even when monetary contracts are allowed or when organizational design is delegated, preferences heterogeneity can always be part of an efficient organization.

As we view it, the mechanism highlighted in this paper is very general and has many implications to every-day organizations. In the area of corporate governance, we provide in a companion paper evidence consistent with independent executives (1) increasing overall profit and (2) increasing the quality of strategic decisions such as acquisitions. This has important normative implications for the role of boards of directors. Optimal independence can also serve as an interesting framework to understand the long-standing debate on the divide of power between elected politicians and professional bureaucrats.

Finally, our theoretical analysis may be extended in several directions. First, we believe that our organizational setting can bring new insight on the understanding of collusion within hierarchies. Indeed, one could try to derive the consequences of allowing the Implementer to bribe the Decision Maker in order to convince him to stick to his preferred project. Second, we have explicitly assumed that Implementers cannot leave a firm with an independent Decision Maker to join an organization with a Decision Maker sharing the same intrinsic preferences. However, there are obvious reasons why an Implementer may prefer to work with a fully congruent manager. An interesting theoretical question that then arises is whether independent organizations, even though optimal, may survive to such sorting equilibrium on the labor market.

Chapter 4

The Corporate Wealth Effect: *From Real Estate Shocks to Corporate Investment*

4.1 Introduction

In the presence of financial frictions, the value of a firm's collateral plays a key role in determining the amount this firm can borrow, and the projects this firm can invest in. Barro (1976), Stliglitz and Weiss (1981) and more recently Kiyotaki and Moore (1997) point out that with either moral hazard or adverse selection, collateral will enhance a firm's ability to issue debt and to invest. Despite an important theoretical literature, there is scant evidence on the role of collateral in determining corporate investment. The existing literature instead has focused on the effect of cash on investment. Yet, cash balance is not the only asset that a firm can use to finance new investment. For instance, real estate property, but also trade credit, inventories or even productive equipment typically serve as collateral to back new loans (Davydenko and Franks, 2005).

This paper is a detailed empirical study of the effect of shocks to the value of collateral. We find robust evidence that firms transform capital gains on land into new investment. Firms invest more when their land value increases. Instead of selling the land, they finance this additional investment by issuing new debt. Increased land value seems to decrease the risk and asymmetric information attached to these new loans. New debt contracts are more long term, more likely to be syndicated, and are less likely to include covenants protecting the creditors. Such a relaxation of financing constraints reduces average profitability of capital for firms whose shareholders are weak and increases it for firms with strong shareholders.

We believe these results are important for at least two reasons. The first implication is positive: it suggests that large, exogenous shifts in the value of shareholders' equity - land in this case - have sizeable effects on corporate demand for equipment goods. Such a "corporate wealth effect" might explain how purely financial shocks generate persistent macroeconomic fluctuations, as argued in the macroeconomics literature since Bernanke and Gertler

(1989). Our paper uncovers the micro foundations of such a macroeconomic model in a precise manner. The second implication of our analysis is normative. As positive shocks to land value alleviate financing constraints, holding real estate on the balance sheet may provide a useful corporate hedging instrument. Following up on Holmstrom and Tirole (2000, 2001), our analysis suggests that firms should benefit more from holding land if their returns are less correlated with their liquidity needs.

Because their effects are easy to measure, we focus on shocks on the value of land holdings of US firms. The first reason to study real estate is that land holdings at the firm level are directly available using standard datasets. Besides, real estate is an appealing type of collateral to study credit constraints because it is a commonly used source of collateral, either in developed (Davydenko and Franks (2005)) or in developing economies (World Bank Survey (2005)). The third virtue of real estate is that its value fluctuates, so that the amount of collateral that a given firm can mobilize varies from one year to the next. At least part of these fluctuations are likely to be exogenous to changes in investment opportunities for firms outside the finance, insurance, construction and real estate industries. These specific features of real estate property will allow us to identify the effect of collateral on investment. Yet, we believe that our analysis extends easily to other forms of capital, like foreign exchange denominated securities, trade credit or inventories.

First, we look at the sensitivity of investment to local land prices at the firm level. We expect in general such a correlation to be positive, simply because land prices comove with demand shocks, and firms tend to build up capacities in order to serve this demand. This is why we compare firms that have land to those that have none, and interpret the differential sensitivity as the effect of fluctuation of land value on investment and other financial policy variables. This strategy rests on two sources of identification. The first one comes from the comparison, *within a region*, of the investment responses to price shocks between land owning and land leasing firms. Our second source of identification is, within the set of land owning firms, the comparison of investment in high and low real estate inflation regions. This approach has been used, for instance, by Case, Quigley and Shiller (2001), in their study of home wealth effects on household consumption.

In spite of all these precautions, it could still be argued that the difference between land owning and land leasing firms is that the former tend to be more “local” than the latter. As a result, and any collateral consideration aside, land owning firms should respond more to land prices because they proxy for local demand fluctuations. We treat such criticism seriously, and submit our results to a series of robustness checks. In particular, we identify a source of land prices variation that is orthogonal to local demand shocks. We use local differences in the supply of land to predict the response of local land prices to shocks on national interest rates. Such differences in the supply of land affect local land prices, but not local demand. Using them as instrument, we find estimates that are very similar to those obtained using more straightforward estimation procedures

Leaning on this empirical strategy, we first report robust causal evidence that real estate inflation has a positive and significant impact on the investment behavior. The point estimate suggests that for each additional \$1 of land holdings, firms invest \$.60 more. Overall, when real estate prices increase by one standard deviation, firms with significant real estate ownership, relative to firms with no real estate assets, increase their level of capital expenditures by around 2% of the standard deviation of investment. The effect is large, given that land is in general only a very small fraction of assets[1]. Hence, while real estate is less liquid than cash, it appears that firms are still able to make use of such collateral to finance additional investments.

Second, we investigate the channel through which the appreciation of land value is converted into additional investment. We find that firms with significant land holdings in states with increased real estate prices significantly modify their capital structure. They do so by mostly increasing their long-term leverage. We then look more precisely into debt contracts. We find that new debt contracts tend to be more "asymmetric information free". They are more likely to be syndicated, to have long maturity, and less likely to include debt covenants, special clauses imposing lower bounds to firm performance whose goal is to protect creditors from moral hazard and adverse selection.

Third, we investigate the profitability of the investment made from this increased collateral value. As discussed by Blanchard, Lopez de Silanes and Shleifer (1994), investment may respond to such "windfalls" for two reasons: because of adverse selection on financial markets (Myers and Majluf, 1984) or because of managerial moral hazard (Jensen and Meckling, 1976). In the first case, a relief on financial constraints should increase value while in the second, it should decrease value. We separate firms whose shareholders are strong from firms whose management is strong, using standard corporate governance indices. We find that, for firms with strong shareholders, collateral windfall do not result in lower profitability of invested capital. But consistently with Blanchard et al's hypothesis, we find that collateral windfalls are followed by a decline in profitability when shareholders are weak. Thus, the shocks in collateral that we expose in this paper also provides us with a good way to evaluate some real effects of the shareholder - manager conflict.

While most of the existing theory relates investment to debt capacity, and debt capacity to collateral, the empirical literature has focused on the direct effect of cash *flows* on investment (Fazzari, Hubbard, and Petersen (1988)). Erickson and Whited (2000) and Hennessy and Whited (2007) have criticized this approach on the ground that, for both theoretical and empirical reasons, such coefficients are difficult to interpret. They advocate the use of GMM estimation. Another branch of the literature has tried to isolate cash flows shocks that are orthogonal to investment opportunies (Blanchard, Lopez-de-Silanes and Shleifer (1994), Lamont (1997), Rauh (2006)). This

[1] On average, land accounts for 2% of Property, Plants and Equipment. When we restrict ourselves to land owning firms, the mean goes up to 4%.

paper clearly belongs to that tradition. Even closer to the present paper, Almeida, Campello and Weisbach (2004) have focused on the role of cash *holdings*, instead of cash flows. They show that credit constrained firms tend to store cash on their balance sheet to avoid forgoing valuable investment opportunities in the future. Rather than looking at cash (flows or stock), we focus on exogenous fluctuations in the value of collateral, in a large panel of firms. To our knowledge, the only existing papers on collateral shocks are Peek and Rosengreen (2000), Goyal and Yamada (2001) and Gan (2006). These contributions focus on corporate investment in the very specific context of the 1980s Japanese real estate bubble. Our paper is on US firms, uses a more stringent identifying strategy - triple, instead of double, differences and investigates in detail the mechanism through which collateral is converted into investment.

In doing this, we touch two issues that have been unexplored by most of the empirical literature on financing constraints: financing policy and corporate performance. First, we investigate the effect of corporate wealth shocks on capital structure. This allows us to add to the literature on financing choices, which has so far mostly used endogenous and temporary shocks to corporate wealth (see for instance Myers and Shyam-Sunders, 1999). In response to an exogenous and permanent balance sheet shock, we ask if firms adjust their leverage. Our results complement the findings of Benmelech, Garmaise and Moskowitz (2005) that more liquid assets (or more "redeployable" assets) are financed with loans of longer maturities and durations. They also complement a recent paper by Sufi (2007), who shows that syndicated debt is associated with loans that exhibit less asymmetric information. We find debt to be more likely to be syndicated in the presence of collateral. A second issue we address is the profitability of constrained investment. This allows us to test if financing constraints originate in the agency cost of separation of ownership and control, or in asymmetric information on financial markets. We find that relaxing financing constraints reduces profitability if firms whose managers are strong. Apart from Blanchard, Lopez de Silanes and Shleifer (1994), few papers have investigated this issue.

The rest of the paper is structured as followed. Section 4.2 presents the construction of the data as well as some summary statistics. Section 4.3 provides the main results on corporate investment and section 4.4 on capital structure. Section 4.5 explores the link between corporate governance and investment performance. Section 4.6 concludes.

4.2 Data

We use accounting data of US listed firms, merged with real estate prices measured both at the level of the state and of the Metropolitan Statistical Area (MSA), where the firm's headquarters are located. We complement this information with governance data from various sources, as well as data on land supply constraints (again, at the state and MSA levels).

4.2.1 Accounting and Governance Data

We begin with the entire sample of active COMPUSTAT firms between 1984 and 2004, with non-missing total assets (COMPUSTAT item #6). This provides us with a sample of 21,122 firms and a total of 185,300 firm-year observations. We then keep firms whose headquarters are located in the United States and exclude from the sample firms operating in the finance, insurance, real estate and construction industries, as well as firms involved in a major takeover operation. Finally, we discard observations were land ownership is not reported.

4.2.1.1 Real Estate Ownership

As mentioned in the introduction, we seek to understand how firms transform capital gains on their real estate into additional collateral and investment. We first measure land holding using COMPUSTAT item #260, labeled "PPE - Land and improvements at cost". This balance sheet item includes all land directly bought by the firm, at its purchase price (Kieso, Weygandt, Warfield, 2006). It excludes constructions built on land, which enter the item "PPE - Buildings at cost" (#263). These variables are reported in COMPUSTAT starting in 1984, hence our choice of period. While "PPE - Buildings at Cost" is also related to real estate prices, we will here focus on land. The main reason for doing this is that facilities tend to be highly firm specific, and are thus likely to be worth little in themselves for other firms or real estate developers. Land, however, is not firm specific and its value as collateral should therefore be more sensitive to changes in real estate market conditions. While we believe it is more sensible to focus on land and exclude buildings, it must be noted that this convention does not affect our empirical results *at all*. This is not surprising. In our data, both items are strongly correlated ($R^2 = 0.63$). Aside from this, both items tend to be simultaneously positive, or simultaneously equal to zero. Among firms who report to own land, only 2% report no building. Almost 94% of firms who report at least some land also own buildings.

First, we check manually the reliability of these variables by looking at the 10K forms filed by listed corporations with the Security and Exchange Commission. We retrieve these documents from the SEC's EDGAR website (`http://www.sec.gov/edgar.shtml`). We first list all firms of our sample that are present in fiscal year 2004, and sort them alphabetically by ticker symbol. We take the first 20 firms whose item #260 is strictly positive, as well as the first 10 firms whose item #260 is equal to zero. For each of these firms, we then look in the 10K for item 2 (entitled "Properties"), which provides an often verbal - with some quantitative elements - description of the facilities that the firm owns or leases. The results of this investigation is reported in Table 4.1. The first two columns report the accounting value of land and buildings held by firms according to COMPUSTAT. The third column equals 1 when land value (from COMPUSTAT) is strictly positive, and zero else. This is to be compared with column 8, which reports a 1 when the firms declares owned land in its 10K. All 20 firms with a positive land holding report that they own at least one facility somewhere. All 10 firms with zero land holdings lease all their buildings and warehouses. Thus, COMPUSTAT information on land ownership is highly reliable.

Table 4.1: Checking the Reliability and Meaning of COMPUSTAT item #260

Ticker Symbol	Company Name	COMPUSTAT Information: Land at Cost ($m)	Building at Cost ($m)	Any property	10-K information (Item 2: Properties): HQ owned	Other owned in HQ state	Any ownership in non HQ state	Any property in HQ state	Any owned property
20 Firms owning Real Estate, According to COMPUSTAT									
A	Agilent Technologies, Inc.	97	1684	1	1	1	1	1	1
AA	Alcoa Inc.	462	6177	1	1		1	1	1
AAIIQ	aaiPharma, inc.	2.786	32.267	1	1	1	0	1	1
AAON	Aaon, inc.	2.082	26.805	1	1	1	1	1	1
AAP	Advance Autopart, inc.	187.624	373.862	1	0	0	1	0	1
AATK	American Access Technologies, Inc.	.104	1.374	1	1	0	0	1	1
ABC	Amerisource Bergen Co.	42.959	233.397	1	0	0	1	0	1
ABG	Asbury Automotive Group	37.085	132.886	1	0	0	1	0	1
ABL	Biltrite inc.	5.526	74.69	1	0	1	1	1	1
ABLE	Able Energy inc.	.479	1	1	0	1	1	1	1
ABS	Albertson's Inc.	2012	6203	1	1	1	1	1	1
ABT	Abbott Laboratories	338.428	2519.492	1	1	1	1	1	1
ACET	Aceto corporation	.326	0	1	0	0	1	0	1
ACME	Acme Communications, Inc.	.15	5.048	1		0	1		1
ACMR	A.C. Moore Arts and Crafts, Inc.	2.466	38.133	1	1	0	0	1	1
ACO	Acmol International Corporation	7.85	61.987	1	1	1	1	1	1
ACR	American Retirement Corporation	34.085	492.309	1		1	1	1	1
ACS	Affiliated Computer Services Inc.	19.089	106.003	1	1	1	1	1	1
ACV	Alberto-Culver Company	16.474	212.238	1	1	1	1	1	1
ACU	ACME United Corporation	.251	2.796	1	0		1		1
	Overall			100%	61%	61%	85%	78%	100%
10 Firms not owning Real Estate, According to COMPUSTAT									
AACC	Asset Acceptance Capital Corp.	0	0	0	0	0	0	0	0
ABAX	Abaxis Inc.	0	0	0	0	0	0	0	0
ABCO	The Advisory board Company	0	0	0	0	0	0	0	0
ABGX	Abgenix inc.	0	0	0	0	0	0	0	0
ABIX	Abatix Corp.	0	0	0	0	0	0	0	0
ABMD	Abiomed, Inc.	0	0	0	0	0	0	0	0
ABTL	Autobytel, Inc.	0	0	0	0	0	0	0	0
ABXA	ABX Air, Inc.	0	0	0	0	0	0	0	0
ACAD	Acadia Pharmaceuticals Inc.	0	0	0	0	0	0	0	0
ACCL	Accelrys, Inc.	0	0	0	0	0	0	0	0
	Overall			0%	0%	0%	0%	0%	0%

Notes: We restrict ourselves to firms present in our sample in 2004. We then split observations into firms with some land (item 260 > 0) and firms without any land (item 260 =0). For each group, we then sort firms by ticker symbol. We focus on the first 20 firms with land, and the first 10 firms without land. For each firm in this list, we look for the 10K form that correspond to activity in year 2004. Under item 2 (property), we find the information that we report here.

Item #260 reports the book value of real estate owned by the firm when it was purchased (historical cost). It is not appreciated when real estate prices go up, so that capital gains do not show up in this accounting variable[2]. To measure (unrealized) capital gains, we thus need to interact this variable with actual real estate price indexes that vary over time. To factor the proper price, though, we need to know where the land held is located.

Of course, COMPUSTAT does not provide us with the geographic location of each specific piece of land owned by a firm. But fortunately, the data reports headquarter location (variables STATE and COUNTY), which we take as a proxy of where the firm holds its real estate. A concern could be that firms may either (1) not own any real estate in the state where their headquarters are or (2) own a lot of real estate in other states - or other countries. We ask if this is the case for the thirty firms of Table 4.1. Column 4 asks if the firms owns its executive offices, while column 5 asks if the firm owns any other property in the state where these offices are located. Out of the 20 land owning firms, 61% actually own their headquarters. Among the remaining firms, a third leases its headquarters, but owns other facilities in the same state (actually, the same town). Overall, 79% of these firms own some land in the state (in these cases, city) where they are headquartered. Thus, land ownership is a good indicator that the firm owns land in the state (even city) where its executive offices are located. As shown in column 6, there is, however, substantial measurement error left: 85% of these land owning firms also own land out of state, suggesting that COMPUSTAT item #260 vastly overestimates the fraction of land held in the HQ's location.

This discussion suggests that (1) COMPUSTAT item # 260 provides a good proxy that the firm owns land in the state (city) where its HQ are located, but that (2) this variable in general overestimates the amount of land the firm actually owns in the area.

This is why we use in most regressions a dummy variable equal to 1 if and only if item #260 is strictly positive. There is another reason why we should not trust the cross sectional dispersion in the value of land and buildings: since land is reported at historical cost, the value of this variable depends crucially on when the firms has bought the facility. Put otherwise, firms who bought early will look like firms who bought little real estate later on. One last reason to discretize item #260 is that the bulk of the cross sectional variation in land ownership comes from difference between firm owning and firms leasing real estate. Indeed, almost 46% of all observations correspond to firms owning neither land nor buildings.

4.2.1.2 Other Accounting Data

Aside from real estate, we also use other accounting variables, and construct ratios as is done in most of the corporate finance literature. Let us start with the variables used in the investment equations. We compute investment rate as the ratio of capital expenditures (COMPUSTAT item #128) to past year's Property Plant & Equipment (item

[2]But, under US GAAP, it is depreciated (impaired) when its market value falls below the purchase price.

#8). We compute market to book value of assets as follows: we take the total market value of equity as the number of common stocks (item #25) times end-of-year close price of common shares (item #24). To this, we add the book value of debt and quasi equity, computed as book value of assets (item #6) minus common equity (item #60) minus deferred taxes (item #74). We then normalize the resulting firm's "market" value using book value of assets (item #6). We also use the ratio of cash flows (item #18 plus item #14) to past year's PPE (item #8).

We use COMPUSTAT to measure debt issuance. We measure long term debt issue as long term debt issuance (item #111) normalized by PPE (item #8). We also compute long term debt repayment (item #114) divided by PPE. Finally, COMPUSTAT does not give us access to short term debt issuance and repurchase, so we content ourselves with net change in current debt (item #301) divided by PPE. Net change in long term debt is defined as long term issuance minus long term repayments normalized by PPE.

In our last regressions, we will measure accounting performance using Return on Assets: operating income before depreciation (item #13) minus depreciation (item #14) divided by total assets (item #6).

Finally, to ensure that our results are statistically robust, we windsorize all variable defined as ratios. Table 4.2 provides summary statistics, as well as the total number of observations after windsorization, for all accounting variables.

Table 4.2: Summary statistics

	Mean	Std. Dev.	Observations	25^{th} percentile	75^{th} percentile	
Firm Level Data						
	Investment	.386	.454	64,218	.112	.444
	Investment net of RE Inv.	.377	.457	56,156	.112	.439
	ROA	-.053	.313	71,488	-.091	.117
	Debt Issuance	.328	.562	67,875	0	.369
	Debt Repayment	.29	.461	68,783	.009	.316
	Changes in Current Debt	.006	.218	38,583	-.043	.048
	Average Interest Rate	1.76	6.623	54,749	7.17	12.14
	LAND_0	.536	.499	72,405	0	1
	$(p_t Land_0/K_{t-1})$	.06	.10	65,239	0	.37
	ABLAND_0	-.001	.315	70,415	-.206	.20
	Market/Book	2.482	3.59	60,105	.943	3.42
	Cash	-.086	1.539	64,858	-.235	.50
	Governance 1	8.718	2.679	19,535	6.8	10.6
	Governance 2	1.975	.814	12,182	1	3
	Governance 3	2.173	1.305	17,946	1	3
MSA Level Data						
	Index Growth Rate (MSA level)	.034	.244	1,785	-.062	.111
	Index (MSA level)	2.094	.997	3,404	1.4	2.43
	Land Constraint (Geography)	.134	.147	920	.0145	.2505
	Land Constraint (Rent Control)	.161	.367	1,288	0	1
	Land Constraint (Regulation)	2.039	.356	1,288	1.8	2.25
State Level Data						
	Index Growth Rate (State level)	.048	.047	965	.023	.062
	Index (State Level)	1.93	.71	1,014	1.36	2.3
	Personal Income Growth Rate	.057	.024	955	.04	.072

Notes: This table provides summary statistics at the firm level (panel 1) at the MSA level (panel 2) and at the state level (panel 3). Investment is defined as capital expenditure (item #128) normalized by lagged value of tangible assets (item #8). Investment net of RE investment is defined as Investment (item #128) minus investment in land (item #260 in year t+1 - item #260) normalized by lagged tangible assets (item #8). ROA is defined as operating income before depreciation minus depreciation and amortization normalized by total assets ((item #13-item #14)/item #6). Debt Issuance is defined as item #111 normalized by tangible assets (item #8). Debt Repayment is defined as item #114 normalized by tangible assets (item #8). Changes in current debt is defined as item #301 normalized by tangible assets (item #8). Average Interest Rate is defined as Interest expenses (item #15) normalized by total debt (item #9+item #34). LAND_0 is a dummy indicating land holding (item #260) in 1984 or in the first year of the firm's appearance in COMPUSTAT. $(p_t LAND_0/K_{t-1})$ is a proxy for the current market value of initial land holdings (See Appendix C.1 for details on the construction of this variable). ABLAND_0 is defined as the residual in column (4) of table 4.3. Market/Book is defined as market value of equity normalized by its book value (item #199 /(item #60 /item #25)). Cash is defined as Income before extraordinary items + depreciation and amortization (item #14 + item # 18) normalized by lagged tangible assets (item # 8). Governance 1 is the Gompers et al. (2004) Index ; Governance 2 is board size (equals to 1 (resp 2 and 3) if the firm is in the bottom (resp. medium and top) third of the distribution of board size) ; Governance 3 is Bebchuck's entrenchment index. Index Growth Rate (MSA Level – resp. State Level) is the growth rate of the MSA (resp. State) real estate price index ; Index (MSA Level – resp. State Level) are levels of real estate price index, and are normalized to 1 in 1984. Personal income is the state's personal income, normalized to 1 in 1980.

Governance Data

We then merge this dataset with corporate governance data. We use three different sources. First, the IRRC corporate governance and directors dataset provides us with board based measures of governance: the fraction of independent directors, the number of directors sitting on the board and the fraction of former employees sitting on the board. These variables are often used in the corporate governance literature. They are available for the 1996-2001 period only, and mostly for large firms. Second, we use the increasingly popular Gompers, Ishii, and Metrick's (2003) (hereafter GIM) index of corporate governance, which compiles various corporate governance provisions included in the CEO's compensation package, in the corporate charter and the board structure. The GIM index is available for 1990, 1993, 1995, 1998 and 2001. In other years, we assume that it takes the value that it had in the most recent year when it was non missing. Third, we will also use the Bebchuk et al. (2004) Entrenchment Index. This index, available from 1990 to 2003, is based on six provisions - four constitutional provisions that prevent a majority of shareholders from having their way (staggered boards, limits to shareholder bylaw amendments, supermajority requirements for mergers, and supermajority requirements for charter amendments), and two takeover readiness provisions that boards put in place to prevent hostile takeovers (poison pills and golden parachutes). The merging process leaves us with a sample of 2,211 firms for which the GIM index is non-missing, 2,358 firms for which the Entrenchment index is non-missing and 1,281 firms for which board information is available.

Although it can be debated, we will, as their authors do, consider that a large value of these index indicates strong managers and weak owners. Thus, everything else equal, we expect such firms to further away from maximizing value.

4.2.2 Real Estate Data

4.2.2.1 Real Estate Prices

Data for real estate prices come from the Office of Federal Housing Enterprise Oversight[3]. The O.F.H.E.O. is an independent entity within the Department of Housing and Urban Development, whose primary mission is "ensuring the capital adequacy and financial safety and soundness of two government-sponsored enterprises (GSEs) - the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac)". The O.F.H.E.O. provides a Home Price Index (HPI), which is a broad measure of the movement of single-family house prices. Because of the breadth of the sample, it provides more information than is available in other house price indexes. In particular, the HPI is available at the state level since 1975. It is also available for the 61 largest Metropolitan Statistical Areas, with a starting date between 1977 and 1987 depending on the MSA considered. We match the state level HPI with our accounting data using the state identifier from COMPUSTAT. To match the

[3] `http://www.ofheo.gov/index.asp`

MSA level HPI, we aggregate FIPS codes from COMPUSTAT into MSA identifiers using a correspondence table available from the OFHEO website.

We use private household price data rather than commercial real estate data for two reasons. First and foremost, these are the only data freely available over such a period of time and at such a level of disaggregation. Moreover, real estate property is a relatively homogeneous good, which makes private single-family a good proxy for real estate. Second, having in mind endogeneity issues, we are concerned about a potential correlation between local real estate prices and local business conditions that may affect the profitability of investment. In that respect, private single-family house prices are *a priori* less correlated with local investment opportunities, than commercial real estate.

4.2.2.2 Measuring Land Supply

We measure geographical restrictions to land supply using data from Rose (1989). Rose computes, for the 40 most populated MSAs in the US, measures of the availability of land for urban use. He takes the sum of weighted annular areas, except water, around the city center. The weights decrease exponentially to zero, at a rate determined by population density. These measures are then normalized by the hypothetical value they would take in the absence of water. Rose's index of land supply ranges from 1 in Atlanta and Phoenix (areas without water), to .521 in San Francisco and .561 in Chicago[4].

As recently argued by Glaeser, Gyourko and Saks (2005) and Green, Malpezzi and Mayo (2005), regulation also plays a key role in restricting the construction of new homes, and therefore in limiting the expansion of land supply. First, regulation can affect the return to new homes and therefore affect the willingness of investors to build them, through, for instance, rent control (as in NYC, Boston and LA). Regulation issued at the state or at the city level can also directly impede the construction of new homes. At the state level, regulation usually take the form of environmental regulation (to protect the coast, to preserve wetlands), or planning. At the city level, the key restriction is zoning (land devoted to commercial real estate, to single family homes, to multiple family homes etc.), as well as the ability for a household or a real estate developer to rezone a given residential subdivision, and obtain a building permit. Another city level restriction that matters is the adequacy of infrastructure, although this part may be more endogenous to the local economy.

We use measures of rent control (at the city level) and state level regulation from Malpezzi (1996). These measures are available for the 56 largest MSAs in the United States, and have been shown to be strongly correlated with measures of land supply elasticities by Green, Malpezzi and Mayo (2005). Taking state regulation, the ordering of MSAs changes somewhat, but the correlation between these indexes is very high.

[4] In the regression analysis that follows, we use 1 minus the Rose measure instead of the Rose measure, so that it is increasing with land restrictions, and therefore homogenous with the other regulation measures we use.

In section 4.3.3, we interact these measures of land supply restriction with a measure of interest rate. We use the "contract rate on 30 year, fixed rate conventional home mortgage commitments" from the Federal Reserve website, between 1977 and 2006.

4.2.3 Loan Contracts

Beyond debt issuance and its maturity, we look at debt contracts with more detail. Here, the dataset is DEALSCAN, which is described in detail by Chava and Roberts (2006) and Sufi (2007). Every year between 1987 and 2004, this dataset collects loans made by banks to many medium to large firms. Each observation is one tranche of a loan made to a given firm in a given year. The information on these tranches is collected directly from banks or through the specialized press. Obviously, this sample is biased toward large firms and large loans. The median loan amount if \$94m; the average amount is \$278m. More than 70% of the tranches correspond to syndicated debt. The coverage improves over time: there are 1,216 loans in 1987, 6,013 in 1996 and 6,445 in 2004. DEALSCAN gives a lot of detailed information on the debt contracts. We take out variables that measure the degree of information asymmetry between the lender and the borrower: the spread, maturity in months, the principal of the tranche, whether the tranche is part of a syndicated loan. We also retrieve information on debt covenants, i.e. promises made by the borrower about minimum interest coverage, minimum assets level, and about giving to the lender the proceeds in case of an asset sale. For each covenant, a dummy variable is constructed to be equal to one if the covenant is present.

We then match this information with our COMPUSTAT data; this leads to a dataset of firm-tranche-year observations that we use in section 4.4.2.

4.3 Real Estate Prices and Investment

4.3.1 Empirical Strategy

In this section, we explore the consequences of variations in real estate prices on investment policy. For firm i, at date t, with headquarters located in state s, we start with the following equation:

$$INV_{it}^{s} = \alpha_i + \delta_t^s + \beta.LAND_i \times P_t^s + controls_{it} + \epsilon_{it}, \tag{4.1}$$

where INV is the ratio of investment to previous year capital stock, $LAND_i$ is a measure of real estate ownership and P_t^s measures real estate prices in state s at time t, normalized by 1980's prices. As controls, we use two variables usually included in the literature: the ratio of cash flows to assets and one year lagged market to book value of assets (see section above for a definition). We also include a firm fixed effect α_i, as well as state-year dummies δ_t^s, designed to capture state specific investment shocks, i.e. fluctuations in the local economy. Shocks ε_{it} are clustered at the state $\times$ year level. This correlation structure is conservative given the explanatory variable of interest $LAND_i \times P_t^s$

is defined at the firm level (see Bertrand, Duflo and Mullainathan [2004]).

We are particularly careful with our land ownership variable $LAND_i$. First, as mentioned above, it is best to use a dummy variable equal to 1 when the firm reports at least some land in its fixed assets. To remove as much endogeneity problems as possible, we define $LAND_i$ as the dummy equal to 1 when the firm has land in the first year when it enters our panel (this date equals 1984 for all firms listed before that date, approximately half of the sample). As a result $LAND_i$ is not time-varying, and its level is not identified separately from the firm fixed effect $\alpha_{i.}$ Again, while sensible and conservative, this convention does not turn out to affect much our results, because the land dummy is very stable over time. Among firms who report at least some land in their first year of presence in the data, 96% of subsequent observations also do. Among initially non land owning firms, 87% still do not own any piece of land after the first year in sample.

Estimating β thus amounts to comparing the response of investment to real estate inflation, between land owning and non land owning firms. This comparison allows to abstract from state specific macro shocks δ_t^s. One potential problem with this approach, however, is that land ownership is itself an endogenous choice. Firms can choose to own or lease their assets. After all, our manual check from Table 4.1 showed that even among land owning firms, 40% were leasing their headquarters in 2004. Such a choice may induce strong endogeneity biases if real estate prices proxy for local demand shocks. Some firms may be more exposed than others to such local shocks, and it is possible that these firms tend to own more land, as for example in the case of local retailers. It could also be the case for, say, small firms. In such a case, the estimate of β would be misleading as it would also capture the effect of these characteristics on the pro-cyclicality of firms' investment.

To alleviate this endogeneity problem, we first control for observables that may affect both the sensitivity to local demand and the propensity to own - instead of lease - land. For the first observation of each firm, we regress the land ownership dummy on its economic determinants - such as size, age - and retrieve the residual of this equation. The determinants of land ownership we include are close to those used by Sharpe and Nguyen (1995) in their study of the share of the lease vs buy decision. We include two-digit industry dummies, as well as a measure of firm size (log of total assets), a measure of firm age (years since IPO), firm profitability and a measure of capital intensity (tangible assets over total assets). We further include book leverage and state of headquarter location dummies. These last regressors do not appear in Sharpe and Ngyuen's study, but may *a priori* affect both the propensity to own land, as well as the sensitivity of investment to local demand. Table 4.3 presents the result of the regression of initial land holding on the various observables we use. A quick inspection of the R^2 suggests that industry dummies have the largest explanatory power (almost 60% of the cross sectional variance): obviously, supermarkets or restaurant chains are more likely to own land than internet start-ups. Most other coefficients have the expected sign: larger and older firms are more likely to own real estate. This is also the case for profitable and capital intensive firms.

More surprisingly, leverage turns out to be positively correlated with land ownership, suggesting a possible reverse causality: land collateral may allow firms to take on more debt. We will actually shed some light on this mechanism in section 4.4.

Table 4.3: Explaining Initial Real Estate Ownership

	Initial RE Asset Dummy			
	(1)	(2)	(3)	(4)
Log(Assets)	.087***	.086***	.084***	.079***
	(.0018)	(.0018)	(.0018)	(.0021)
Firm Age		.052***	.053***	.055***
		(.0083)	(.0083)	(.0087)
IPO after 1984		.029	.032	.028
		(.037)	(.037)	(.037)
Tangible/Asset			.29***	.29***
			(.021)	(.022)
ROA				.12***
				(.012)
Leverage				.054***
				(.0098)
Year Dummies	Yes	Yes	Yes	Yes
State Dummies	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Observations	8,456	8,456	8,456	8,192
Adj. R^2	.56	.57	.57	.58

Notes: This table explains the initial real estate asset ownership of a sample of COMPUSTAT firms. The dependent variable is a dummy indicating land holding (item #260) in 1984 or in the first year of the firm's appearance in COMPUSTAT. The explanatory variables are: Log(Assets) (item #6), Firm Age measured as the first year in COMPUSTAT, a dummy indicating whether the firm became public after 1984, Tangible net of real estate assets (item #8-item #260)/Assets(item #6), ROA ((item #13-item #14)/item #6) and leverage ((item #9 + item #34)/ item #6). All regressions also control for state of location, year and industry fixed effect. *, **, and *** means statistically different from zero at 10, 5 and 1% level of significance.

We label $ABLAND_i$ the residual of the equation presented in column 4 of Table 4.3 and use, in most cases, the following specification:

$$INV_{it}^s = \alpha_i + \delta_t^s + \beta.ABLAND_i \times P_t^s + controls_{it} + \epsilon_{it} \qquad (4.2)$$

This specification amounts to running equation (4.1), but including various observables (industry, size, age etc.) interacted with prices P_t^s. By virtue of Frisch-Waugh theorem, the estimate of β that we get using (4.2) is exactly the same. We thus control for observables that may induce a false correlation between investment and local real estate prices. Yet, there may be unobservables that could generate a strong correlation between land ownership and pro-cyclical behavior: for instance, more ambitious firms may follow demand more aggressively and prefer to buy land. We deal with this potential critique in section 4.3.3.

4.3.2 Main Results

Table 4.4 reports various estimates of equation (4.2). Column 1 is just the standard investment equation, estimated on our sample; it simply assumes that $\beta = 0$ and includes both Tobin's q and cash flows as explanatory variables. Both traditional determinants come out statistically very significant, as in most studies. Yet, as widely argued in the literature, it is difficult to interpret the positive correlation of cash flows and investment as evidence of financing constraints, both empirically and theoretically (see for instance Erickson and Whited (2000)). The explanatory power of variables included in this traditional model is not huge: for instance, a one standard deviation increase in cash flows increases investment by 3% of fixed assets, which corresponds to less than 9% of the cross sectional s.d. of investment.

Table 4.4: Real Estate Prices and Investment Behavior

			Capital Expenditure				Cap. Exp. - RE Inv.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$LAND_0 \times$ Index		.12***					
		(.021)					
$ABLAND_0 \times$ Index			.046***	.039***	.034**		.04***
			(.018)	(.013)	(.014)		(.015)
$ABLAND_0 \times$ Personal Income					.019		
					(.018)		
$(p_t Land_0/K_{t-1})$						.60***	
						(.18)	
Cash	.033***			.034***	.034***	.032***	.034***
	(.0037)			(.0036)	(.0025)	(.0036)	(.0037)
Market/Book	.02***			.02***	.017***	.02***	.02***
	(.0015)			(.0015)	(.0011)	(.0015)	(.0014)
Year×State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	53,237	53,237	52,107	52,107	52,100	53,237	45,046

Notes: This table presents the impact of real estate prices on firm investment decisions, depending on a firm initial land holding. Columns (1), (2), (3), (4), (5) and (6) use capital expenditure (item # 128 normalized by lagged item #8) as dependent variable. Columns (7) use capital expenditure less real estate investment (item # 128 - (item #260 in year $t+1$ - item #260) normalized by lagged item # 8). Column (1) estimates a basic investment equation, using cash (item #14 + item # 18 normalized by lagged item # 8) and lagged Market to Book ratio (item #199 /(item #60 /item #25)) as control variables. Column (2) controls for initial land holding and housing prices using $LAND_0$ as a measure of initial land holding. Column (3) uses $ABLAND_0$ (constructed as the residuals in column (4) of table 4.3) as the measure of initial land holding. Column (4) estimates equation 4.2 at the state level, while column (5) adds a direct measure of local activity (Personal Income define as an index with a value of 1 in 1980) to control for potential endogeneity issue. Column (6) uses a the current market value of initial land holding normalized by lagged tangible assets (i.e. $(p_t Land_0/K_t)$ – see Appendix C.1 for details) as an explanatory variable. Finally, column (7) estimates equation 4.2 using Investment minus real estate investment as a dependent variable. All specifications use year-state as well as firm fixed effect and allow for correlation of residuals within a given state-year. *, **, and *** means statistically different from zero at 10, 5 and 1% level of significance.

In column 2, we remove those controls and include the interaction term $LAND_i \times P_t^s$. We test whether $\beta > 0$ and find that land owning firms ($LAND_i = 1$) invest significantly more when real estate prices (P_t^s) increase. A one standard deviation increase in real estate prices (+15 points) increases capital expenditure by about 1.8% of fixed assets more for firms who own real estate. This magnitude may not appear very large, as the cross sectional standard deviation of investment stands around 33% of tangible fixed assets (PPE). Yet, it is important to keep in mind that land holding accounts, for firms with positive land holding, for only 4% of the capital stock. Given that land is such a small portion of all assets, the estimated economic magnitude is surprisingly large, when compared to, for instance, cash flows in the traditional investment equation.

Column 3 uses a similar specification to that of column 2, but replaces the land ownership dummy $LAND_i$ by the abnormal land ownership variable constructed above $ABLAND_i$. In contrast to columns 2, we now take into account the fact that land owning firms tend to be larger, older, more profitable, more indebted and concentrated particular industries. We still exclude the usual determinants of investment. Again, the effect remains statistically very significant (below 1%). Including these controls, however, cuts the estimated size of the coefficient, by nearly 60%. In column 4, we add cash flows and Tobin's q. The coefficient of interest is unchanged, and remains statistically significant at 1% (with a t-statistic of 3). Taking the various correlates of land into account, as well as cash flows and market to book, a 1 s.d. deviation increase in real estate prices (15 points) leads to a differential increase in investment of some .4% of total PPE, between firms that stand 2 s.d. apart from each other in terms of $ABLAND_i$. This effect is small (about 1% of the sample s.d. of investment), but again, it has to be compared to the share of land in PPE (4%).

The methodology used so far allows to control for observable heterogeneity in sensitivity to local demand. Yet, some of this heterogeneity may be unobservable. One very first way to tackle this line of criticism is to actually control for local demand shocks. We do this in Table 4.4, column 5. There, to measure local demand, we take state level Disposable Personal Income (DPI) series available from the Bureau of Economic Analysis, and estimate the following equation:

$$INV_{it} = \alpha_i + \delta_t^s + \beta.ABLAND_i \times P_t^s + \delta.ABLAND_i \times DPI_t^s + \epsilon_{it}$$

where DPI_t^s is personal income in state s at date t. We normalise state level DPI to be equal to 1 in 1984. As one can see from column 6 of Table 4.4, adding the controls for local activity to our baseline regression does not change at all the estimates of our coefficient of interest. It decreases very slightly the precision of the estimation but the result is still significant at the 1% level (t-value of 2.4). In addition, real estate owning firms do not behave differently in the wake of a demand shock: as expected, the coefficient on the DPI interaction term is slightly positive, but far from being statistically significant. This is comforting: at least part of the variability in real estate inflation is orthogonal to the dynamics of local demand, and still affects firm investment. It remains that this test may lack power if DPI_t^s does not accurately reflect local demand shocks.

One other way to test for this alternative interpretation is by focusing on firms that are most likely to sell locally. To do this, for each manufacturing industry, we run regression (4.2) separately and obtain distinct β coefficient. We then ask if β is larger for industries that tend to sell locally. We measure the propensity of each manufacturing industry to sell locally by using transport costs from National Accounts. In non reported results, we do not find any correlation between industry β and industry transport cost. In other words, in the cross section of sectors, it is not the case that "local" industries are responsible for the average β we find in Table 4.4. Yet again, this test lacks power as our measure of industry level transport costs is a very noisy proxy of whether a firm adresses local, or global markets. To gain such power, we will run similar regressions using city level home prices in section 4.3.3.

The overall effect of real estate prices on corporate investment that we describe in columns 2–5 of table 4.4 appears to be rather small. As we already mentioned, this is mainly due to the fact that land holdings account, on average, for a very small share of PPE (4%).

In column 6, we quantitatively assess the role of real estate assets on a firm's investment. We estimate the same equation as in column 4, replacing $ABLAND_i \times index$ by the market value of initial land holding, expressed as a fraction of total fixed assets (variable $p_t \times Land_i/K_{t-1}$). This "continuous" specification allows us to interpret quantitatively our results. For each extra $1 of collateral, firms invest an $.60. We must insist on the fact that the market value of land holding is not directly observable. We have to rely on a proxy for this variable.[5] The point estimate ($.60 investment for each $1 of collateral) is large and economically significant. It is in line with previous estimate in the literature. In their study of financial contracts in the property development industry, Benmelech, Garmaise and Moskowitz [2005] find leverage ratios of nearly 90% for loans secured on real estate. This coefficient should however be interpreted with caution. It relies on strong assumptions about the date of purchase of land holdings (see Appendix C.1), and the variable we use to derive it, COMPUSTAT item #260, is likely to be mis-measured (see Section 4.2.1.1). In any case, this regression confirms that our effect is not driven by the choice of a dummy rather than a "continuous" variable.

Finally, one last caveat with the estimates from columns 2-6 is that investment contains land purchase. As a result, our strong coefficients may simply reflect the fact that firms buy more land when its price goes up, a recommendation expressed by several real estate practitioners (see Pomazal, 2001). In non reported regressions, we looked at the elasticity of land holdings to real estate prices. We only found a slightly negative, and insignificant at the 41% level, relation between real estate inflation and the change in land ownership at cost, controlling for other investment determinants. The negative sign suggests that perhaps a fraction of the firms with positive land

[5]We defer the reader to Appendix C.1 for details on the computation of this variable.

holdings are realizing some capital gains and transform them into cash. In column 7, we report instead estimates of an equation where we replace capital expenditure by capital expenditure net of contemporaneous change in land ownership. The coefficient on $ABLAND_i$ is similar to the one reported in column 5.

We ran further robustness checks that we do not report here. First, we replaced $LAND_0$ by a dummy equal to one when the sum of land *and* buildings is strictly positive. The idea behind this regression is that some buildings may not be firm specific and have resale value that is affected to fluctuations on the real estate market. None of our results were affected, as firms owning land also tend to own buildings. Second, we ran "placebo" regressions in the spirit of Bertrand, Duflo and Mullainathan [2004]. For each observation in our sample, we used the model estimated in Table 4.3 to predict the probability of owning land. For each observation, we then make a draw from a uniform distribution $U_{[0;1]}$: if the draw is below the predicted probability of owning land, the firm is labeled "placebo land owner". The conditional distribution of these placebo land owners is the same as the distribution of actual land owners. We then run regressions (4.2) using the placebo land ownership dummy. We save the point estimate, and replicate the procedure 200 times. At the end of this process, we find placebo estimates centered around zero and spread between -.01 and +.01, while the point estimate using the actual $LAND_i$ dummy turned out to be .12 (see Table 4.4, col 2). Thus, it is the information contained in the $LAND_i$ variable that generates the correlation of investment with real estate prices, not some hard wired effect of our estimation procedure. Finally, as an ultimate robustness check, we conducted a similar analysis using French data, and obtained very similar results (see Chaney et al. (2006)).

4.3.3 City level results

In this section, we replace, in equation (4.2), state level home prices by home prices measured at the level of the city (Metropolitan Statistical Area) where the firm's headquarters are located. In this new equation, we assume implicitly that firms owning land tend to own land in the MSA where their headquarters are located (which is likely, given that 60% of the firms manually checked in Table 4.1 that own some real estate actually own their executive offices). This results in the amended version of equation (4.2):

$$INV_{it}^{m} = \alpha_i + \delta_t^m + \beta.ABLAND_i \times P_t^m + controls_{it} + \varepsilon_{it} \tag{4.3}$$

for firm i, at date t, with headquarters located in MSA m. Controls are cash flows and market to book ratio. We cluster the error terms ε_{it} at the MSA×year level. The result of this regression is reported in Table 4.5, column 1. The number of observations is lower than in Table 4.4 as home prices are not available for all MSAs in the US. The coefficient β that we obtain is equal to 0.1, significant at 1% (with a t-stat of 4.3). The estimated sensitivity of investment to land value is more than twice as large when we measure value using MSA level prices, rather than state level prices (we obtained, in column 5 of Table 4.4, a β of 0.039). Yet precision remains high: our interpretation for this difference is that, since firms tend to own their headquarters, the use of MSA level prices gives rise to less measurement errors, and therefore less downward bias in our measure of β.

Table 4.5: Robustness Table: Looking at MSA level price variation

	Investment			
	(1)	(2)	(3)	(4)
$\text{ABLAND}_0 \times$ MSA Index	.1***	.08***	.12***	.16***
	(.023)	(.031)	(.047)	(.049)
$\text{ABLAND}_0 \times$ Stock Index		.005		
		(.0044)		
$\text{ABLAND}_0 \times$ GDP			-.013	
			(.029)	
Cash	.03***	.03***	.03***	.03***
	(.0049)	(.0049)	(.0049)	(.0049)
Market/Book	.022***	.022***	.022***	.022***
	(.0019)	(.0019)	(.0019)	(.0019)
Year FE$\times$ ABLAND_0	No	No	No	Yes
Year $\times$ MSA FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	23,781	23,781	23,781	23,781

Notes: This table investigates the robustness of results in table 4.4 looking at price variation at the MSA Level. The dependent variable is investment (item #128 normalized by lagged item #8). Column 1 simply estimates equation 4.2 at the MSA Level. Column 2 (resp. Column 3) controls for aggregate shocks in activity, controlling for the interaction of ABLAND_0 and the GDP (defined as an index taking the value 1 in 1980) (resp. the Stock Market Capitalization (also defined as an index)). Column 4 controls for ABLAND_0 interacted with year dummies. All regressions control for year-MSA as well as firm fixed effects, and cluster observations at the MSA-year level. *, **, and *** means statistically different from zero at 10, 5 and 1% level of significance.

One potential source of bias in such estimates is that our $ABLAND_i$ variable measures some particular exposition to the aggregate business cycle. In a fashion similar to the control used in Table 4.4, column 6, we first control for stock market prices (column 2) or aggregate GDP growth (column 3). None of these controls affects our estimate of β. Last, we choose to be more agnostic about patterns of the business cycle, and include direct interactions between $ABLAND_i$ and year dummies. Although we lose some precision, our coefficient remains high (.16) and statistically significant (with a t-statistic above 3).

These robustness checks are reassuring. Yet, it could still be argued that $ABLAND_i$ measures different exposition to *local* demand shocks. Although we have shown in the past section that our results are robust to the introduction to an interaction of $ABLAND_i$ with state level personal income, one clear possibility is that state level income does not measure local demand cycle precisely enough.

Fortunately, using MSA level data has the advantage of giving us natural instrumental variables. We interact measures of local constraints on land supply and aggregate shifts in the interest rate to predict real estate prices. A lowering of interest rates shifts the demand for real estate upward. If the local supply of land is very elastic, the increased demand will translate mostly into more construction (more quantity) rather than higher land prices. If the supply of land is very inelastic on the other hand, the increased demand will translate mostly into higher prices rather than more construction. We expect that in MSAs where land supply is constrained, a drop in interest rate should have a larger impact on real estate prices.

We start by checking this prediction. We estimate, for MSA m, at date t, the following model of real estate prices P_t^m:

$$P_t^m = \alpha^m + \delta_t + \gamma.SupplyConstraint^m \times IR_t + u_t^m \tag{4.4}$$

where $SupplyConstraint^m$ measures constraints on land supply at MSA level, IR_t is the aggregate interest rate at which banks refinance their home loans (see description above). α^m is an MSA fixed effect, and δ_t captures macroeconomic fluctuations in real estate prices, from which we want to abstract. These first stage regressions are reported in table 4.6. Each of three columns of Table 4.6 takes a different measure of constraints on land supply (see exact descriptions above). In column 1, we use physical land supply (lake or sea) preventing city expansion in one direction. This specification has slightly fewer observations as the physical constraints variables compiled by Rose[1989] are only available for a 20 cities in the US. In column 2, we take a dummy equal to 1 in the presence of rent control for at least part of the homes. In column 3, we take city level regulation (zoning restrictions, building permits, infrastructure).

In all cases, high values of $SupplyConstraint^m$ means an MSA with very constrained land supply. As a result, we expect the effect of declining interest rates on prices to be strongest in MSA with high $SupplyConstraint^m$. In line with our expectations, γ turns out to be negative, and significant at 1%. In the following, we compare the price

Table 4.6: Impacts of Geography, Land Regulation and Rent Control on Housing Prices

	Price Index		
	(1)	(2)	(3)
Geography×Mortgage Rate	-.46***	-.27***	-.28***
	(.18)	(.071)	(.059)
Year Dummies	Yes	Yes	Yes
MSA Fixed Effect	Yes	Yes	Yes
Observations	874	1,196	1,196
Adj R^2	.84	.85	.85
F-STAT.	6	14	23

Notes: This table investigates how geography, rent control and land regulation affects real estate prices. The dependent variable is the real estate price index, defined at the MSA level. Column 1 uses the presence of a lake or the sea (variable Geography) interacted with mortgage rates adjusted for the inflation rate. Column 2 uses rent control while column 3 uses building regulation at the MSA level. **All three variables are increasing in land scarcity**. All regressions control for year as well as MSA fixed effects, and cluster observations at the MSA-year level. *, **, and *** means statistically different from zero at 10, 5 and 1% level of significance.

responses of real estate prices to a 100bp interest rate decline, between "constrained" cities (75th percentile of the supply constraint distribution) and "unconstrained" cities (25th percentile). In column 1 (physical constraints), we find that prices in "constrained" cities increase by 11 more points than in "unconstrained" cities (out of sample s.d. in price increases of 15). The coefficient is significant, but the F-test is not larger than 6, suggesting that this instrument may be weak. In column 2, the F-stat is much larger (14) suggesting that rent control provides us with a stronger instrument. A 100bp decrease in aggregate interest rates leads to a rise of real estate prices that is 27 points larger in "constrained" cities than in "unconstrained" cities. In column 3, we also have a strong instrument (F-stat of 23) leading to a price response of 12 points. These effects are large economically, and highly significant.[6]

We then move to the second stage. Equation (4.4) allows us to predict prices $\widehat{P_t^m}$ at the MSA level using differential impact of interest rates between MSAs. We then use the predictors of price levels from this equation as inputs for our investment equation:

$$INV_{it}^m = \alpha_i + \delta_t^m + \beta.ABLAND_i \times \widehat{P_t^m} + \gamma.ABLAND_i \times \delta_t + controls_{it} + \varepsilon_{it}^m \tag{4.5}$$

which is identical to equation (4.3). The ε_{it}^m are clustered at the MSA-year level. The controls $ABLAND_i \times \delta_t$ are there to ensure that the identification of β rests on the differential impact of interest rates according to land supply, not on the aggregate impact of interest rate. We report the results using the three measures of land supply in Table 4.7, columns 1-3. All these estimates have to be compared with column 4, in Table 4.5, where actual MSA level prices are used instead of predicted prices, but where controls are identical (estimate of β equal to .16). The number of observations declines somewhat as land supply measures are not available for all MSAs.

In column 1, we predict price levels using physical constraints on land supply. We find a coefficient of .36, significant at 1%, which is larger than the non instrumented estimate. Regulation and rent control differences give lower estimates (.22 and .25 respectively), less significant (at the 5% level of significance). In all estimations, we find slightly larger coefficients than in non instrumented regressions, but the difference is never statistically significant. Our interpretation is that, if anything, MSA level home prices are still noisy proxies of the land value of firms, and that straight OLS (within) estimators deliver slightly underestimated, but broadly correct, coefficients. In the following, we will therefore focus on OLS (within) estimators.

[6] The order of magnitude of these effects is, however, not unrealistic. Assuming for instance that land delivers a perpetuity of π, its value should be equal to:

$$V = \frac{\pi}{r}$$

Thus, the price response to an increase in r should write:

$$\frac{dV}{V} = -\frac{1}{r}.dr$$

Under this - simple and unrealistic - calibration, with interest rates of 5%, a 100bp decrease would generate an increase in prices of 20%.

Table 4.7: Real Estate Prices and Investment Behavior: IV estimates

	Investment		
	Geography	Regulation	Rent Control
$\text{ABLAND}_0 \times \widehat{MSA\ Index}$	.36***	.22**	.25**
	(.14)	(.11)	(.13)
Cash	.032***	.038***	.038***
	(.0062)	(.0053)	(.0053)
Market/Book	.018***	.021***	.022***
	(.002)	(.0025)	(.0025)
Year FE× ABLAND_0	Yes	Yes	
Year× MSA FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	13,433	17,282	17,228

Notes: This table presents IV estimation of equation 4.2 using restriction on land supply interacted with mortgage interest rates as instruments for the level of real estate prices (see table 4.6 for details). The instruments used are: geography (column 1) ; rent control (column 2) ; Building regulation (column 3). All regressions control for year-MSA as well as firm fixed effects, and cluster observations at the MSA-year level. *, **, and *** means statistically different from zero at 10, 5 and 1% level of significance.

4.4 Collateral and Debt

In this section, we try to explore the channel through which firms are able to convert capital gains on their land holdings into further investment. In order to do so, we first use COMPUSTAT and look at the response of debt issuance to real estate price shocks. We will then use DEALSCAN data to see what features of debt contracts are affected by capital gains on real estate.

4.4.1 Debt Issuance

As we saw in section 4.3.2, firms, when confronted with an increase in the value of their land holdings, do not sell their real estate properties. It means that outside financing must be increased to explain the observed increase in investment. One clear candidate at this stage is the issue of new debt, secured on the incremental value of land holdings.

Table 4.8 reports results of the effect of an increase in land value on debt issues. To simplify interpretations, we will remove controls from equation (4.2), and replace investment on the right hand side by debt issuance:

$$DebtIssue_{it}^{s} = \alpha_i + \delta_t^s + \beta.ABLAND_i \times P_t^s + \varepsilon_{it}^s \tag{4.6}$$

To obtain estimates comparable to investment results, our debt issuance variables are normalized by tangible fixed assets (PPE). We start by running the investment regression, which is identical to the specification of Table 4.4, column 2. The only difference is that we include all observations for which cash flows and Tobin's q controls of investment are missing in COMPUSTAT. In this slightly larger sample, the investment coefficient is broadly the same as in Table 4.4, column 2: $\beta = 0.044$.

Table 4.8: Real Estate Prices and Debt Issues - COMPUSTAT Data

	Investment	Change in debt	Long term debt issuance	Long term debt repayment	Change in current debt
	(1)	(2)	(3)	(4)	(5)
$ABLAND_0\times$ Index	.044***	0.054**	.073***	.02	-.021*
	(.0054)	(0.025)	(.025)	(.02)	(.011)
Year× State Fixed Effect	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes
Observations	68,203	64,917	66,369	67,259	69,477

Notes: This table presents capital structure regressions, using COMPUSTAT data. The dependent variables are: (1) Investment defined as (item #128) normalized by tangible assets (item #8), (2) Change in Total Debt (item # 111 - item #114) normalized by item #8, (3) Long Term Debt Issuance, defined as (item #111) normalized by item #8 (4) Long Term Debt Repayment defined as (item #114) normalized by (item #8) (5) Changes in Current Debt as (item #301) normalized by item #8. The specification is otherwise similar to that of column 2 of table 4.4. The regressions also include state-year and firm fixed effects. All regressions cluster observations at the state-year level. *, **, and *** means statistically different from zero at 10, 5 and 1% level of significance.

To see how this additional investment is financed, we then look at net long term debt issue (column 2), which COMPUSTAT allows us to break down into long term debt issue (column 3) and long term debt repayment (column 4). We also investigate net change in current debt (column 5), which is provided in a single item by COMPUSTAT. Overall net (of repayment) long term debt issue responds to real estate inflation by the same order of magnitude as investment ($\beta = 0.054$ compared to 0.044). This suggest that almost all investment is financed by long term debt issue. When we break down net issue of debt, the bulk of the effect of capital gains is on long term debt issue, whose coefficient β (0.073) is larger than that of investment (0.044). Put otherwise, the data is consistent with all new investment being financed by an additional issue of long term debt. A 15 points increase in the index is in general accompanied by a differential increase in new long term issues of .4% of total assets, between firms that stand 1 s.d. of $ABLAND_i$ apart from each other. This is a very significant effect, albeit small when compared to average new long term issues, which amount on average to some 30% of all tangible fixed assets. Yet again, land is small fraction of all assets (4%).

Column 5 shows that capital gains on land are in general accompanied by a slight decrease in short term debt. Overall, the coefficients on investment (0.044) and decrease in current debt (0.021) add up almost to the coefficient on long term debt (0.054). This suggests that the increase in land value is used both to invest more, but also to increase overall debt maturity, as both pecking order and trade off theories of capital structure would suggest.

4.4.2 Debt Contracts

The above results are consistent with firms with more valuable land holdings taking on more long term debt. We ask here whether the new debt issued tends to be less information sensitive, as the pecking order theory of capital structure would predict. To do this, we look at various features of the debt contracts themselves, and see how they correlate with capital gains, much in the spirit of equation (4.6). Since some firms may sign several debt contracts in a given year, the dataset we use in this section is a panel of debt contracts, matched with firm characteristics (see description in section 4.2.3). For debt contract j, issued by firm i, at t, located in state s, we estimate:

$$F^s_{j,it} = \alpha_i + \delta^s_t + \beta.ABLAND_i \times P^s_t + \varepsilon^s_{it} \tag{4.7}$$

where F is the chosen feature of the contract (maturity, spread etc.). As in equation (4.6), we do not include firm level, time changing, controls, mostly because the literature provides very little guidance as to what to control for. Error terms ε^s_{it} are clustered at the state year level. Results of these regressions are reported in Table 4.9.

Table 4.9: Real Estate Prices and Debt Issues - Loans Characteristics

	Spread	Syndicated Loan	Loan's Principal	Maturity (Log)	Covenant on Interest Coverage	Cov.on Asset	Asset Sweep
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$ABLAND_0 \times$ Index	-15	.095***	.17	.17**	-.083**	-.32**	-.22***
	(14)	(.037)	(.19)	(.084)	(.041)	(.15)	(.085)
Year×State Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,102	11,893	12,181	11,656	12,736	3,183	3,183

Notes: This table investigates loan characteristics, using the DEALSCAN and SDC datasets. The dependent variables are: the loan spread (column (1)), the loan principal (column (3)), a dummy variable indicating whether the loan is syndicated (column (2)), the loan maturity in days (in logarithm, column (4)), a dummy variable indicating the presence of a covenant on interest coverage (column (5)), on asset sales (column (6)) and a dummy indicating the presence of an asset sweep (column (7)). The specification used in this regression is similar to that of column (2) in table 4.4. Each regression uses state-year as well as firm fixed effects and clusters observations at the state-year level. *, **, and *** means statistically different from zero at 10, 5 and 1% level of significance.

We start with interest rates (column 1). We do not find that loans are significantly cheaper for firms whose land has appreciated. The spread is slightly lower, but the difference is slim. The differential response of spread to a 15 points increase in real estate prices between two firms standing 1 s.d. of $ABLAND_i$ apart from each other is less than 1 bp. The effect is therefore neither statistically significant nor economically meaningful. We interpret this as being consistent with the fact that collateral does not allow the firm to borrow at a cheaper rate, but rather allows the firm to borrow more. This is consistent with rationing on the credit market. Collateral helps the firm to take on loans (and possibly more expensive ones) that banks did not want to grant before.

The rest of the evidence presented in Table 4.9 is consistent with new loans being less information sensitive. First, these new loans are more likely to be syndicated (column 2). A 15 point increase in prices raises the probability of syndication by .5%, again comparing two firms apart from each other by 1 s.d. of $ABLAND_i$. Sufi (2007) shows that syndication is evidence of low asymmetry of information between lenders and borrowers; our evidence suggests that collateral may indeed reduce such information problems. Second, these new loans are more likely to be long term (column 4), which is consistent with COMPUSTAT evidence, although there may be doubts that DEALSCAN is actually representative of all firms' new loans (the sampling procedure does not ensure this). A 15 points increase in real estate prices increases maturity by nearly 1%. Thus, new loans seem less risky from the bank viewpoint.

Third, they are less likely to include three types of covenants. Covenants are promises in debt contracts that can take many forms, and are usually interpreted by the literature as features designed to reduce information asymmetries between the lender and the borrower (see for instance Chava and Roberts (2006)). Breaching a covenant usually leads to renegotiation, although technically the bank could terminate the loan and demand immediate payback (such events are labeled "technical default"). Hence, the outcome of this renegotiation is in general in favor of the bank. Column (5) uses as the dependent variable a dummy equal to 1 if the loan specifies a threshold on the interest coverage ratio (the ratio of operating income to interest expenses). If the firm breaks this threshold, it enters into technical default. Column (6) looks at the presence of a threshold on the firm's assets, below which the terms will most certainly be renegotiated. Column(7) focuses on "asset sweep" covenants, which force the firm to pay back the loan if it sells one of its assets. For each of these features, an increase in land value is associated with a significantly lower probability that the new debt contracts includes these covenants. As with syndication and debt maturity, the presence of additional collateral seems to alleviate information asymmetries and ease the contractual conditions under which firms can have access to new debt.

4.5 Corporate Governance and Investment Performance

In the previous sections, we have shown that additional collateral coming from increasing land value reduces information asymmetries between firms and lenders. It allows firms to borrow more long term and therefore invest more. Firms are therefore credit constrained, and quickly take advantage of new collateral to invest more. Yet, the question of why such sensitivity is present in the data remains open. Blanchard, Lopez-de-Silanes and Shleifer [1994] suggest two reasons for this. One first possibility is that managers are benevolent maximizers of shareholder value, but firms face adverse selection on the credit market. This creates rationing, so that a positive shock to collateral alleviates informational asymmetries and leads firms with valuable investment opportunities to invest more. The second possibility is that managers are simply empire-builders, not value maximizers. As a result, cash or collateral windfalls are a cheap way to help managers pursue their growth strategies, be they profitable or not.

Both theories are likely to contain some truth. To investigate their respective explanatory power, we look at the cross section of firms. We compare firms where shareholders are strong to firms where the management is strong. Our hypothesis is that additional investments made possible by collateral windfalls are more likely to be profitable in firms with strong shareholders. To test such a prediction, we measure the impact of shocks to real estate prices on the profitability of land owning firms. We compare this response for firms with strong shareholders (well governed) and firms with weak shareholders (badly governed). We expect profits of well governed firms to increase more - or decrease less - than that of badly governed ones. To check this, we take three governance measures from the existing literature and estimate the following equation:

$$ROA^s_{it} = \alpha_i + \delta^s_t + \gamma GOV_i \times P^s_t + \beta.ABLAND_i \times P^s_t + \zeta.GOV_i \times ABLAND_i \times P^s_t + \varepsilon^s_{it}, \quad (4.8)$$

where ROA is Return on Assets (operating income on total assets), and GOV_i measures the quality of corporate governance. The last interaction term $GOV_i \times ABLAND_i$ is not included because of the fixed effect α_i.

Table 4.10 shows estimates of (4.8). Column 1 first assumes homogenous governance in the sample ($GOV_i = 1$ for all firms). We find here that performance does not respond to collateral shocks. This can be consistent with both empire building and asymmetric information theories working in opposite directions. One other possibility is that the asymmetric information theory holds, but some firms have decreasing returns to scale, such that even a profit maximizing firm my reduce its average profitability by investing more (see for instance the discussion in Banerjee and Duflo (2004])). Some other firms may have increasing returns to scale - such that all investment results in improved productivity. On average, both effects may cancel out.

Yet, for given returns to scale, it is likely that profitability of badly governed firms improves less, or deteriorates more, than for well governed ones. In columns 2, 3 and 4, we interact the $ABLAND_i \times P^s_t$ term with three governance indices taken from the corporate governance literature, respectively the Gompers et al. (2003) index (GIM index), board size from IRRC, and the Bebchuck et al. (2004) Entrenchment Index. Note that each is an inverse measure of corporate governance, so that a high GIM index, a large board size and a large Entrenchment index all mean poor governance, i.e. weak shareholders. All results point to a statistically strong detrimental effect

Table 4.10: Performance and Collateral Windfall - Corporate Governance

	Return On Assets (×100)			
		GIM Index	Board Size	Entrenchment Index
	(1)	(2)	(3)	(4)
$ABLAND_0 \times$ Index	.0078	.048***	.024*	.035***
	(.013)	(.017)	(.012)	(.0097)
$ABLAND_0 \times$ Governance × Index		-.0049**	-.02***	-.0085**
		(.002)	(.0066)	(.0042)
Governance× Index		-.002***	-.0035**	-.004***
		(.00045)	(.0015)	(.0011)
Year×State Dummies	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes
Observations	69,851	19,238	12,044	17,657

Notes: This table relates corporate governance to investment quality, providing an estimation of equation 4.8. Dependent variable is ROA, defined as ((item #13-item #14)/item #6). Corporate governance measures are: the Gompers Ishii Metrick Index (column 2); board size (column 3) ; the Bebchuk et al's Entrenchment Index (column 4). All governance measures are constant for a given firm across time. *Note that a high GIM or entrenchment index indicates poor governance.* All specification use year-state as well as firm fixed effect. All regressions also cluster observations at the state-year level. *, **, and *** means statistically different from zero at the 10, 5 and 1% level of significance.

of poor corporate governance on the quality of investment. Again, however, given that land is only a very small fraction of assets, the economic magnitude of the resulting effect is small. Take, for instance, results from column 4. Well governed firms have an entrenchment index of 1. The effect of collateral increase, as measured by the difference between two firms that are 1 s.d. apart in terms of $ABLAND_i$, is nearly equal to zero. For badly governed firms (index of 3), the effect of collateral increase is to reduce ROA by 0.1 percentage point.

These results suggest that while firms with sound corporate governance do not translate a positive collateral shock into higher performance, profitability declines among badly governed ones. Measures of corporate governance therefore seem to entail informational content about a firm's ability to transform financing into value. In a recent paper, Franzoni (2007) obtains comparable results by looking at stockmarket reactions to negative cash flow shocks. He finds that such responses are less negative in firms whose governance is weak. His results and ours comfort Blanchard et al (1994)'s view that firms differ in their willingness to maximize shareholder value. This also suggests that the quality of governance has real effects on firm profitability. Probably because they have focused on the cross sectional dispersion in profits, few papers have managed to exhibit real effect of corporate governance - an exception being Bertrand and Mullainathan (2003). This paper set itself a much less ambitious goal, as it focuses on the dispersion in performance among well and badly governed corporations, *conditional* on experiencing an exogenous shock to collateral value and assuming that governance is independent from this shock. Still, we believe these results are important considering the few "real effects" available in the literature.

4.6 Conclusion

The key implication of our analysis is normative. As positive shocks to land value alleviate financing constraints, holding real estate in the balance sheet may provide a useful corporate hedging mechanism. Following up on Holmstrom and Tirole (2000, 2001), our analysis suggests that firms should benefit more from holding land when its returns are less correlated with their own cash flows. Thus, the decision to lease or buy land should be part of the corporate hedging policy.

The present paper opens up many leads for further research. One interesting hypothesis would be to use shocks to real estate value to investigate how internal capital markets function. On a restricted sample of oil conglomerates, Lamont (1997) has shown that capital markets indeed respond to cash flow shocks of one of the conglomerate's activities. Because so many firms have land in their balance sheet, studying such land value shocks allows to replicate Lamont (1997)'s study on a larger sample. Such a new approach would allow us to study the organizational determinants of well functioning capital markets. While US data are not necessarily well suited for this kind of study - COMPUSTAT does not provide land ownership at the segment level - French firms, with their group structure, provide the ideal field on which to test the various theories of internal capital markets that have emerged in recent years.

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Appendix A

Performance and Behavior of Family Firms

A.1 Data

This study uses 5 distinct sources of data.

A.1.1 Corporate Accounts

The initial sample is drawn from the DAFSA yearbook of all firms listed on the French stockmarkets.[1] over the 1994-2000 period[2] There are on average some 700 such firms each year. This yearbook mostly collects data from annual reports and therefore provides us with the firm's consolidated accounts (balance sheet and profit accounts) as well as more "organizational information" such as: total employment, major shareholders, all board members and part of the top management - including the CEO. Firms' age and industry are also provided, although the industry classification only has 13 different names.[3]

Overall, there were 682 firms listed on the French stockmarket in 1999, and 549 for which we have value added figures - therefore excluding mostly financial firms. Also the number of these firms is modest when compared to the overall population (some 2 millions of firms exist in France, among which some 700,000 corporations), these firms tend to be heads of groups, and thus to control a large number of other firms. Most of the time, these subsidiaries are legally different firms, but effectively mere "divisions" of the group. Less frequently, these firms really are separate entities that are controlled by the listed holding, but with other shareholders. This is why it is critical here to use *consolidated accounts*; without them, our information on employment, assets, sales and costs would be almost meaningless (a holding company has no sales and just checks in dividends, for example). Given that listed firms

[1] Until 1997, France had no less than 7 stock exchanges (Bordeaux, Marseilles, Nancy, Nantes, Lille, Lyons and Paris), where most firms (70%) were listed in Paris. All exchanges were merged in 1997.

[2] The DAFSA yearbooks in fact collected firm level information since at least the mid-1960s, but they have been computerized only since 1994.

[3] Another, finer and more standard, classification was also provided, but it turns out that under this classification more than a third of all firms simply appears as "holdings", with no further information on the group's activity. This is why we chose to focus on the data-specific, unconventional, industry classification.

tend to be large and group leaders, it turns out that they represent a large share of aggregate activity. Total sales generated by these firms represent some 900 bn euros, or 66% of French GDP. For those 549 firms for which we have value added figures in 1999, the sample we have represents 14% of total GDP. Total employment amounts to some 6 million jobs (a third of private sector employment), although many of them abroad - in particular in very large groups. Last, total market capitalisation of firms listed on the French stock exchange amounts to 119% of GDP.

A.1.2 Family Ownership and Management

Taking all firms listed on the stock exchange in 1999, we begin by determining whether these firms are "family firms" or not. To do so, we look at the firm's shareholders. When we find that the founder or the founder's family was a blockholder of the company, we label the firm as "family firm". We also add as an additional requirement that the blockholder owns more than 20% of the voting rights, taking into account the pyramidal structure of certain family groups. This requirement is almost useless as in only very few cases did a family own less than 20% of the voting rights. A few additional remarks are needed at this point. First, we deal with the problem of multiple founders by considering that it is sufficient that one of the family is still present among the shareholders to label the firm as a family firm. Second, in few instances, we stumble upon raiders, that is individuals who started with a very tiny firm - sometimes a family firm - and became progressively major players through a series of successful market operations and acquisitions - for instance François Pinault, or Vincent Bolloré. We label these firms as family firms (and more precisely as "founder-controlled") - even though they did not create, *per se*, the companies in question.

In addition to the basic DAFSA files, the informations on the company's history and the identity of the owner are collected from three main sources. First, we directly look into the annual company reports obtained mainly through the Internet. As it turns out, in many cases, the ownership structure provided in the annual reports remains somewhat opaque, especially since in many circumstances French families tend to hold control through pyramids of holding corporations (see Faccio and Lang (2002)). To get at the identity of the ultimate controlling owner, we use the information collected since 1997 by the *Conseil des Marchés Financiers* (CMF). This administrative body is an outlet of the Treasury supposed to monitor French financial markets ; an act passed in 1997 made it mandatory to individuals or firms who cross various thresholds in a listed firm's capital to declare it to the CMF.[4] In turn, the CMF has to make it public, and, in order to improve the transparency of the French financial system, the CMF publication provides us with the ultimate owners of the holdings generally responsible for the transactions. Last, we complemented these two sources of information with the use of various French business newspaper websites (*L'Expansion*, *Le Nouvel Economiste*).

Following Anderson et al. (2003), we then break this category down into three sub categories. First, the firm

[4] These thresholds are 5%, 10%, 20%, 33% and 50% of all votes.

is said to be "founder-controlled" when the founder of the firm still holds the family block and is CEO. Second, the firm is said to be "heir-managed" when the founder no longer holds control over the firm - most of the time because he retired or died - but when heirs of the founder collectively control the company votes, and an heir - direct or indirect - of the founder is the actual CEO of the company. Third, a firm is said to be family-owned, but professionally managed, when the family (founder or heirs) still holds the controlling block, but the CEO position is held by an outsider.

Following this methodology for our starting year 1999, we are able to track the family status of 470 companies among the 549 non financial / non real-estate firms present on the market this year. We then track back any family status changes between 1994 and 1999 by looking at CEO changes in the period. We find 161 such CEO changes and try, for every one of them, to determine whether the nature of the family status is affected: only 52 of them actually turn out to correspond to such transitions. We also track with the same method any family status changes in the year 2000.

Finally, we repeat this whole operation on firms exiting the market before 1999 but present at some point on the market after 1994, so that we finally look at the family status of any firm present on the French stock market between 1994 and 2000.

Out of a total sample (i.e. including all years) of 731 non financial / non real-estate firms, we are able to track the family status for 595 firms.

A.1.3 Employment Data

Total firm employment (consolidated) is reported in the DAFSA yearbook. Computing the skill, seniority and age structure within the firm requires more detailed firm-level employment data.

To do this, we use the social security files made available to the statistical office by the tax administration. For each subsidiary that belongs to the listed group, these files provides us with the wage, occupation, age and seniority of 4% of the employees - all employees born in October of an even year. We then use another survey ("Liaisons Financières", described for instance in Thesmar and Thoenig (2004)) to track the group that each subsidiary belongs to. This survey on financial relations between firms is exhaustive on all firms that have more than 500 employees or more than 1.5 million euros of shares of other firms. Consequently, most subsidiaries of our listed groups are likely to be covered by the sampling technique. We restrict ourselves to subsidiaries that are 100% controlled, directly or indirectly by the group leader (who is in general the listed firm of the group).

We first us these employee level data to re-compute total employment and average wage in the firm. In general, computed total employment is smaller than employment reported by DAFSA,[5] for two reasons. First, most of these

[5] In 1998 for instance, domestic employment of French listed firms (computed using social security files) accounted for about 37% of total employment of these firms (computed using reported employment in the DAFSA Yearbook).

firms, in particular the largest ones, have foreign subsidiaries and thus foreign employees that do not enter our social security records. Secondly, some of these firms include in their consolidated statements employees of firms that they do not 100% control. Since accounting regulation is not clear on consolidating rules, there is little we statisticians can do on that front.

We then use these data to add information on firms' gender, occupational, age and seniority structure. Unfortunately, education based measures of skill are not available from this dataset ; yet, as can be made clear from the Labour Force Survey which includes both informations, the occupation variable proxies education. We computed the fraction of Managers, Supervisors, Skill workers/clerks and Unskilled workers/clerks as well as the average age, age squared and average seniority of workers. Finally, we also retrieved the fraction of women employed.

A.1.4 Stock Prices

Daily stock price data over the 1991-2002 period are provided by Euronext, the French stock exchange. For each day the stock market is open, Euronext provides in particular, for each firm listed, the price at which the last transaction of the day was realized. For each month, we take the price of the last transaction of the last day of the month, and compute monthly returns using these prices. Euronext price data take account of dividends payments, but not always of stock splits, which creates sometimes huge variations in calculated monthly stock returns. To account for this, we simply trimmed the stock returns data by deleting the top and bottom 1% of the distribution.

To compute abnormal returns, we need a model of expected returns. We estimate three different models of expected returns. The first model simply assumes that a stock's expected return equals the market return. Unfortunately we cannot directly compute the market return with our data, because Euronext does not provide any figure for the number of shares outstanding before 1997. To simplify, we use as proxy for the market return the monthly return on the leading French stock market index, the CAC40, which is provided since 1988.

The second model of expected returns is the CAPM. We first take our measure of the riskless rate of return from EUROSTAT, which provides us with a monthly time series on the rate of return of 10-years French Treasury bills since 1980. After de-annualization, we use this measure to compute excess returns on various stocks and the market. Then, for each firm, we regress the excess stock return on the excess market return, and take the residuals of these regressions as our second measure of abnormal return.

The third model takes into account the fact, well documented in the asset pricing literature, that small firms, and value firms (with low market to book value of assets), show consistently positive abnormal return in a CAPM model. As it has become standard in this literature, we follow Fama and French (1996) and add to our model of expected returns, in addition to the market return, the excess return of small firms (SMB), and the excess return on value firms (HML). SMB is computed by sorting firms according to the past year capitalisation. We call big, the

20% largest firms, and small the 20% smallest. To determine SMB, we subtract, each month, the value weighted monthly returns of the largest firms (by previous year's standard) from the value weighted monthly returns of the 20% largest firms (again, by previous year's standard). To compute HML, we sort firms by past year book to market value of assets. We call "value firms" firms with the 20% highest book to market in the previous year, and glamor, firms with the lowest 20%. HML is the difference in value-weighted monthly returns between the value and the gloamor portfolio. Finally, for each firm, we regress excess returns on the time series of the market excess return, on SMB and on HML, and take the residual of this regression as our third measure of abnormal returns.

In the last two cases, the models of expected returns are estimated separately for each transaction (acquisition), in all the months available since 1991 *before* the deal. We also require that the acquiring firm has at least 12 months of stock returns prior to the transaction.

A.1.5 Acquisitions

The data source for large acquisitions is SDC platinium, a firm that collects publicized transactions (repurchases, LBOs, M&A) undertaken by companies in various countries. For France, SDC reports since 1990 some 1,000 completed acquisitions per year. We focus on all successfully completed acquisitions where the bidder (1) belongs to our sample, (2) owns less than 50% before the transaction and more than 50% afterwards. From SDC, we then retrieve the month and year of the acquisition.

For the firms in our sample, we end up with some 100 acquisitions per year between 1994 and 1998. In 1999 and 2000, we have some 150 acquisitions, which is not surprising given excellent financial market acquisitions. The number of firms making acquisitions is somewhat lower, given that some firms undertake several acquisitions (sometimes as much as 5 in a given year): over the whole period, some 80 firms (out of 650) make at least one acquisition. For the few observations for which target size is reported (a third of the total), we find that the average cost of the transaction stands around $ 180 millions.

A.2 Additional Tables

Table B1: Year by Year Regressions of Performance of Family Firms

	ROA(×100)			ROE(×100)		
	Founder CEO	Heir CEO	Professional CEO	Founder CEO	Heir CEO	Professional CEO
1994	1.3	2.2**	1.7	12.5***	12.3***	10.0***
	(1.1)	(1.0)	(1.2)	(3.3)	(3.1)	(3.5)
1995	1.7	1.1	1.7	8.8***	4.4	8.5***
	(1.1)	(1.0)	(1.1)	(3.2)	(3.0)	(3.3)
1996	.4	.8	.7	5.3	9.8***	3.9
	(1.1)	(1.0)	(1.1)	(3.5)	(3.3)	(3.6)
1997	1.4	1.2	.6	11.4***	11.7***	8.7***
	(1.2)	(1.1)	(1.2)	(3.3)	(3.1)	(3.3)
1998	2.4**	2.0*	1.5	13.8***	9.6***	9.7***
	(1.1)	(1.1)	(1.2)	(3.0)	(2.8)	(3.0)
1999	.8	1.8*	1.4	8.9**	5.3	11.2***
	(1.2)	(1.1)	(1.2)	(3.5)	(3.5)	(3.7)
2000	3.7***	2.7**	2.5**	8.6**	7.4*	7.3*
	(1.2)	(1.2)	(1.2)	(4.4)	(4.4)	(4.5)
Fama-Mc Beth	1.7***	1.8***	1.4 ***	9.9***	8.6***	8.5***
Coefficient	(.4)	(.3)	(.2)	(1.1)	(1.2)	(.9)

Source: year by year OLS estimates. See A.1 for details on data construction and sources. Dependent variable are ROA (column 1 to 3) and ROE (column 4 to 6). Control variables are similar to those used in table 1.3. Estimates of the coefficients on all three family dummies, along with their standard errors, are reported for each year (lines). *,** and *** mean statistically different from zero at 10%, 5% and 1% level of significance.

Table B2: Performance of Family Firms: Further Robustness Checks

	ROA (×100)	ROE (×100)	Market to book	Log(wage bill / empl.)
Founder CEO	2.3***	10***	.31***	-.025
	(.9)	(2.2)	(.1)	(.048)
Heir CEO	2.6***	11***	.14	-.12***
	(.79)	(1.9)	(.093)	(.048)
Professional CEO	1.8**	8.9***	.16	-.091**
	(.85)	(2.2)	(.12)	(.047)
Log(Assets)	-.29*	1.3**	.064***	.016
	(.16)	(.53)	(.023)	(.011)
Log(Firm Age)	-.6*	-3.3***	-.18***	-.0015
	(.36)	(.92)	(.044)	(.017)
Former SOE	-1	1.5	-.4***	.099*
	(.82)	(2.5)	(.14)	(.053)
Fraction equity	.24	.26	.12	.026
of largest block	(1.2)	(3.1)	(.14)	(.062)
Debt/Assets	-10***	-23***	-.97***	-.25***
	(1.4)	(4.5)	(.17)	(.065)
Stock Return Volatility	-9.7***	-23***	-1.2***	-.083
	(2.2)	(6.8)	(.24)	(.14)
Focus	1.1	-.48	.27**	.051
	(1.1)	(2.9)	(.14)	(.058)
Industry FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Heir=Professional	.33	.4	.89	.45
Observations	1,841	1,845	1,762	1,753
Adj. R^2	.21	.17	.29	.3

Source: Huber-White-Sandwich estimates, allowing for correlation of observations within a given firm. See A.1 for details on data construction and sources. Note: this table is similar to table 1.3 with *focus* (herfindhal index using 2 digits classification of industries - equal 1 when firm operates in a single sector and goes to 0 as the firm becomes very diversified) as an additional control. *, ** and *** mean statistically different from zero at 10%, 5% and 1% level of significance.

A.3 Breaking down Performance

Differences in ROA among the different groups of family firms are estimated with through equation (1):

$$\forall i,t: \quad ROA_{i,t} = \alpha + \beta_1 F_{1,i} + \beta_2 F_{2,i} + \beta_3 F_{3,i} + \gamma X_{i,t} + \epsilon_{i,t}$$

For family status f, this difference is given by the β_f coefficient, which is identified as:

$$\beta_f = \overline{ROA_f} - \overline{ROA_0} + \beta\left(\overline{X_f} - \overline{X_0}\right),$$

where $\overline{ROA_f}$ is the mean value of ROA for family status f. To understand where this difference comes from, we use he following equality, for each firm i:

$$ROA_i = (L/K)_i \left((Y/L)_i - w_i\right),$$

where L/K is the ratio of employment to capital, Y/L is the ratio of value added to employment and w is the mean wage paid in firm i.

Using this equality, we can compute the mean of ROA for any type of family status f as:

$$\overline{ROA_f} = \overline{(L/K)}_f \left(\overline{(Y/L)}_f - \overline{w}_f\right) + cov\left((L/K)_f, (Y/L-w)_f\right)$$

Therefore, the unconditional difference in the mean of ROA between firms with family status f and widely held firms comes as:

$$\begin{aligned}\Delta(ROA) = \overline{ROA_f} - \overline{ROA_0} \quad &= \quad \overline{(L/K)}_f \left(\Delta\left(\overline{(Y/L)}\right) - \Delta(\overline{w})\right) \\ &+ \left(\overline{(Y/L)}_0 - \overline{w}_0\right)\Delta\left(\overline{(L/K)}\right) + \Delta\left(cov\left((L/K), (Y/L) - w\right)\right)\end{aligned} \tag{A.1}$$

The differences in the right-hand side of the previous equation are unconditional differences. We are interested in the contribution of conditional differences to corporate performance. Therefore, we can estimate the following equations:[6]

$$\begin{cases} \forall i,t: \quad (L/K)_{i,t} = a + b_1 F_{1,i} + b_2 F_{2,i} + b_3 F_{3,i} + cX_{i,t} + \eta_{i,t} \\ \forall i,t: \quad (Y/L)_{i,t} = A + B_1 F_{1,i} + B_2 F_{2,i} + B_3 F_{3,i} + CX_{i,t} + u_{i,t} \\ \forall i,t: \quad w_{i,t} = \mathcal{A} + \mathcal{B}_1 F_{1,i} + \mathcal{B}_2 F_{2,i} + \mathcal{B}_3 F_{3,i} + \mathbf{C} X_{i,t} + \nu_{i,t} \end{cases}$$

Using the result from these estimations, one can link the conditional differences in profitability (the β_f coefficients) to the conditional differences in labor to capital ratio (the b_f coefficients), labor productivity (the B_f coefficients) and wages (the $\mathcal{B}_f$ coefficients):

$$\begin{aligned}\Delta(ROA) \quad &= \quad \overline{(L/K)}_1 \left(B_1 - \mathcal{B}_1 + (C - \mathcal{C})(\overline{X_1} - \overline{X_0})\right) + \\ &\left(\overline{(Y/L)}_0 - \overline{w}_0\right)\left(b_1 + c(\overline{X_1} - \overline{X_0})\right) + \Delta\left(cov\left(L/K, Y/L - w\right)\right)\end{aligned}$$

So that:

$$\begin{aligned}\beta_f \quad = \quad &\underbrace{\overline{(L/K)}_f \left(B_f - \mathcal{B}_1\right)}_{\text{Diff. in Labor Prod. -Diff in Wage}} + \underbrace{\left(\overline{(Y/L)}_0 - \overline{w}_0\right) b_1}_{\text{Diff. in cap. lab. ratio}} \\ &+ \underbrace{\left(\overline{X_f} - \overline{X_0}\right)\left(\beta + \overline{(L/K)}_f (B - \mathcal{B}) + \left(\overline{(Y/L)}_0 - \overline{w}_0\right) c\right)}_{\text{Diff. in observable}} + \underbrace{\Delta\left(cov\left(L/K, Y/L - w\right)\right)}_{\text{covariance term}}\end{aligned} \tag{A.2}$$

We therefore see that the conditional differences in ROA come from 5 different sources: conditional differences in labor productivity ; conditional differences in wages ; conditional differences in capital to labor ratio ; differences in observables between family status ; different covariance structure between labor to capital ratio and labor productivity net of wages. Table 6 simply displays each of these 5 terms for the differences in performance between founder-managed, heir-managed, professionally managed and widely held firms.

[6] Notice that these three models use the real ratios and not the logarithm of these ratios.

Appendix B

Optimal Independence in Organizations

B.1 Proofs

B.1.1 Proof of Proposition 1

The conditions for the existence of the separating equilibrium announced in the proposition has been shown in the text. This equilibrium exists only when $\beta_2^\star \geq 0$, otherwise there is no level of congruence for which the Decision Maker is willing to select project 2 when receiving signal 2. $\beta_2^\star \geq 0$ is equivalent to condition 3.6.

That this equilibrium is the unique separating equilibrium is easy to prove. The only other candidate for a separating equilibrium would be one where the Decision Maker selects project 2 (resp. project 1) after having received signal 1 (resp. signal 2). In such an equilibrium, the posterior beliefs of the Implementer are necessarily given by:

$$\mu_1 = 1 - \mu_2 = 1 - \alpha$$

In words, the Implementer is sure that the Decision Maker has received signal 1 (resp. 2) when project 2 (resp. 1) has been selected. Consider the two incentive constraint of the Decision Maker:

$$\begin{cases} (1-\alpha)\underline{B}\left(\beta F((1-\alpha)\underline{b}) + (1-\beta)F((1-\alpha)\bar{b})\right) \geq \alpha\bar{B}\left(\beta F(\alpha\bar{b}) + (1-\beta)F(\alpha\underline{b})\right) \\ (1-\alpha)\bar{B}\left(\beta F((1-\alpha)\bar{b}) + (1-\beta)F((1-\alpha)\underline{b})\right) \geq \alpha\underline{B}\left(\beta F(\alpha\underline{b}) + (1-\beta)F(\alpha\bar{b})\right) \end{cases}$$

Adding up these two constraints leads to the following inequality:

$$(1-\alpha)(\bar{B}+\underline{B})\left(F((1-\alpha)\bar{b}) + F((1-\alpha)\underline{b})\right) \geq \alpha(\bar{B}+\underline{B})\left(F(\bar{b}) + F(\underline{b})\right),$$

which is clearly never satisfied. Therefore, the separating equilibrium of the proposition is indeed the unique separating equilibrium of the model.

That $\beta_2^\star \leq 1$ and $\beta_1^\star \geq 0$ follow directly from the definition 5 and 3.

Assume that $\beta \leq \beta_1^\star$. Then:

$$\alpha\bar{B}\left(\beta F(\alpha\bar{b}) + (1-\beta)F(\alpha\underline{b})\right) \leq (1-\alpha)\underline{B}\left(\beta F(\alpha\underline{b}) + (1-\beta)F(\alpha\bar{b})\right)$$

Because $\alpha > 1-\alpha$, this directly implies that:

$$(1-\alpha)\bar{B}\left(\beta F(\alpha\bar{b}) + (1-\beta)F(\alpha\underline{b})\right) < \alpha\underline{B}\left(\beta F(\alpha\underline{b}) + (1-\beta)F(\alpha\bar{b})\right) \Rightarrow \beta < \beta_2^\star,$$

which proves that $\beta_1^\star < \beta_2^\star$.

Finally note $t = \underline{B}/\bar{B}$ and $\tau = \underline{b}/\bar{b}$. Then one can rewrite the threshold $\beta_2^\star$ as:

$$\beta_2^\star = \frac{\alpha F(\alpha\bar{b})t - (1-\alpha)F(\alpha\tau\bar{b})}{\left[F(\alpha\bar{b}) - F(\alpha\tau\bar{b})\right][1-\alpha+\alpha t]}$$

First, we look at how $\beta_2^\star$ evolves with α. Consider $\alpha_2 > \alpha_1$ and let $\beta \leq \beta_2^\star(\alpha_1)$. This implies that:

$$\underbrace{(1-\alpha_1)\bar{B}\left(\beta F(\alpha_1\bar{b}) + (1-\beta)F(\alpha_1\underline{b})\right)}_{=\psi(\alpha)} \leq \underbrace{\alpha_1\underline{B}\left(\beta F(\alpha_1\underline{b}) + (1-\beta)F(\alpha_1\bar{b})\right)}_{=\phi(\alpha)}$$

Note that $\phi()$ is strictly increasing with α as F is also strictly increasing. We have:

$$\begin{aligned} \psi'(\alpha) &= \bar{B}\left(-\beta F(\alpha\bar{b}) - (1-\beta)F(\alpha\underline{b}) + (1-\alpha)\beta\bar{b}f(\alpha\bar{b}) + (1-\alpha)(1-\beta)\underline{b}f(\alpha\underline{b})\right) \\ &= -\bar{B}\left(\beta\left(F(\alpha\bar{b}) - (1-\alpha)\bar{b}f(\alpha\bar{b})\right) + (1-\beta)\left(F(\alpha\underline{b}) - (1-\alpha)\underline{b}f(\alpha\underline{b})\right)\right) \end{aligned}$$

Because F is strictly concave, we know that: $\forall\ x \geq 0,\ F(x) \geq xf(x)$, so that: $F(\alpha\bar{b}) \geq \alpha\bar{b}f(\alpha\bar{b}) > (1-\alpha)\bar{b}f(\alpha\bar{b})$ and similarly: $F(\alpha\underline{b}) \geq \alpha\underline{b}f(\alpha\underline{b}) > (1-\alpha)\underline{b}f(\alpha\underline{b})$.

This proves that $\psi()$ is strictly decreasing so that we have:

$$\psi(\alpha_2) < \psi(\alpha_1) \leq \phi(\alpha_1) < \phi(\alpha_2)$$

which proves that:

$$\beta < \beta_2^\star(\alpha_2) \Rightarrow \beta_2^\star(\alpha_1) < \beta_2^\star(\alpha_2)$$

Of course, the proof that $\beta_2^\star$ is a decreasing function of α is similar. Let us briefly sketch it. Consider $\alpha_2 > \alpha_1$ and let $\beta \geq \beta_1^\star(\alpha_1)$. Then:

$$(1-\alpha_1)\underline{B}\left(\beta F(\alpha_1\underline{b}) + (1-\beta)F(\alpha_1\bar{b})\right) \leq \alpha_1\bar{B}\left(\beta F(\alpha_1\bar{b}) + (1-\beta)F(\alpha_1\underline{b})\right) \Leftrightarrow \nu(\alpha_1) \leq \omega(\alpha_1)$$

It is easy to prove that $\nu()$ is a decreasing function of α while ω is an increasing function of α, so that:

$$\nu(\alpha_2) \leq \nu(\alpha_1) \leq \omega(\alpha_1) \leq \omega(\alpha_1) \Rightarrow \beta \geq \beta_1^\star(\alpha_2)$$

This proves that $\beta_1^\star(\alpha_1) \geq \beta_1^\star(\alpha_2)$.

We now investigate how $\beta_2^\star$ evolves with t. We directly compute the derivative:

$$\frac{\partial\beta_2^\star}{\partial t} = \frac{\alpha(1-\alpha)}{(1-\alpha+\alpha t)^2}\frac{F(\alpha\bar{b}) + F(\alpha\tau\bar{b})}{F(\alpha\bar{b}) - F(\alpha\tau\bar{b})} \geq 0$$

Therefore, an increase in the Decision Maker's bias (i.e. a decrease in t) makes her more reluctant to select project 2 after having received signal 2.

Similarly, we can compute the derivative of $\beta_1^\star$ with respect to t. We find:

$$\frac{\partial\beta_1^\star}{\partial t} = \frac{\alpha(1-\alpha)}{(\alpha+(1-\alpha)t)^2}\frac{F(\alpha\bar{b}) + F(\alpha\tau\bar{b})}{F(\alpha\bar{b}) - F(\alpha\tau\bar{b})} \geq 0$$

Here, an increase in the Decision Maker's bias (i.e. a decrease in t) makes her less reluctant to select project 1 after having received a signal 1. For this particular incentive constraint, a higher Decision Maker's bias is actually helping reactivity to emerge. The natural question is therefore whether overall reactivity is impaire or enhanced by an increase in the Decision Maker's bias. Fortunately, it is to compute the derivative of $\beta_2^\star - \beta_1^\star$ with respect to t:

$$\frac{\partial\left(\beta_2^\star - \beta_1^\star\right)}{\partial t} = \frac{\alpha(1-\alpha)(1-t^2)(2\alpha-1)}{(\alpha+(1-\alpha)t)^2(1-\alpha+\alpha t)^2}\frac{F(\alpha\bar{b}) + F(\alpha\tau\bar{b})}{F(\alpha\bar{b}) - F(\alpha\tau\bar{b})} \geq 0$$

Overall, an increase in the Decision Maker's bias decreases the scope for reactivity.

We turn to the sensitivity of $\beta_2^\star$ with respect to τ:

$$\frac{\partial\beta_2^\star}{\partial\tau} = \frac{\alpha\bar{b}f(\alpha\tau\bar{b})F(\alpha\bar{b})}{\left(F(\alpha\bar{b}) - F(\alpha\tau\bar{b})\right)^2} \times \frac{\alpha t - (1-\alpha)}{1-\alpha+\alpha t}$$

As one can see, the link between $\beta_2^\star$ and τ is ambiguous. A higher Implementer's bias (i.e. a decrease in τ) makes the Decision Maker more reluctant to select project 2 after having received signal 2 only when the signal is sufficiently precise (i.e. $\alpha \geq \frac{\bar{B}}{\bar{B}+\underline{B}}$). To have a more interesting comparative static for the scope for reactivity, we need thus to look at $\beta_1^\star$. As one can easily compute:

$$\frac{\partial\beta_1^\star}{\partial\tau} = \frac{\alpha\bar{b}f(\alpha\tau\bar{b})F(\alpha\bar{b})}{\left(F(\alpha\bar{b}) - F(\alpha\tau\bar{b})\right)^2} \times \frac{(1-\alpha)t-\alpha}{(1-\alpha)t+\alpha} \leq 0$$

Therefore, a more biased Implementer makes it more attracting for the Decision Maker to select project 2 after having received signal 1. Overall, we can now look at the scope for reactivity as a function of τ:

$$\frac{\partial\left(\beta_2^\star - \beta_1^\star\right)}{\partial\tau} = \frac{\alpha\bar{b}f(\alpha\tau\bar{b})F(\alpha\bar{b})}{\left(F(\alpha\bar{b}) - F(\alpha\tau\bar{b})\right)^2} \times \frac{2\left(\alpha^2 - (1-\alpha)^2\right)t}{\left((1-\alpha)t+\alpha\right)\left(\alpha t + (1-\alpha)\right)}$$

Which proves the announced proposition. QED ∎

B.1.2 Proof of Proposition 2

We first investigate the pooling equilibrium where the Decision Maker always selects project 1. In such an equilibrium, the Implementer's posterior belief is given by:

$$\mu_1 = 1/2,$$

as, on the equilibrium path, no information on the state of nature can be inferred from the Decision Maker's project selection. However, out of the equilibrium path, any belief is *a priori* admissible, i.e. $\mu_2 \in [1-\alpha, \alpha]$.

We look for restrictions on these out-of-equilibrium beliefs imposed by the D1 refinement. Let us briefly introduce some notations. Call $U_1^\star$ (resp. $U_2^\star$) the equilibrium utility of a Decision Maker receiving signal 1 (resp. signal 2). Call $U_1^D(\mu_2)$ (resp. $U_2^D(\mu_2)$) the out-of equilibrium utility of a Decision Maker receiving signal 1 (resp. signal 2) when out-of-equilibrium beliefs are given by μ_2, i.e. the utility a Decision Maker gets by selecting project 2.

Call $D_i = \left\{\mu_2 \in [1-\alpha, \alpha] \;\mid\; U_i^\star < U_i^D(\mu_2)\right\}$ and $D_i^0 = \left\{\mu_2 \in [1-\alpha, \alpha] \;\mid\; U_i^\star = U_i^D(\mu_2)\right\}$

Definition (D1 Refinement)
If $D_1 \bigcup D_1^0 \subseteq D_2$, then $\mu_2 = 1-\alpha$. In words, if each out-of-equilibrium belief μ_2 that leads to a profitable deviation for a Decision Maker with signal 1 also leads to a strictly profitable deviation for a Decision Maker with signal 2, then the Implementer must believe that only Decision Makers with signal 2 deviate from the equilibrium, i.e. that $\mu_2 = 1-\alpha$.

Therefore, let $\mu_2 \in [1-\alpha, \alpha]$ such that $U_1^\star \leq U_1^D(\mu_2)$ (i.e. $\mu \in D_1 \bigcup D_1^0$). This means that:

$$(1-\alpha)\underline{B}\left(\beta F((1-\mu_2)\underline{b}) + (1-\beta)F((1-\mu_2)\bar{b})\right) \geq \alpha\bar{B}\left(\beta F(\frac{\underline{b}}{2}) + (1-\beta)F(\frac{\bar{b}}{2})\right)$$

But then, because $\alpha > 1-\alpha$, we have that:

$$U_2^D(\mu_2) = \alpha\underline{B}\left(\beta F((1-\mu_2)\underline{b}) + (1-\beta)F((1-\mu_2)\bar{b})\right) > (1-\alpha)\bar{B}\left(\beta F(\frac{\underline{b}}{2}) + (1-\beta)F(\frac{\bar{b}}{2})\right) = U_2^\star$$

So that $\mu_2 \in D_2$, which implies $D_1 \bigcup D_1^0 \subseteq D_2$. Therefore, with our equilibrium concept (i.e. Perfect Bayesian Equilibrium with D1 refinement), this pooling equilibrium must necessarily verify $\mu_2 = 1-\alpha$.

There are a priori two incentives constraints to check for this pooling equilibrium to exist. The first one is that a Decision Maker receiving signal 2 should prefer to select project 1. This can be written as:

$$(1-\alpha)\bar{B}\left(\beta F(\frac{\underline{b}}{2}) + (1-\beta)F(\frac{\bar{b}}{2})\right) \geq \alpha\underline{B}\left(\beta F(\alpha\underline{b}) + (1-\beta)F(\alpha\bar{b})\right) \Leftrightarrow \beta \geq \beta_2^{\star\star}$$

The other incentive constraint states that a Decision Maker receiving signal 1 should also prefer to select project 1. This incentive constraint is equivalent to:

$$\alpha\bar{B}\left(\beta F(\frac{\underline{b}}{2}) + (1-\beta)F(\frac{\bar{b}}{2})\right) \geq (1-\alpha)\underline{B}\left(\beta F(\alpha\underline{b}) + (1-\beta)F(\alpha\bar{b})\right)$$

But if $\beta \geq \beta_2^{\star\star}$, then, because $\alpha > 1-\alpha$:

$$\begin{aligned}
\alpha\bar{B}\left(\beta F(\frac{\underline{b}}{2}) + (1-\beta)F(\frac{\bar{b}}{2})\right) &> (1-\alpha)\bar{B}\left(\beta F(\frac{\underline{b}}{2}) + (1-\beta)F(\frac{\bar{b}}{2})\right) \\
&\geq \alpha\underline{B}\left(\beta F(\alpha\underline{b}) + (1-\beta)F(\alpha\bar{b})\right) \\
&> (1-\alpha)\underline{B}\left(\beta F(\alpha\underline{b}) + (1-\beta)F(\alpha\bar{b})\right),
\end{aligned}$$

so that the first incentive constraint (a Decision Maker with signal 2 must select project 1) implies the second incentive constraint (a Decision Maker with signal 1 must select project 1).

We now prove that $\beta_2^{\star\star} \geq \beta_2^\star$. Let $\beta \geq \beta_2^{\star\star}$. Then:

$$(1-\alpha)\bar{B}\left(\beta F(\frac{\underline{b}}{2}) + (1-\beta)F(\frac{\bar{b}}{2})\right) \geq \alpha\underline{B}\left(\beta F(\alpha\underline{b}) + (1-\beta)F(\alpha\bar{b})\right)$$

Using the fact that $\alpha > 1/2$, this implies that:

$$(1-\alpha)\bar{B}\left(\beta F(\alpha\underline{b}) + (1-\beta)F(\alpha\bar{b})\right) \geq \alpha\underline{B}\left(\beta F(\alpha\underline{b}) + (1-\beta)F(\alpha\bar{b})\right) \Rightarrow \beta \geq \beta_2^\star$$

We thus have $\beta_2^{\star\star} \geq \beta_2^\star$.

The derivation of the other pooling equilibrium as well as the proof that $\beta_1^{\star\star} \leq \beta_1^\star$ is exactly similar and are thus skipped.

We now turn to the comparative statics in the thresholds $\beta_2^{\star\star}$ and $\beta_1^{\star\star}$.

Let us focus on the proof for $\beta_2^{\star\star}$, the proof for $\beta_1^{\star\star}$ being just symmetric.

Let $\alpha_2 > \alpha_1$ and let $\beta \leq \beta_2^{\star\star}(\alpha_1)$. This implies that:

$$(1-\alpha_1)\bar{B}\left(\beta F(\frac{\bar{b}}{2}) + (1-\beta)F(\frac{\underline{b}}{2})\right) \leq \alpha_1\underline{B}\left(\beta F(\alpha_1\underline{b}) + (1-\beta)F(\alpha_1\bar{b})\right)$$

But $\alpha_2 > \alpha_1$ and $1-\alpha_2 < 1-\alpha_1$, so that:

$$(1-\alpha_2)\bar{B}\left(\beta F(\frac{\bar{b}}{2}) + (1-\beta)F(\frac{\underline{b}}{2})\right) \leq \alpha_2\underline{B}\left(\beta F(\alpha_1\underline{b}) + (1-\beta)F(\alpha_1\bar{b})\right) \Rightarrow \beta \leq \beta_2^{\star\star}(\alpha_2)$$

This proves that: $\beta_2^{\star\star}(\alpha_2) \geq \beta_2^{\star\star}(\alpha_1)$.

We can compute the derivative of $\beta_2^{\star\star}$ with respect to t:

$$\frac{\partial\beta_2^{\star\star}}{\partial t} = \frac{\alpha(1-\alpha)F(\alpha\bar{b})F(\bar{b}/2)}{\left((1-\alpha)\left(F(\bar{b}/2)-F(\underline{b}/2)\right)+\alpha t\left(F(\alpha\bar{b})-F(\alpha\underline{b})\right)\right)^2} \geq 0$$

Finally, let $\tau_2 > \tau_1$ and let $\beta \leq \beta_2^{\star\star}(\tau_1)$. This implies that:

$$(1-\alpha)\left(\beta F(\frac{\bar{b}}{2})+(1-\beta)F(\frac{b}{2})\right) \leq \alpha\tau_1\left(\beta F(\alpha\underline{b})+(1-\beta)F(\alpha\bar{b})\right) < \alpha\tau_2\left(\beta F(\alpha\underline{b})+(1-\beta)F(\alpha\bar{b})\right)$$

So that $\beta \leq \beta_2^{\star\star}(\tau_2)$ and $\beta_2^{\star\star}(\tau_1) \leq \beta_2^{\star\star}(\tau_1)$. QED. ▮

B.1.3 Proof of Proposition 3

We first show that there cannot be equilibrium where the Decision Maker would randomize strictly for both values of the signal. If such an equilibrium were to exist, then the Decision Maker would have to be indifferent between both project, for both value of the signal, otherwise she would not be strictly randomizing. Call κ the probability of selecting project 1 after receiving a signal 1 and χ the probability of selecting project 1 after having received signal 2. The indifference condition mentioned above can be written as:

$$\begin{cases} \alpha\bar{B}\left(\beta F(\mu_1\bar{b})+(1-\beta)F(\mu_1\underline{b})\right) = (1-\alpha)\underline{B}\left(\beta F((1-\mu_2)\underline{b})+(1-\beta)F((1-\mu_2)\bar{b})\right) \\ (1-\alpha)\bar{B}\left(\beta F(\mu_1\bar{b})+(1-\beta)F(\mu_1\underline{b})\right) = \alpha\underline{B}\left(\beta F((1-\mu_2)\underline{b})+(1-\beta)F((1-\mu_2)\bar{b})\right) \end{cases},$$

where μ_i is the posterior belief that state of nature is 1 when project i has been selected.

Dividing the two previous equations yields: $\alpha/(1-\alpha) = (1-\alpha)/\alpha$ which cannot happen as $\alpha > 1/2$.

Therefore, a mixed equilibrium can only involve the Decision Maker randomizing strictly for one particular value of the signal. Let us focus on the equilibrium where the Decision Maker randomizes when she receives signal 2, $\rho \in]0,1[$ being the probability that she selects project 1 in that case. We proved earlier that posterior beliefs, imposed by Baye's law, are given by:

$$\begin{cases} \mu_1(\rho) = \dfrac{\alpha+\rho(1-\alpha)}{1+\rho} \\ \mu_2(\rho) = 1-\alpha \end{cases}$$

Because she randomizes when receiving signal 2, the Decision Maker must be indifferent between project 1 and project 2 when receiving such a signal. This implies that:

$$\alpha\underline{B}\left(\beta F(\alpha\underline{b})+(1-\beta)F(\alpha\bar{b})\right) = (1-\alpha)\bar{B}\left(\beta F(\mu_1(\rho)\bar{b})+(1-\beta)F(\mu_1(\rho)\underline{b})\right) \quad \text{(B.1)}$$

The other Decision Maker's incentive constraint should verify that, after receiving signal 1, the Decision Maker wants to select project 1. Using the fact that $\alpha > 1-\alpha$, this is indeed the case as:

$$\begin{aligned} \alpha\bar{B}\left(\beta F(\mu_1(\rho)\bar{b})+(1-\beta)F(\mu_1(\rho)\underline{b})\right) &> (1-\alpha)\bar{B}\left(\beta F(\mu_1(\rho)\bar{b})+(1-\beta)F(\mu_1(\rho)\underline{b})\right) \\ &= \alpha\underline{B}\left(\beta F(\alpha\underline{b})+(1-\beta)F(\alpha\bar{b})\right) \\ &> (1-\alpha)\underline{B}\left(\beta F(\alpha\underline{b})+(1-\beta)F(\alpha\bar{b})\right) \end{aligned}$$

Therefore, when condition B.1 is verified, the semi-reactive equilibrium is an equilibrium. Condition 3.12 defines an implicit function $\beta(\rho)$, for each $\rho \in]0,1[$, which is the only level of congruence for which the ρ-mixed equilibrium is an equilibrium. $\mu_1()$ is strictly decreasing in ρ and goes from $1/2$ to α. $\beta(\rho)$ is uniquely defined as:

$$\beta(\rho) = \frac{\alpha\underline{B}F(\alpha\bar{b})-(1-\alpha)\bar{B}F(\mu_1(\rho)\underline{b})}{\alpha\underline{B}\left(F(\alpha\bar{b})-F(\alpha\underline{b})\right)+(1-\alpha)\bar{B}\left(F(\mu_1(\rho)\bar{b})-F(\mu_1(\rho)\underline{b})\right)} \quad \text{(B.2)}$$

It is easy to prove that $\beta(\rho)$ is an increasing function of beta. Let $1 > \rho_1 > \rho_2 > 0$. By definition of $\beta(\rho_1)$, we have:

$$\alpha\underline{B}\left(\beta(\rho_1)F(\alpha\underline{b})+(1-\beta(\rho_1))F(\alpha\bar{b})\right) = (1-\alpha)\bar{B}\left(\beta(\rho_1)F(\mu_1(\rho_1)\bar{b})+(1-\beta(\rho_1))F(\mu_1(\rho_1)\underline{b})\right)$$

We know that $\mu_1()$ is a strictly decreasing function of ρ, so that:

$$\begin{aligned} &\alpha\underline{B}\left(\beta(\rho_1)F(\alpha\underline{b})+(1-\beta(\rho_1))F(\alpha\bar{b})\right) < (1-\alpha)\bar{B}\left(\beta(\rho_1)F(\mu_1(\rho_2)\bar{b})+(1-\beta(\rho_1))F(\mu_1(\rho_2)\underline{b})\right) \\ \Leftrightarrow \quad &\beta(\rho_1) > \frac{\alpha\underline{B}F(\alpha\bar{b})-(1-\alpha)\bar{B}F(\mu_1(\rho_2)\underline{b})}{\alpha\underline{B}\left(F(\alpha\bar{b})-F(\alpha\underline{b})\right)+(1-\alpha)\bar{B}\left(F(\mu_1(\rho_2)\bar{b})-F(\mu_1(\rho_2)\underline{b})\right)} = \beta(\rho_2) \end{aligned}$$

So that β is indeed strictly increasing in ρ, which implies that ρ, defined as a function of β is a strictly increasing function of β.

It is direct to check that for $\beta = \beta_2^{\star\star}$, the indifference condition B.1 is satisfied for $\rho = 1$ and that for $\beta = \beta_2^{\star}$, it is satisfied for $\rho = 0$.

The derivation of the semi-reactive equilibrium with the Decision Maker randomizing conditional on receiving signal 1 is exactly similar and is therefore skipped. QED. ▮

B.1.4 Proof of Proposition 4

We begin this proof by showing that the value of a semi-reactive organization, when it exists, is a decreasing function of β. We consider the case of a semi-reactive equilibrium where the Decision Maker's decision rule strictly randomizes over project 1 and 2 only when receiving signal 2 (Point 2 of proposition 3). The proof for the other semi-reactive equilibrium is similar.

The value of such a semi-reactive equilibrium is given by:

$$V^{SR} = \left(\frac{1}{2}\left(\alpha + (1-\alpha)\rho\right)\left(\beta F(\mu_1(\rho)\bar{b}) + (1-\beta)F(\mu_1(\rho)\underline{b})\right) + \frac{1}{2}\alpha(1-\rho)\left(\beta F(\alpha\underline{b}) + (1-\beta)F(\alpha\bar{b})\right)\right) R,$$

where ρ is given by the indifference equation 3.12.

Using this indifference equation, we can rewrite organization's value in a very simple fashion:

$$V^{SR} = \left(\frac{1}{2}\left(\alpha + (1-\alpha)\rho\right)\frac{\alpha\underline{B}}{(1-\alpha)\bar{B}} + \frac{1}{2}\alpha(1-\rho)\right)\left(\beta F(\alpha\underline{b}) + (1-\beta)F(\alpha\bar{b})\right) R \tag{B.3}$$

We can derive now the organization's value with respect to β, being aware that ρ is an implicit function of β:

$$\frac{dV^{SR}}{d\beta} = \frac{\partial V^{SR}}{\partial\rho}\frac{\partial\rho}{\partial\beta} + \frac{\partial V^{SR}}{\partial\beta}$$

But we have:

$$\frac{\partial V^{SR}}{\partial\rho} = \left(\beta F(\alpha\underline{b}) + (1-\beta)F(\alpha\bar{b})\right)\alpha R\frac{\underline{B}-\bar{B}}{\bar{B}} \leq 0$$

And:

$$\frac{\partial V^{SR}}{\partial\beta} = \left(\frac{1}{2}\left(\alpha + (1-\alpha)\rho\right)\frac{\alpha\underline{B}}{(1-\alpha)\bar{B}} + \frac{1}{2}\alpha(1-\rho)\right)\left(F(\alpha\underline{b}) - F(\alpha\bar{b})\right) \leq 0$$

Moreover, we have proved in proposition 3 that ρ is an increasing function of β, so that: $\frac{\partial\rho}{\partial\beta} \geq 0$. Therefore, organization's value evolves monotonically with β as:

$$\frac{dV^{SR}}{d\beta} = \underbrace{\frac{\partial V^{SR}}{\partial\rho}}_{\leq 0}\underbrace{\frac{\partial\rho}{\partial\beta}}_{\geq 0} + \underbrace{\frac{\partial V^{SR}}{\partial\beta}}_{\leq 0} \leq 0$$

Therefore, setting aside the conditions of existence of a reactive equilibrium, we have that: $V^{SR} \leq V^{SR}(\beta = \beta_2^\star) = V^R$. If the reactive equilibrium exists, then the Owner always prefers this equilibrium to the semi-reactive equilibrium.

Define now α^0 as in proposition 4:

$$\alpha^0\left(F(\alpha^0\bar{b}) + F(\alpha^0\underline{b})\right) = F(\bar{b}/2)$$

First, assume that: $\alpha^0\underline{B}F(\alpha^0\bar{b}) \geq (1-\alpha^0)\bar{B}F(\alpha\underline{b})$.

This condition implies that for $\alpha = \alpha^0$ $\beta_2^\star > 0$, so there exist a range of $\beta \in [0,1]$ with positive measure supporting a reactive equilibrium. Moreover, we also have for $\alpha = \alpha^0$ that $\beta_2^{\star\star} < 1$.

Indeed, let $\alpha = \alpha^0$ and let $\beta = 1$. Then:

$$\begin{aligned}(1-\alpha^0)\bar{B}F(\bar{b}/2) &\geq (1-\alpha^0)\underline{B}F(\bar{b}/2)\\ &\geq \alpha^0\underline{B}F(\alpha^0\underline{b}),\end{aligned}$$

since $\alpha^0 F(\alpha^0\underline{b}) = F(\bar{b}/2) - \alpha^0 F(\alpha^0\bar{b}) < (1-\alpha^0)F(\bar{b}/2)$. This means that for $\beta = 1$ and $\alpha = \alpha^0$, the Decision Maker's strategy consisting in always selecting project 1 is an equilibrium, or equivalently that $\beta_2^{\star\star} < 1$. Therefore, for $\alpha = \alpha^0$, both a reactive and a non-reactive equilibrium exists.

By definition of α^0, we know that at $\alpha = \alpha^0$, reactive and "optimal" (i.e. $\beta = 1$) non-reactive organizations deliver the same profit to the Owner. Moreover, as $\beta_2^{\star\star}$ and $\beta_2^\star$ are increasing functions of α (see proof of proposition 1 and 2, we know that for $\alpha \leq \alpha^0$, a non-reactive equilibrium always exists while for $\alpha \geq \alpha^0$, a reactive equilibrium always exists. Finally, since the reactive organization's value is strictly increasing with α while the non-reactive organization's value is independent of α, we conclude that for $\alpha \geq \alpha^0$ the optimal organization is reactive while for $\alpha \leq \alpha^0$, it is non-reactive. Note that semi-reactive organizations are always dominated in this case, as for $\alpha \leq \alpha^0$, the non-reactive organization delivers a higher profit than that of the reactive organization, which itself is more profitable that the semi-reactive organization (see above), while, for $\alpha \geq \alpha^0$, the reactive organization always exists and therefore dominates the semi-reactive equilibrium. This proves the proposition's first bullet point.

Before turning to the second bullet point of proposition 4, let us prove that V^{SR} is, for a given level of congruence β, an increasing function of α. Consider first ρ as a function of α, for a given β. Then one can differentiate the indifference equation 3.12 with respect to α:

$$\underbrace{\underline{B}\left(\beta F(\alpha\underline{b}) + (1-\beta)F(\alpha\bar{b})\right) + \bar{B}\left(\beta F(\mu_1(\rho)\bar{b}) + (1-\beta)F(\mu_1(\rho)\underline{b})\right) + \alpha\underline{B}\left(\beta\underline{b}F(\alpha\underline{b}) + (1-\beta)\bar{b}F(\alpha\bar{b})\right)}_{\geq 0}$$

$$= \frac{\partial\rho}{\partial\alpha}\left\{(1-\alpha)\bar{B}\underbrace{\frac{\partial\mu_1(\rho)}{\partial\rho}}_{\leq 0}\underbrace{\left(\beta\bar{b}f(\mu_1(\rho)\bar{b}) + (1-\beta)\underline{b}F(\mu_1(\rho)\underline{b})\right)}_{\geq 0}\right\}$$

This implies that $\frac{\partial \rho}{\partial \alpha} \leq 0$. Finally, differentiating the semi-reactive organization's profit B.3 with respect to α:

$$\frac{dV^{SR}}{d\alpha} = \underbrace{\frac{\partial V^{SR}}{\partial \alpha}}_{\geq 0} + \underbrace{\frac{\partial V^{SR}}{\partial \rho}}_{\leq 0} \underbrace{\frac{\partial \rho}{\partial \alpha}}_{\leq 0} \geq 0$$

So that we proved that V^{SR} is an increasing function of α.

We now turn to the second bullet point of proposition 4. Therefore, consider the case where: $\alpha^0 \underline{B} F(\alpha^0 \bar{b}) < (1-\alpha^0)\bar{B}F(\alpha \underline{b})$. This means that for $\alpha = \alpha^0$, $\beta_2^\star < 0$, so that a reactive organization fails to exist for this level of signal's precision. Define $\tilde{\alpha}^1$ such that: $V^{SR}(\alpha_1, \beta = 0) = V^{NR}(\beta = 1) = \frac{1}{2}F(\bar{b}/2)R$, and $\hat{\alpha}^1$ such that: $\hat{\alpha}^1 \underline{B} F(\hat{\alpha}^1 \bar{b}) = (1-\hat{\alpha}^1)\bar{B}F(\underline{b}/2)$. Finally, define α^1 and α^2 such that:

$$\begin{cases} \alpha_1 = \max\{\tilde{\alpha}^1, \hat{\alpha}^1\} \\ \alpha^2 \underline{B} F(\alpha^2 \bar{b}) = (1-\alpha^2)\bar{B}F(\alpha^2 \underline{b}) \end{cases}$$

First, for $\alpha \geq \alpha^1$, we know that (1) a semi-reactive equilibrium exists, i.e. $\beta_2^{\star\star} \geq 0$ and (2) the semi-reactive organization with $\beta = 0$, if it exists, is more profitable than the non-reactive organization. For $\alpha \leq \alpha^2$, we know that the reactive organization does not exist, or equivalently that $\beta = 0$ supports a semi-reactive equilibrium.

Let us prove that $\alpha^2 \geq \alpha^1$. Assume it is not the case so that $\alpha^1 > \alpha^2$. First, if $\alpha^1 = \hat{\alpha}^1$, then there is a contradiction as for $\alpha \in]\alpha^2, \alpha^1[$, $\beta_2^{\star\star} < 0$ but $\beta_2^\star > 0$ which is not possible as $\beta_2^{\star\star} > \beta_2^{\star\star}$. Second, assume that $\alpha^1 = \tilde{\alpha}^1$. Then, by definition of $\tilde{\alpha}^1$, we have formally:

$$V^{NR} = V^{SR}(\alpha_1, \beta = 0) \geq V^{SR}(\alpha_2, \beta = 0) = V^R(\alpha^2)$$

as α^2 is such that $\beta_2^\star = 0$, i.e. that a reactive equilibrium exists for $\beta = 0$. But then, this must implies that $\alpha^2 \leq \alpha^0$ as the value of a reactive organization for $\alpha = \alpha^2$ is inferior to the value of a non-reactive equilibrium. As $\beta_2^\star(\alpha^2) = 0$, $\alpha^2 < \alpha_0$ and $\beta_2^\star$ is increasing with α, this must imply that $\beta_2^\star(\alpha^0) > 0$ which is a contradiction. Thus: $\alpha^2 \geq \alpha^1$.

Moreover, we have that $\alpha^1 \geq \alpha^0$ (of course, $\alpha^0 \leq \alpha^2$ otherwise this would contradict directly the definition of α^0 (i.e. α^0 would be such that a reactive equilibrium exists for $\beta = 0$)). By contradiction, assume that $\alpha^0 > \alpha^1$. Then, α^0 is such that there is a semi-reactive equilibrium for $\beta = 0$ (as $\alpha^0 \leq \alpha^2$). Thus:

$$V^{SR}(\alpha^0, \beta = 0) > V^{SR}(\alpha^1, \beta = 0) = V^{NR}$$

. But we know that: $V^{SR}(\alpha^0, \beta = 0) \leq \frac{\alpha^0}{2}(F(\alpha^0 \bar{b}) + F(\alpha^0 \underline{b}))$ so that:

$$\frac{\alpha^0}{2}(F(\alpha^0 \bar{b}) + F(\alpha^0 \underline{b})) > V^{NR}$$

which contradict the definition of α^0.

Therefore, we have $\alpha^0 \leq \alpha^1 \leq \alpha^2$. For $\alpha \leq \alpha^1$, a pooling equilibrium always exist (optimal with $\beta = 1$) and is optimal compared to semi-reactive equilibrium which are the only other equilibrium that exist in this range of signal's precision. For $\alpha \in [\alpha^1, \alpha^2]$, semi-reactive organizations are optimal (with $\beta = 0$ as their value is decreasing with β and $\beta = 0$ always support a semi-reactive equilibrium in this range of α) over non-reactive equilibrium, because of the definition of α^1 and α^2 and because of the monotonicity in α of the semi-reactive organization's value. Finally, for $\alpha \geq \alpha^2$, the optimal organization is reactive (because of the monotonicity in α of the reactive organization's value, because semi-reactive organizations are less profitable than reactive organizations when such organizations exist, and because of the definition of α^2) and can be supported by any $\beta \in [\beta_1^\star, \beta_2^\star]$. QED. ∎

B.1.5 Proof of Proposition 5

As we already proved in the main text, the optimal reactive organization for the Decision Maker is the one with $\beta = \beta_2^\star$. Moreover, as soon as a reactive equilibrium is feasible (i.e. as soon as $\beta_2^\star > 0$), then this organization with $\beta = \beta_2^\star$ can be put in place.

Assume that a reactive organization is feasible ($\beta_2^\star > 0$). In that case, a semi-reactive organization with the Decision Maker randomizing only after having received signal 2 is also feasible. Using the indifference condition 3.12, one can easily compute the Decision Maker's *ex ante* utility from such a semi-reactive organization (at least for any $\rho \in]0, 1[$ such that the semi-reactive equilibrium exists):

$$\forall \beta \in]\beta_2^\star, \beta_2^{\star\star}[, \quad V^{SR} = \frac{1}{2}\frac{\alpha}{1-\alpha}\underline{B}\left(\beta F(\alpha \underline{B}) + (1-\beta)F(\alpha \bar{b})\right)$$

Therefore, the value of a semi-reactive organization is decreasing with β. It is thus maximized for $\beta = \beta_2^{\star\star}$, i.e. for a reactive organization. Thus, as long as a reactive organization is feasible, the Decision Maker will always prefer a reactive organization over a semi-reactive one.

The Decision Maker, provided that reactive and non-reactive organizations are feasible (i.e. that $\beta_2^{\star\star} < 1$ and $\beta_2^\star > 0$), must therefore choose between a reactive and a non reactive organization from which he gets utility given by expression 3.18 and 3.19. This trade-off corresponds to the trade-off we exhibited in expression 3.20. In particular, because $\beta_2^\star$ is an increasing function of α (see proof of proposition 1), we see that the Decision Maker's utility from a reactive organization is an increasing function of α while it is independent of α for non-reactive organizations.

Define now $\bar{\alpha}_1 \in]1/2, 1[$ the unique value of α such that the value of a reactive organization equals that of a non reactive organization:

$$\frac{\bar{B}}{2}\left(\beta_2^\star(\bar{\alpha}_1)F(\bar{\alpha}_1 \bar{b}) + (1 - \beta_2^\star(\bar{\alpha}_1)F(\bar{\alpha}_1 \underline{b}))\right) = \frac{\bar{B}}{2}F(\bar{b}/2)$$

First note that this $\bar{\alpha}_1$ is indeed unique and in $]1/2, 1[$:

Proof if $\psi(\alpha) = \frac{\bar{B}}{2}\left(\beta_2^\star(\alpha)F(\alpha\bar{b}) + (1-\beta_2^\star(\alpha)F(\alpha\underline{b}))\right) - \frac{\bar{B}}{2}F(\bar{b}/2)$, then ψ is strictly increasing with α as $\beta_2^\star()$ is an increasing function of α from proposition 1.

Proof $\beta_2^\star(1) = 1$ so that $\psi(\alpha = 1) > 0$

Proof $\beta_1^\star(1/2) < 1$ so that $\psi(1/2) < 0$, so that finally, $\bar{\alpha}$ is uniquely defined and belongs to $]1/2, 1[$.

Define also $\bar{\alpha}_2$ as the unique $\alpha \in]1/2, 1[$ such that a non-reactive organization with the Decision Maker always selecting project 2 fails to exist:

$$(1-\bar{\alpha}_2)F(\bar{b}/2)\bar{B} = \bar{\alpha}_2\underline{B}F(\bar{\alpha}_2\underline{b})$$

The proof that $\bar{\alpha}_2$ is uniquely defined in the interval $]1/2, 1[$ is similar to the proof for $\bar{\alpha}_1$ and is thus skipped.

Defined $\bar{\alpha} = \min \bar{\alpha}_1, \bar{\alpha}_2$.

We are going to prove that under condition 3.21, $\bar{\alpha} > \alpha^0$, so that for $\alpha \geq \bar{\alpha}$ a reactive equilibrium exists and is preferred by the Decision Maker while for $\alpha \leq \bar{\alpha}$ a non-reactive organization exists and is preferred by the Decision Maker.

First consider any α such that $\alpha \geq \bar{\alpha}_1$, then by definition of $\bar{\alpha}_1$ (using expression 3.17 for the Decision Maker's utility in reactive organizations):

$$U^R(\beta) = \frac{\alpha}{2}[\beta.F(\alpha\bar{b}) + (1-\beta).F(\alpha\underline{b})]\bar{B} + \frac{\alpha}{2}\left[(1-\beta).F(\alpha\bar{b}) + \beta.F(\alpha\underline{b})\right]\underline{B} \geq \frac{\bar{B}}{2}F(\bar{b}/2) = U^{NR}$$

Therefore, because $\bar{B} > \underline{B}$:

$$\frac{\alpha}{2}\left[F(\alpha\bar{b}) + F(\alpha\underline{b})\right] > \frac{1}{2}F(\bar{b}/2)$$

Which proves that $\bar{\alpha}_1 > \alpha^0$.

This implies that $\beta_2^\star(\bar{\alpha}_1) > 0$ so that a reactive equilibrium exists for $\alpha \geq \bar{\alpha}_1$ and using the definition of $\bar{\alpha}_1$, this implies that reactivity is the optimal organizational form for this range of α.

Second, as we saw in the proof of proposition 4, for $\alpha = \alpha^0$, we have $\beta_2^{\star\star} < 1$, so that, as $\beta_2^{\star\star}(\bar{\alpha}_2) = 1$ and $\beta_2^{\star\star}$ is an increasing function of α (see proposition 2, this must imply that: $\bar{\alpha}_2 > \alpha^0$.

Therefore: $\bar{\alpha} > \alpha^0$. For $\alpha > \bar{\alpha}$, the Decision Maker's optimal organization is a reactive one (with any $\beta \in [\beta_1^\star, \beta_2^\star]$) either because such an organization delivers a higher utility (when $\alpha \geq \bar{\alpha}_1$) or because a non-reactive organization is not feasible and a reactive organization delivers a higher utility than a semi-reactive organization (for $\alpha \geq \bar{\alpha}_2$) In this range of α, thanks to condition 3.21, a reactive organization does indeed exist. For $\alpha \leq \bar{alpha}$, the Decision Maker would select a non-reactive organization with a perfectly congruent Implementer (i.e. $\beta = 1$), and by definition of $\bar{\alpha}$, we are sure that such an organization exists in this range of α.

Therefore, over the range $]\alpha^0, \bar{\alpha}[$, which we proved is non empty, the Decision Maker would select a non-reactive organization while the Owner would select a reactive organization: organizational design in these cases should not be delegated to the Decision Maker. For all other values of α, the Decision Maker would design an optimal organization from the Owner's point of view. QED. ∎

B.1.6 Proof of Proposition 6

We thus assume that F is uniform over [0,X], where $X \geq (\bar{b} + R)$ so that F is always defined over the relevant range. Call $w_{i,j}$, the Decision Maker's wage when project i is successful and the Implementer's preferred project is project j. Note $z_{i,j}$, the Implementer's wage when project i is implemented and successful and the Implementer's preferred project is project j.

When the organization is designed to be reactive, the Owner's program can be written as:

$$\left|\begin{array}{l} \max\limits_{w_{i,j}, z_{i,j}, \beta} \left\{ \frac{\alpha}{2}\left(\beta\alpha(\bar{b} + z_{11})(R - z_{11} - w_{11}) + (1-\beta)\alpha(\underline{b} + z_{12})(R - z_{12} - w_{12})\right) \right. \\ \qquad \left. + \frac{\alpha}{2}\left(\beta\alpha(\underline{b} + z_{21})(R - z_{21} - w_{21}) + (1-\beta)\alpha(\bar{b} + z_{22})(R - z_{22} - w_{22})\right) \right\} \\ \alpha\left(\beta\alpha(\bar{b} + z_{11})(\bar{B} + w_{11}) + (1-\beta)\alpha(\bar{B} + z_{12})(\bar{B} + w_{12})\right) \geq (1-\alpha)\left(\beta\alpha(\bar{b} + z_{22})(\underline{B} + w_{22}) + (1-\beta)\alpha(\underline{b} + z_{21})(\underline{B} + w_{12})\right) \\ \alpha\left(\beta\alpha(\bar{b} + z_{22})(\underline{B} + w_{22}) + (1-\beta)\alpha(\underline{b} + z_{21})(\underline{B} + w_{12})\right) \geq (1-\alpha)\left(\beta\alpha(\bar{b} + z_{11})(\bar{B} + w_{11}) + (1-\beta)\alpha(\bar{B} + z_{12})(R - z_{12} - w_{12})\right) \end{array}\right.$$

First of all, let us omit the two incentive constraints. Then, the unconstrained solution of the previous problem clearly features $w_{i,j} = 0$, i.e. there is no need to give any rent to the Decision Maker once there is the incentive for decision making are omitted. Solving for the optimal $z_{i,j}^\star$ is then very easy and independent from the chosen β: the Owner must give proper incentives to the Implementer for each case (i.e. each project selected and each Implementer's preferred project). These four different maximization problems in $z_{i,j}$ are concave and therefore admit a unique solution given by:

$$\begin{cases} \underline{z} = z_{11}^\star = z_{22}^\star = \dfrac{R - \bar{b}}{2} \\ \bar{z} = z_{12}^\star = z_{21}^\star = \dfrac{R - \underline{b}}{2} \end{cases}$$

In this case, the organization profit can be rewritten as:

$$V^R = \frac{\alpha^2}{2}\left(\frac{R}{2} + \frac{\bar{b}}{2}\right)^2 + \frac{\alpha^2}{2}\left(\frac{R}{2} + \frac{\underline{b}}{2}\right)^2$$

Note first that, even in the presence of monetary contracts, this profit is independent of β: this is so because the optimal Implementer's compensation is symmetric (i.e. provides the same reward to an Implementer implementing his preferred project, whatever this preferred project). Second, note that this (unconstrained) profit is, when feasible (i.e. when $\beta_2^\star > 0$), clearly the solution to the Owner's problem. Thus, we need to check when this unconstrained solution is a solution to the constrained problem: we must check when the Decision Maker's incentive constraints are verified with this solution.

We find that reactivity is feasible with a strict level of dissent as long as:

$$\hat{\alpha_2}' = \frac{\bar{B}\left(\frac{R}{2}+\frac{b}{2}\right)}{\underline{B}\left(\frac{R}{2}+\frac{\bar{b}}{2}\right)+\bar{B}\left(\frac{R}{2}+\frac{b}{2}\right)} < \alpha < \frac{\bar{B}\left(\frac{R}{2}+\frac{\bar{b}}{2}\right)}{\bar{B}\left(\frac{R}{2}+\frac{\bar{b}}{2}\right)+\underline{B}\left(\frac{R}{2}+\frac{b}{2}\right)} = \hat{\alpha_2}$$

The remaining question is the following: can a reactive organization be optimal for such a level of signal precision α ?

To answer this question, we look at the maximum profit of a non-reactive organization. Such an organization always features a maximum level of congruence ($\beta = 1$). Omitting the incentive constraints of the decision maker in this non-reactive equilibrium, the profit maximizing program can be written as:

$$\max_z \pi^{NR} = \frac{1}{2}F\left(\frac{\bar{b}+z}{2}\right)(R-z)$$

With the uniform distribution function, the optimal profit is directly given by:

$$\pi^{NR} = \frac{1}{4}\left(\frac{R}{2}+\frac{\bar{b}}{2}\right)^2$$

Therefore, the optimal reactive organization with a positive level of dissent always dominates the non-reactive organization when:

$$\alpha^2 > \frac{\frac{1}{2}\left(\frac{R}{2}+\frac{\bar{b}}{2}\right)^2}{\left(\frac{R}{2}+\frac{\bar{b}}{2}\right)^2+\left(\frac{R}{2}+\frac{b}{2}\right)^2} = \hat{\alpha_1}^2 \in]1/2, 1[$$

Because $\bar{B} > \underline{B}$, a little computation gives:

$$\hat{\alpha_2} > \hat{\alpha_1}$$

Therefore, for all $\alpha \in [\min \hat{\alpha_1}, \hat{\alpha_2}', \hat{\alpha_2}]$, the optimal organizational is a reactive organization with strict dissent i.e. $\beta < 1$. Thus, complete contracting is not in general a limit to the use of dissent in organizations. QED. ▮

B.2 Proof of Proposition 7

Consistently with the analysis of Section 3.3, it is straightforward to show - proof omitted - that: (1) for intermediate values of β, the reactive equilibrium is feasible and (2) for extreme values of β , the non-reactive equilibrium is feasible. In between, there are semi-reactive equilibria where the Decision Maker only partially reacts to the signal. We omit here the analysis pertaining to very low β s, where the Decision Maker always follows the Implementer's bias, as, for a broad range of parameters such equilibria are not even feasible. We also omit the analysis of semi-reactive equilibria, because (1) it is similar to part 3.3 and (2) such arrangements are never optimal from the Owner's perspective. In this new, asymmetric, model the equivalent to proposition 4 is given by:

Lemma When the Decision Maker intrinsically prefers the"status quo"project:

1. A non-reactive equilibrium where the "status quo" is always selected occurs for all $\beta \in [\xi_2^{**}(\theta); 1]$.
2. A reactive equilibrium where the Decision Maker chooses the project indicated by her private signal occurs for all $\beta \in [\xi_1^*(\theta); \xi_2^*(\theta)]$, with $\xi_2^*(\theta) < \xi_2^{**}(\theta)$

Proposition 8

1. *When the Decision Maker intrinsically prefers the "change" project:*
   1. *A non-reactive equilibrium where the "status quo" is always selected occurs for all* $\beta \in [\beta_2^{**}(\theta), 1]$.
   2. *A reactive equilibrium where the Decision Maker selects the project indicated by the signal occurs for all* $\beta \in [\beta_1^*(\theta), \beta_2^*](\theta)$, *with* $\beta_2^*(\theta) < \beta_2^{**}(\theta)$.

   Provided that β is not "too low,"a reactive equilibrium is easier to obtain with a pro-"change" Decision Maker, i.e.:

$$\xi_2^{**}(\theta) < \beta_2^{**}(\theta), \xi_2^*(\theta) < \beta_2^*(\theta) \text{ and } \xi_1^*(\theta) < \beta_1^*(\theta)$$

   When θ increases (i.e., uncertainty decreases), reactivity becomes more difficult to sustain for a given level of congruence, β, provided this congruence is not too high, i.e.:

$$\xi_2^{**}(\theta),\ \beta_2^{**}(\theta)\ ,\ \xi_2^*(\theta),\ \beta_2^*(\theta),\ \xi_1^*(\theta) \text{ and } \beta_1^*(\theta)\ \searrow\ \theta$$

In this context, the net gain of a reactive organization is given by:

$$\Delta(\theta) = V^R(\theta, \beta_2^{**}(\theta)) - V^R(\theta)$$

where:

$$\begin{aligned} V^R(\theta,\beta) &= \theta\alpha.\left[\frac{\theta\alpha}{\theta\alpha+(1-\theta).(1-\alpha)}.\left(\beta\bar{b}+(1-\beta)\underline{b}\right)\right] \\ &+(1-\theta).\alpha.\left[\frac{(1-\theta).\alpha}{\theta(1-\alpha)+(1-\theta).\alpha}.\left(\beta\underline{b}+(1-\beta)\bar{b}\right)\right] \end{aligned}$$

and:

$$V^R(\theta) = \theta^2.\bar{b}$$

The marginal effect of an increase in θ is written as:

$$\frac{d\Delta}{d\theta} = \underbrace{\frac{\partial V}{\partial \beta}}_{>0} . \underbrace{\frac{db_2^{**}}{d\theta}}_{<0} + \underbrace{\frac{\partial}{\partial \theta}\left(V^R - V^{NR}\right)}_{<0}$$

The negativity of the first term is obvious. Here, we show the negativity of the second term. We note:

$$\begin{aligned} f(\theta) &= \theta\alpha . \frac{\theta\alpha}{\theta\alpha + (1-\theta).(1-\alpha)} \\ &= -\frac{\alpha^2(1-\alpha)}{(2\alpha-1)^2} + \frac{\alpha^2}{(2\alpha-1)}.\theta + \frac{\alpha^2.(1-\alpha)^2}{(2\alpha-1)^3}.\frac{1}{\theta + \frac{1-\alpha}{2\alpha-1}} \end{aligned}$$

so that the gain of reactivity rewrites to:

$$\begin{aligned} G(\beta,\theta) &= \frac{\partial}{\partial\theta}\left(V^R - V^{NR}\right) \\ &= \left(\beta\overline{b} + (1-\beta)\underline{b}\right).f'(\theta) - \left(\beta\underline{b} + (1-\beta)\overline{b}\right).f'(1-\theta) - 2\theta.\overline{b} \end{aligned}$$

where β is considered fixed. As it turns out:

$$\frac{\partial^2 G}{\partial\theta^2} = \left(\beta\overline{b} + (1-\beta)\underline{b}\right).f'''(\theta) - \left(\beta\underline{b} + (1-\beta)\overline{b}\right).f'''(1-\theta)$$

however, $f''' > 0$, and $\theta > 1/2$. As a result, this second derivative is positive. Thus, $\partial G/\partial\theta$ is an increasing function of θ, and:

$$\frac{\partial G}{\partial \theta}(\beta, 1) = 16\alpha^2.(1-\alpha)^2.(\overline{b} + \underline{b}) - 2\overline{b} < -\overline{b} + \underline{b} < 0$$

thus, $\partial G/\partial\theta$ is negative, and G is decreasing. But:

$$G\left(\beta, \frac{1}{2}\right) = 2\beta.\left(\overline{b} - \underline{b}\right)\alpha^2.(3-2\alpha) - \overline{b} < -\underline{b} < 0$$

so $G < 0$ for all $\theta > 1/2$. QED. ∎

B.3 The True Role of Uncertainty

In order to disentangle the effect of uncertainty about the state nature from the effect of uncertainty about the implementer's preferences, we provide here a simple extension of our main model, where:

- There are $N > 2$ possible projects, indexed by $i \in [1; N]$
- The decision maker has no bias, she is just interested in maximizing the probability of success
- The implementer receives $b > 0$ if one particular project succeeds, and 0 else.
- From the DM's viewpoint, the implementer prefers project 1 with probability β, and all the others with probability $(1-\beta)/(N-1)$
- The DM receives a private signal on the state of nature. α is the probability that the state is i if the signal says "i". The state can be any other j with probability $(1-\alpha)/(N-1)$.

In this model, $\beta \geq 1/N$ parameterizes uncertainty of the DM about the implementer's type. N parameterizes fundamental uncertainty about the right course of action.

We first look for reactive equilibria. The binding condition for them to exist is that a DM receiving a signal that is not "1" follows it nonetheless. The cost of following such a signal is that the implementer is likely not to like it. This happens iff:

$$\alpha.\frac{1-\beta}{N-1}.F(\alpha b) > \frac{1-\alpha}{N-1}.\beta.F(\alpha b) \Longleftrightarrow \beta < \alpha$$

where the DM faces the tradeoff of following an informative signal and of betting on the likely preferences of the implementer. As a result, the reactive equilibrium is sustainable as long as the uncertainty on the implementer's type is high enough compared to the signal precision.

The analysis of pooling equilibria is also similar to that of our main model. For such an equilibrium to emerge, it has to be that the DM wants to resist the temptation to give an order consistent with signals that are not "1". To simplify matters, we use the same refinement as in proposition 4: beliefs held by an implementer that receives the out-of-equilibrium order $j \neq 1$ are that the DM has told the truth. Thus, pooling equilibria are sustainable iff:

$$\frac{1-\alpha}{N-1}.\beta.F\left(\frac{b}{N}\right) > \alpha.\frac{1-\beta}{N-1}.F(\alpha b) \Leftrightarrow \beta > \widehat{\beta} > \alpha$$

thus, pooling equilibria are sustainable when β is large enough compared to α.

The model makes formally the point of the main text: as uncertainty about the implementer's type increases (β is reduced), reactivity becomes easier to sustain. Therefore, in cases where reactivity is valuable (α is large), total DM ignorance about the implementer's type is more likely to be optimal ($\beta = 1/N$). ∎

Appendix C

The Corporate Wealth Effect

C.1 Construction of the $p_t Land_i$ Variable

In this section, we explain how we have constructed the $p_t Land_i$ variable used in column 6 of table 4.4. To derive a simple quantitative assessment of our effect, we want to regress investment on real estate capital gains made on initial land holding. The variable we have at our disposal in COMPUSTAT, item #260, provides us with the book value of initial land holdings. Calling $p_{t_{0i}}$ the "composite" price of land purchased by firm i before the first year of appearance in COMPUSTAT and L_i the quantity (square feet) of land purchased, we have:

$$item\#260 = p_{t_{0i}} \times L_i$$

The current market value of these initial land holdings is given by:

$$p_t L_i = p_{t_{0i}} \times L_i \times \left(\frac{p_t}{p_{t_{0i}}}\right) = item\#260 \times \left(\frac{p_t}{p_{t_{0i}}}\right)$$

We thus need to provide a proxy for this "composite price" of initial land holdings, as we do not observe the date of purchase of these real estate assets owned by firms initially. The most conservative proxy we can use assumes that firms purchased these initial real estate assets in their first year of appearance *in COMPUSTAT* (and not necessarily in our sample). Given that real estate inflation is positive on average, we will tend to underestimate the market value of real estate assets purchased after the birth date of a firm, and therefore we will tend to underestimate the sensitivity of investment to collateral. Using such an assumption, we are able to compute a proxy for the ratio $\left(\frac{p_t}{p_{t_{0i}}}\right)$ for most firms in our sample. A last difficulty with computing this ratio stems from the fact that real estate price series are available only since 1975. We need to define this ratio $\frac{p_t^s}{p_{t_{0i}^s}}$ for firms appearing in COMPUSTAT before 1975. We assume that before 1975, real estate inflation in state s is equal to the average real estate inflation in this state over the 1975-2004 period. Using this assumption, we can construct backward real estate prices for all years before 1975. Note that this approximation concerns 900 firms over the 8,493 firms that constitute our sample. Using this approximation and the assumption that real estate assets are purchased in the first year of appearance in COMPUSTAT, we are able to define, for each firm in the sample, the variable $p_t L_i / K_{t-1}$

Once we have defined this proxy, the regression we estimate amounts to:

$$\frac{CAPEX_{it}}{PPE_{it-1}} \sim \beta \times \frac{P_t^s L_i}{PPE_{it-1}},$$

which can be rewritten as:

$$\Delta\left(CAPEX_{it}\right) \sim \beta \times \underbrace{\Delta\left(P_t^s . L_i\right)}_{\text{capital gain}}$$

Column 6 of table 4.4 reports that β is significantly positive and equal to .60, implying that a $1 capital gain on land holdings translates in a $.60 increase in capital expenditure.