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Vanina D. Forget

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THESE

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Vanina D. Forget

Le 13 décembre 2012

LES FONDS DE CAPITAL INVESTISSEMENT PEUVENT-ILS PROMOUVOIR LA RESPONSABILITE SOCIALE DES ENTREPRISES ?

CAN PRIVATE EQUITY FUNDS FOSTER CORPORATE SOCIAL RESPONSIBILITY?

Jury

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Abstract

Is Corporate Social Responsibility (CSR), defined as the commitment of business to contribute to sustainable development and take responsibility for their impacts on society, coherent with Private Equity? To answer this question, the Chapter 1 of this Ph.D. dissertation surveys the literature on the economic determinants of CSR behaviors and its impacts on market structure, economic performance and society. Chapter 2 then tackles how firms can both succeed on profitability and sustainability levels and shows that the diverse policies encompassed in CSR do not equally matter to do well and do good. Chapter 3 empirically assesses where the French Private Equity industry stands in terms of CSR integration, and why. Responsible investment practices spread among mainstream Private Equity investors, characterized by a specific investor engagement and strategically driven by a need for new value creation sources, increased risk management and differentiation. Chapter 4 uses signaling theory to ask whether CSR could be used by Private Equity investors to better select their investments. It presents a money-burning investment game and experimentally tests it comparing a public good signal to a standard advertising signal. Results indicate that CSR does not improve firm selection, but it does not perfectly substitute to standard money-burning signals and impacts equilibrium selection. Finally, Chapter 5 turns to professional Private Equity investors to quantify the impact sustainable and unsustainable corporate practices have on equity financing in a unique field experiment. An asymmetric effect is observed, entrepreneurs having more to loose from unsustainable practices than to gain from sustainable ones. The dissertation concludes by discussing main results, implications for the Private Equity industry and public policies, and the limits and possible extensions of this research.

Résumé

La Responsabilité Sociale des Entreprises (RSE), définie comme l'engagement des entreprises à contribuer au développement durable et à assumer la responsabilité de leurs impacts sur la société, est-elle compatible avec le Capital Investissement ? Pour répondre à cette question, le Chapitre 1 de la thèse analyse la littérature sur les déterminants économiques de la RSE et ses impacts sur la structure des marchés, la performance économique et la société. Le Chapitre 2 explore comment les entreprises peuvent réussir à être simultanément rentables et durables et montre que toutes les politiques de RSE n'équivalent pas pour y parvenir. Le Chapitre 3 évalue et explique empiriquement l'état de l'industrie française du Capital Investissement en matière d'intégration des enjeux de RSE. Il montre une rapide diffusion chez les acteurs conventionnels de pratiques d'investissement socialement responsable, qui se caractérisent par un engagement actionnarial particulier et sont stratégiquement déterminées par un besoin de nouvelles sources de création de valeur, d'amélioration de la gestion des risques et de différentiation. Le Chapitre 4 teste le potentiel de la RSE comme critère de sélection des investissements à partir de la théorie des jeux de signaux. Le modèle proposé est expérimentalement testé en laboratoire. Les résultats indiquent que la RSE n'améliore pas la sélection des entreprises mais ne se substitue pas parfaitement aux signaux standards et modifie la sélection des équilibres. Enfin, le Chapitre 5 présente une expérience avec des investisseurs professionnels qui permet de quantifier l'impact de la performance extra-financière sur l'accès aux capitaux propres. Un effet asymétrique est observé, les entrepreneurs ayant plus à perdre des pratiques irresponsables qu'à gagner des responsables. La thèse se conclut en discutant les principaux résultats, leurs implications pour les investisseurs en capital et les politiques publiques, leurs limites et leurs possibles extensions.

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NOTE DE PRESENTATION SYNTHETIQUE EN FRANÇAIS

Dans *Our Common Future*, aussi connu sous le nom de rapport Brundtland, la Commission Mondiale sur l'Environnement et le Développement a défini le développement durable comme *"un développement qui répond aux besoins du présent sans compromettre la capacité des générations futures à répondre aux leurs" (*1987). En une génération, ce vaste concept s'est largement disséminé dans notre société et dans les politiques publiques. La stratégie de croissance européenne pour la décade en cours (Europe 2020) consiste ainsi à devenir *"une économie intelligente, durable et inclusive"* et fonde ses objectifs de durabilité sur la compétitivité, la protection environnementale et l'inclusion sociale. En tant qu'acteurs économiques majeurs pour la croissance et l'emploi, les entreprises jouent un rôle crucial pour que notre société parvienne à ces objectifs. La Responsabilité Sociale des Entreprises (RSE) est définie comme leur engagement à contribuer à un développement économique durable (World Bank, 2003) [1] et à assumer la responsabilité de leurs impacts sur la société (Commission Européenne, 2011a).

La crise financière et économique que le monde traverse depuis 2008 resserre les marges de manœuvre pour parvenir aux objectifs de durabilité, tout en augmentant l'urgence d'y réussir. Les Petites et Moyennes Entreprises (PME), qui constituent la majorité de notre tissu économique, industriel et social, sont confrontées à des difficultés significatives pour obtenir le financement dont elles ont besoin pour assurer leur croissance, menaçant leur capacité d'innovation et de création d'emplois (Commission Européenne, 2011b). Les fonds de Capital Investissement sont des véhicules d'investissements spécialisés dans les entreprises non cotées et dont l'efficacité, déjà soulignée par les académiques, a été mise en avant dans un rapport du Conseil d'Analyse Economique (CAE, 2008) comme suit : *"la crise des marchés financiers va entraîner globalement un renforcement très significatif de ce type de financement de l'économie, jusqu'à lui donner un rôle majeur dans la restructuration du tissu productif des grandes économies développées. (…) Tout simplement parce que des milliers d'entreprises, de taille moyenne qui composent une large partie de la structure productive de notre pays, n'ont pas aujourd'hui et auront encore moins demain, d'autres sources de*

[1] La Banque Mondiale (2003) définit précisément la RSE comme "*l'engagement du monde des affaires à contribuer au développement économique durable, en travaillant avec les employés, leurs familles, la communicate locale et la société au sens large pour améliorer la qualité de vie, de façon positive tant pour les affaires que pour le développement".*

financement que celles du Capital Investissement." Le rapport prend ainsi clairement position en faveur du rôle positif que l'industrie du Capital Investissement peut jouer pour l'économie et fait des propositions pour augmenter de façon accélérée cette classe d'actifs.

En 2011, les fonds de Capital Investissement ont investi environ 45.5 milliards d'euros dans un peu plus de 5 000 entreprises en Europe (dont 9.7 milliards d'euros dans 1 700 entreprises françaises), dont environ 85% de PME (EVCA, 2012). La Commission Européenne (2011b) estime que plus de 10 000 entreprises européennes étaient détenues en 2009 dans les portefeuilles des fonds de Capital Investissement. Toutefois, le Capital Investissement suscite depuis 2007 une forte contestation sociale, tant aux Etats Unis qu'en Europe, suite à des cas très médiatisés de pillages d'entreprises. Les critiques ciblent le court-termisme des fonds, l'assèchement des capacités d'investissement, les impacts négatifs sur la croissance à long terme, la répartition inégale des produits de sessions des firmes, et l'expropriation des fondateurs d'entreprises. Un important corpus de travaux académiques a donc entrepris d'évaluer l'impact de l'industrie du Capital Investissement sur l'emploi et les salaires. De part et d'autre de l'Atlantique, ces recherches concordent et contredisent les critiques, trouvant en effet un impact global positif à long terme (Boucly et al., 2008, 2009; Amess and Wright, 2007; Davis et al., 2011).

Toutefois, les inquiétudes formulées se justifient dans les effets individuels à court-terme des investisseurs en capital, qui tendent à accélérer les processus de restructuration et de réallocation des emplois entre les sites des entreprises. Les changements structuraux peuvent générer de fortes tensions sociales, que les fonds ne prennent pas nécessairement en compte ou ne gèrent pas toujours de façon appropriée. Pour citer le Conseil d'Analyse Economique (CAE, 2008), il y a un réel besoin *"de favoriser le Capital Investissement tout en le rendant plus acceptable socialement"*. [2]

Cette thèse de doctorat explore la compatibilité du concept de RSE avec l'industrie du Capital Investissement et le potentiel de cette classe d'investisseurs pour promouvoir les comportements socialement responsables dans les entreprises qu'ils financent. Les investisseurs en capital peuvent-ils contribuer au développement durable à travers la RSE ? Ces questions de recherche sont issues du terrain, la RSE et les investissements socialement responsables étant des sujets encore émergents dans l'industrie du Capital Investissement

[2] Ce paragraphe et le précédent s'appuient sur le chapitre "Capital Investissement et Emploi", Forget V.D. et Massut F.,à paraître dans l'ouvrage collectif *Tout Savoir sur le Capital Investissement*, G. Mougenot (Ed.), City & Work, Paris, 2013.

pendant la construction du projet doctoral (en 2008-2009). Peu de recherche académique avait alors été conduite (ce qui est encore le cas actuellement) sur le potentiel de l'investissement responsable dans cette classe d'actifs, quelque peu contestée, peu transparente, et néanmoins d'une importance stratégique pour les PME. C'est donc un travail exploratoire sur le champ nouveau de la RSE en Capital Investissement qui est ici présenté.

L'Investissement Socialement Responsable (ISR) a été défini par Renneboog et al. (2008) comme un processus d'intégration des considérations sociales, environnementales et éthiques dans les décisions d'investissement. L'ISR est un marché de niche qui a généré un intérêt considérable au sein des académiques et des médias cette dernière décennie, intérêt essentiellement centré sur la question de sa performance financière boursière (Capelle-Blancard et Monjon, 2010). Le canal du Capital Investissement a entièrement été écarté de la thématique (Scholtens, 2008), à l'exception notable du travail pionnier de Cumming et Johan (2007).

Pourtant, le Capital Investissement est une classe d'actifs qui semble structurellement plus adaptée à la promotion de la RSE dans les entreprises - si ce n'est plus adaptée que l'ISR sur les marchés cotés. En effet, les investisseurs en capital sont des actionnaires significatifs (voire majoritaires) des entreprises de leurs portefeuilles pour un horizon de moyen à long terme, puisqu'ils les détiennent habituellement entre 5 et 7 ans. Ils peuvent donc activement promouvoir la RSE dans les comités de direction des entreprises s'ils le décident, tandis que les investisseurs ISR n'ont souvent d'autres options sur les marchés cotés que de voter avec leurs pieds s'ils ne sont pas d'accord avec les pratiques des firmes. L'ISR sur les marchés cotés s'oppose également au principe de diversification qui fonde la théorie moderne du portefeuille de Markowitz (1952) (Capelle-Blancard et Giamporcaro-Saunière, 2006). A l'inverse, le Capital Investissement se base structurellement sur la sélection améliorée de quelques entreprises qu'ils suivent. L'investissement responsable en Capital Investissement apparait ainsi comme un concept qui mérite d'être exploré.

Toutefois, ce n'est pas un hasard si la question de l'investissement responsable en Capital Investissement a si peu été traitée par les académiques jusqu'ici. C'est plutôt la conséquence d'une complète absence de données sur le sujet. Mesurer la RSE est déjà une tâche délicate sur les entreprises cotées, qui doivent répondre à des exigences réglementaires de transparence et de reporting, et font souvent l'objet d'évaluations par des agences spécialisées. Cela se complexifie encore plus lorsque l'on s'attaque aux firmes non cotées, et

particulièrement aux PME, qui n'ont pas ces obligations. De surcroît, les valeurs des deals et la performance financière des fonds de Capital Investissement (« Private Equity » en anglais) sont par essence des données privées. Cette thèse recourt donc à des sources de données innovantes et à des méthodologies variées pour contourner ces difficultés. Chaque chapitre traite un aspect différent du sujet de recherche et utilise pour ce faire les données et méthodologies les plus adéquates compte tenu des contraintes précédemment exprimées. La boite à outils qui en résulte associe économétrie, théorie des jeux et économie expérimentale.

Le premier chapitre propose une revue de la littérature de la RSE afin d'identifier quels en sont les déterminants économiques. Une analyse empirique est ensuite effectuée dans le second chapitre pour comprendre comment les entreprises peuvent réussir à la fois sur les plans de la rentabilité et de la durabilité en se concentrant sur la nature multidimensionnelle de la RSE. Le Chapitre 3 évalue alors empiriquement où en est l'industrie française du Capital Investissement en termes d'intégration des enjeux de RSE (autrement dit, d'investissements socialement responsables), et pourquoi. Le Chapitre 4 prend un point de vue un peu différent et teste en laboratoire si la RSE peut être utilisée par les investisseurs en capital pour mieux sélectionner leurs investissements. Le Chapitre 5 se tourne vers les investisseurs professionnels pour évaluer expérimentalement si les pratiques responsables et irresponsables des entreprises impactent leur accès aux capitaux propres, et quantifie dans quelle mesure. Enfin, la conclusion de cette thèse met en perspective les résultats des différents chapitres pour répondre à la question centrale et discute de leurs implications pour l'industrie du Capital Investissement et les pouvoirs publics, avant de présenter ses limites et les futures pistes de recherche qu'elle ouvre.

Les sections suivantes détaillent chaque chapitre et sa méthodologie et fournissent quelques éléments pour contextualiser les contributions qui sont apportées à la littérature de la RSE, de l'investissement socialement responsable, de la théorie des jeux et de la finance d'entreprise.

QUELS SONT LES DETERMINANTS ECONOMIQUES DE LA RSE?

Comme point de départ, le Chapitre 1 fait la revue de la littérature théorique et empirique sur la RSE et utilise une perspective économique pour proposer un cadre unifié des forces qui la

déterminent. Il est basé sur un article en cours co-écrit avec Patricia Crifo : "The Economics of Corporate Social Responsibility: A Survey" (soumis à une revue à comité de lecture).[3]

Cette revue de littérature est une première pierre fondamentale dans la compréhension de l'intégration des enjeux de RSE en Capital Investissement, car une connaissance considérable sur la RSE a déjà été assemblée dans d'autres champs de recherche. Plus qu'un simple catalogue de la recherche existante, le Chapitre 1 a pour objectif de proposer une synthèse créative de la littérature pour mettre en lumière à la fois sa cohérence et ses manques.

Une définition pragmatique de la RSE est tout d'abord proposée à partir du cadre donné par la Commission Européenne (2011a). Alors que le concept de RSE est en phase avec les aspirations du développement durable, les questions de pourquoi les entreprises s'y engagent et de son impact effectif sont loin d'être triviales. Comprendre les déterminants de la RSE est central pour pouvoir analyser pourquoi et comment les firmes entreprennent des démarches socialement responsables et comment ces pratiques peuvent impacter leurs activités et la société dans son ensemble.

La littérature économique sur les comportements de RSE peut être analysée à travers le prisme de trois classes d'imperfections de marché, qui structurent la revue de littérature. La première source de défaillance de marché déterminant la RSE est l'existence d'externalités et de bien public, dont la provision peut être motivée par l'évitement de régulations publiques, la réponse à une pression sociale, ou la volonté d'exercer son devoir moral pour que les activités de l'entreprise soient en phase avec ses valeurs. La seconde catégorie de déterminants de comportements de RSE vient de la compétition imparfaite, qui génère une différenciation des produits, des structures de marché particulières et l'exploitation d'asymétrie informationnelle sous la forme du « greenwashing ». La troisième catégorie d'imperfections de marché derrière les stratégies de RSE est ancrée dans les contrats imparfaits, la RSE pouvant alors être appréhendée comme la responsabilité déléguée des actionnaires de l'entreprise, de ses dirigeants et de ses employés. Pour chaque déterminant, les arguments théoriques et leurs tests empiriques sont présentés.

[3] Le Chapitre 1 met à jour et enrichit le chapitre "A Survey of the Literature on Corporate Social Responsability & Financial Performance" (Forget V.D, dans *CSR: From Compliance to Opportunity*?, P. Crifo et J. P. Ponssard (Eds), Editions de l'Ecole Polytechnique, 2010), publié pendant la première année du doctorat.

Enfin, les impacts de la RSE sur la performance des entreprises et sur la société sont passés en revue. Un double fossé est ainsi mis en lumière dans la littérature. Tout d'abord, il y a une déconnection importante entre notre connaissance des déterminants de la RSE et de ses impacts. Ensuite, il y a un grand écart entre ce que nous savons des conséquences financières et sociales de la RSE, ces dernières demeurant très peu étudiées.

Parmi les pistes de recherche suggérées, la nature multidimensionnelle de la RSE et ce qu'elle implique pour la performance des firmes apparait prometteuse. Cette recherche fait l'objet du Chapitre 2.

COMMENT LES ENTREPRISES PEUVENT-ELLES SIMULTANEMENT REUSSIR SUR LES PLANS FINANCIER ET EXTRA-FINANCIER?

La revue de littérature révèle que le lien entre la performance financière et extra-financière a suscité ces trente dernières années un grand nombre de recherches. Au-delà de la question de l'existence de ce lien, laquelle fait maintenant l'objet d'un consensus (Margolis et al., 2009), le mécanisme liant la rentabilité à la RSE est complexe et toujours académiquement débattu. Ce mécanisme est également central pour les investisseurs qui souhaitent s'en servir pour promouvoir la durabilité. Le Chapitre 2 est construit sur l'idée (développée dans le Chapitre 1) que la RSE comprend des politiques diversifiées, avec des effets variables sur la rentabilité qu'il est nécessaire de clarifier. Ce chapitre vise ainsi à comprendre l'importance relative des différentes politiques extra-financières pour la rentabilité. Il est basé sur l'article en cours "Doing Well and Doing Good: A Multidimensional Puzzle" (HAL-00672037; soumis à une revue à comité de lecture).

Contrairement aux autres chapitres de cette thèse, des données étaient disponibles pour traiter la question posée par le Chapitre 2. L'agence de notation extra-financière Vigéo nous a en effet donné accès à sa base de données, qui a été appariée avec la base de données financières Orbis (Bureau Von Dijk). La base de données résultante couvre 461 grandes et moyennes capitalisations européennes entre 1998 et 2007. Les données de RSE couvrent une certaine gamme de pratiques : la performance environnementale, les bonnes pratiques avec les clients

et les fournisseurs, l'implication dans les communautés locales, la gestion des ressources humaines et la gouvernance de l'entreprise.

Une fois la base de données prête, la résolution d'un tel puzzle multidimensionnel demeure néanmoins délicate. En effet, le lien entre performance financière et les multiples dimensions de la RSE se heurte au problème dit d'« incertitude de modèle ». Cette incertitude vient de ce que les théories existantes ne sont pas suffisamment explicites pour indiquer quelles dimensions de RSE appartiennent (ou non) à la « vraie » régression (et auquel cas, avec quelle spécification). Dans un article très influent, Sala-i-Martin et al. (2004) discutent d'un problème similaire sur l'économie de la croissance, un champ de recherche où les chercheurs sont également confrontés à une multitude de régresseurs potentiels. Ignorer l'incertitude de modèles résulte généralement dans des estimations de paramètres biaisées, des écarts types trop confiants et des inférences trompeuses.

Pour s'attaquer à la nature multidimensionnelle de la RSE, le chapitre introduit dans la littérature le « model averaging », un cadre statistique formel qui prend explicitement en compte l'incertitude de modèle. Le model averaging affecte des poids aux différents modèles alternatifs en fonction de leur qualité et fournit ainsi une distribution de probabilité pour chaque estimation de coefficient. Il s'est déjà révélé pertinent dans de nombreux champs de recherche. Au-delà de son application originale à la RSE, la méthodologie ici présentée est une variante qui a le potentiel d'être aisément transférée à d'autres questions économiques par la simplicité de sa mise en œuvre. Toutefois, la méthodologie étant très consommatrice de données, le Chapitre 2 se limite à l'étude de la relation entre RSE et performance financière et ne peut adresser la question de la causalité entre ces deux groupes de variables.

Le Chapitre 2 dévoile quelles dimensions de la RSE sont significativement liées à la performance financière, et lesquelles ne le sont pas. Il démontre ainsi que toutes les politiques de RSE n'ont pas la même importance pour réussir financièrement et extra-financièrement, les bons comportements avec ses clients et fournisseurs apparaissant comme essentiels. La performance environnementale et la gestion des ressources humaines sont également faiblement liées à la rentabilité, ce qui n'est dans les données ni le cas de la gouvernance ni celui de l'implication dans les communautés locales. Un fort soutien est également apporté à la coexistence de politiques présentant un niveau optimal

pour la rentabilité (bonnes relations avec les clients et les fournisseurs, performance environnementale) et de politiques qui lui liées de façon monotone (gestion des ressources humaines).

Les résultats suggèrent que les différentes dimensions de la RSE ont des niveaux optimums différents à atteindre pour que les entreprises réussissent socialement et financièrement. Ainsi, la RSE ne vient pas comme un lot de mesures à promouvoir aveuglément, mais appelle plutôt une analyse stratégique du modèle de gestion de l'entreprise considérée afin de sélectionner avec précaution le mélange approprié de politiques lui permettant à la fois d'être rentable et durable. Pour les investisseurs en capital, ces résultats impliquent un besoin d'expertise sur la RSE afin d'appréhender avec pertinence les occasions où elle peut générer du profit.

OU EN EST L'INDUSTRIE DU CAPITAL INVESTISSEMENT EN TERMES DE RSE, ET POURQUOI?

Le Chapitre 3 présente la littérature sur les investissements socialement responsables et met en exergue sa concentration sur le canal des marchés financiers publics, écartant celui du Capital Investissement. Il s'attaque donc à caractériser le mouvement d'investissement responsable en Capital Investissement et à analyser ses déterminants. Il est basé sur un article co-écrit avec Patricia Crifo : "Think Global, Invest Responsible: Why the Private Equity Industry Goes Green*"* (accepté pour publication dans le *Journal of Business Ethics*).

Comme précédemment détaillé, il n'y a pas de cadre théorique ni de données disponibles sur la question de la RSE en Capital Investissement. Néanmoins, il a été relativement aisé de rassembler des éléments anecdotiques sur le sujet. Le Chapitre 3 définit et propose à partir de ces éléments une perspective historique sur les investissements socialement responsables en Capital Investissement, contextualisant l'intégration des enjeux de RSE dans cette classe d'actifs. La rapide intégration des enjeux environnementaux, sociaux et de gouvernance par les investisseurs en capital conventionnels est ainsi dévoilée et apparait avoir bénéficié de la maturation des investissements socialement responsables sur les marchés financiers côtés et de l'impulsion de grands acteurs traditionnels de l'industrie.

Des hypothèses sur les caractéristiques et les déterminants de ce mouvement sont ensuite proposées à partir des littératures de la finance d'entreprise, de la RSE et de l'ISR. La seule

façon de tester de façon effective ces hypothèses a été de construire une base de données ad hoc. Des données sur 309 sociétés françaises de gestion de fonds de Capital Investissement ont donc été collectées en 2011 dans le domaine public à partir d'informations issues de la presse spécialisée, de communiqués de presse et des sites internet des sociétés. Pour avoir un aperçu des opinions ayant cours dans les fonds, ces données publiques ont été complétées avec des données de sondage collectées en partenariat avec Novéthic (filiale de la Caisse des Dépôts et Consignations) sur 74 sociétés. La construction minutieuse de cette base de données a nécessairement contraint sa couverture au marché français.

Les résultats empiriques montrent que l'investissement socialement responsable en Capital Investissement est caractérisé par l'engagement des investisseurs et stratégiquement déterminé par un besoin d'amélioration de la gestion des risques et de différentiation. En particulier, les résultats indiquent que les fonds indépendants, qui ont besoin de lever des fonds et d'attirer des investisseurs, ont une plus grande probabilité de développer des pratiques socialement responsables que les fonds captifs, moins soumis à la compétition. L'intégration des enjeux de RSE dans l'industrie du Capital Investissement apparait donc en continuité avec la maximisation de la valeur des actionnaires et cohérente avec une amélioration organisationnelle et opérationnelle. Toutefois, pour cela, comme l'a mis en évidence le Chapitre 3, elle nécessite une réelle expertise, dont l'existence dans les fonds peut actuellement être mise en doute. Une forte limite du chapitre est sa nature exploratoire. Une extension de recherche consisterait à construire, à partir des éléments proposés, un réel cadre théorique de l'investissement responsable en Capital Investissement.

LES INVESTISSEURS PEUVENT-ILS UTILISER LA RSE POUR IDENTIFIER LES ENTREPRISES LES PLUS PERFORMANTES?

Les Chapitres 1 et 2 ont montré que faire de l'argent grâce à la RSE n'a rien d'une tâche aisée. Le Chapitre 4 vise à explorer une explication alternative de l'intérêt croissant qu'ont les investisseurs en capital pour la RSE, et qui n'a pas été testée dans le Chapitre 3. Des travaux récents suggèrent en effet que les firmes performantes sur le plan extra-financier seraient celles qui auraient suffisamment de ressources pour se permettre d'en dépenser une partie en RSE (Baron et al., 2011). Le Chapitre 4 construit sur ces faits stylisés et teste théoriquement puis expérimentalement si la RSE pourrait servir de signal (« money-burning ») qui réduirait

l'asymétrie informationnelle dans les négociations de Capital Investissement. Le Chapitre 4 est basé sur l'article en cours : "Green Signaling in Experimental Private Equity Negotiations".

L'approche choisie diffère ici significativement des méthodologies utilisées dans les chapitres précédents. Déterminer l'efficacité d'un signal dans des négociations de Capital Investissement est déjà délicat en termes d'accès aux données, mais cela devient plus difficile encore quand les signaux contribuent à un bien public. D'un point de vue théorique, le Chapitre 4 montre que la performance environnementale peut se modéliser comme un signal (dit de « money-burning »), mais sa substituabilité à des signaux plus standards demeure incertaine. Face à ces limites et incertitudes, ce chapitre a recourt à une expérience en laboratoire, laquelle permet de contrôler l'environnement dans lequel sont prises les décisions financières et de se centrer sur l'observation des comportements qui nous intéressent. Cette méthodologie a ainsi permis par le passé de nombreux développements de la théorie financière (Pouget, 2011). Comme souvent dans les expériences en laboratoire, l'objectif étant de comprendre les mécanismes et non pas de tester le savoir des individus, les participants de l'expérience n'étaient pas spécialistes du Capital Investissement. Cette recherche a été menée en partenariat avec le CIRANO (Montréal, Canada), dont le laboratoire d'économie expérimentale a accueilli les sessions expérimentales avec l'aide, les conseils et le soutien de Jim Engle-Warnick.

Un modèle non-coopératif de négociation de financement par capitaux en présence de deux signaux est tout d'abord proposé. La négociation théorique entre un investisseur en capital et une entreprise (qui peut être soit de type « haut » soit de type « bas ») a lieu de façon séquentielle et utilise deux types de signaux : un signal prix et un signal dit de « money-burning » (littéralement d' « argent brûlé », c'est-à-dire qui a l'apparence d'un gaspillage d'argent, et qui est indépendant de la qualité). L'expérience permet ensuite de donner un contenu réel à ce signal en laissant aux entreprises la possibilité d'acheter soit un signal « vert » (contribuant à un bien public) soit un signal « brun » (une publicité standard) selon les traitements. Les deux types de signaux de money-burning ont les mêmes incitations monétaires mais diffèrent en termes de conséquences sociales, le signal « vert » contribuant réellement à un bien public (compensation carbone via le site internet d'une ONG). Le design de l'expérience comprend 6 traitements définis par le contenu du signal (vert, brun, ou choix entre les deux) et son prix, les signaux pouvant être soient « chers » (accessibles uniquement

par les firmes de type haut) soit « peu chers » (accessibles par les deux types d'entreprises). Un septième traitement de contrôle, sans signal, complète ce dispositif. Dans tous les traitements, les paramètres du modèle ont été fixés de façon à ce que l'achat des signaux soit théoriquement sous-optimal, la prédiction du modèle étant que les sujets ne devraient pas les acheter et converger vers un équilibre non séparateur (les firmes proposent toutes le même prix et les investisseurs ne peuvent distinguer les entreprises de type haut et de type bas). 296 sujets, recrutés par le CIRANO parmi la population de Montréal, ont pris part à l'expérience.

Les résultats expérimentaux montrent que les participants ne préfèrent pas le signal vert au signal brun, et qu'en conformité avec les prédictions théoriques, ils ne les achètent pas. Toutefois, la sélection de l'équilibre dépend quand même du contenu du signal de qualité. En effet, lorsque le signal brun est disponible, les sujets ne l'achètent pas et convergent bien vers l'équilibre non séparateur. Par contre, en présence du signal vert, ils dévient de l'équilibre prédit en n'achetant pas le signal mais en convergeant vers un équilibre séparateur par les prix (des firmes de type différents proposent des prix différents, permettant leur identification par les investisseurs) théoriquement dominé. Le Chapitre 4 contribue ainsi à la théorie du signal en montrant que la performance environnementale (et les contributions à un bien public de façon plus générale) ne peut se substituer parfaitement à des signaux de money-burning standards. La présence d'un signal de contribution à un bien public semble combler la motivation intrinsèque des acteurs à révéler leur type via les prix (ce qui est moins couteux qu'avec le signal) et donc converger vers un équilibre séparateur. Dans cette expérience, l'asymétrie informationnelle est donc réduite dans les négociations de Capital Investissement mais les entreprises ne contribuent pas pour autant au bien public. Les implications en termes de transparence des marchés de capitaux et d'impacts sur la société sont discutées.

Les Pratiques Responsables et Irresponsables des Entreprises Impactent-elles Leur Acces au Financement par Capitaux Propres?

Le dernier chapitre de cette thèse de doctorat a pour but de mesurer l'impact des pratiques responsables et irresponsables des entreprises sur leur accès au financement par capitaux propres. Plus précisément, son objectif est de quantifier la potentielle plus-value accordée par les investisseurs en capital aux entreprises qui font de la RSE, ce en termes de valorisation et

d'attractivité en tant qu'investissement. Le Chapitre 5 est basé sur un article en cours co-écrit avec Patricia Crifo et Sabrina Teyssier: "The Price of Unsustainability: An Experiment with Professional Private Equity Investors".

Comme dans le Chapitre 4, le choix de la méthodologie a été contraint par le fait que les données des transactions en Capital Investissement ne sont pas publiques. Remarquons que, même si elles l'étaient, il serait très difficile d'isoler les effets de la RSE parmi les autres facteurs qui influencent le prix de ces transactions. A nouveau, nous nous sommes donc tournés vers l'économie expérimentale. Contrairement au Chapitre 4, il était crucial que les participants de l'expérience soient des spécialistes du Capital Investissement pour pouvoir quantifier les effets réels de la RSE sur la valorisation des entreprises. Nous avons donc construit une expérience encadrée de terrain unique dans laquelle 33 investisseurs en capital professionnels ont été mis en compétition pour acquérir des entreprises fictives. Cette recherche n'aurait pu avoir lieu sans un partenariat sans le partenariat monté avec le Club Développement Durable de l'Association Française de Capital Investissement (AFIC) et la société de gestion Eurazéo PME, lesquelles ont apporté une aide précieuse au projet, notamment en assurant la crédibilité des cas et la participation des investisseurs.

Le dispositif expérimental a permis de contrôler l'information sur laquelle se fonde la valorisation des entreprises et de se focaliser sur l'impact de trois piliers de la RSE : les facteurs Environnementaux, Sociaux et de Gouvernance. Le design de l'expérience est basé sur des enchères scellées au premier prix avec un « coût d'embarras » (forme de pénalité causée par la gêne de se tromper dans l'évaluation du prix), dont nous montrons au préalable qu'elles permettent aux investisseurs de révéler leur vraie valorisation des entreprises. Contrairement au Chapitre 4, ici, l'expérience n'a pas vocation à tester le modèle. Le modèle d'enchères permet plutôt de garantir l'efficacité de la révélation des prix des firmes dans l'expérience. Quatre traitements ont été testés, à partir de trois études de cas d'entreprises construites avec précaution afin d'être les plus réalistes possibles. Un des traitements a été mené à travers un site internet que nous avons développé.

Les résultats sur 330 observations mettent en évidence que la performance extra-financière impacte le financement par capitaux propres, tant en termes de prix que d'attractivité. Le résultat principal est l'existence d'un effet asymétrique des enjeux de RSE, les entrepreneurs ayant plus à perdre des pratiques irresponsables qu'à gagner avec des pratiques responsables. Lorsque l'hétérogénéité entre les investisseurs est contrôlée, nous évaluons que des pratiques

irresponsables décroissent la valorisation d'une entreprise de respectivement 11%, 10% et 15% pour des problèmes environnementaux, sociaux et de gouvernance. Les pratiques responsables environnementales et sociales n'accroissent la valeur des entreprises que de 5%, une bonne gouvernance n'étant pas récompensée en termes de valeur. Les pratiques irresponsables diminuent également la probabilité de l'investissement d'environ 30. Le Chapitre 5 conclue que les pratiques irresponsables des entreprises peuvent affecter le financement par capitaux propres et augmenter son coût, la RSE pouvant alors devenir une stratégie défensive pour protéger la valeur des entreprises et l'accès aux capitaux.

PRINCIPALES CONTRIBUTIONS ET IMPLICATIONS

Les cinq chapitres de cette thèse mobilisent différentes méthodologies pour traiter sous des angles complémentaires la question de la compatibilité de la RSE avec l'industrie du Capital Investissement. Ce faisant, des contributions ont été faites à différents champs de la littérature. Si chaque chapitre les détaille, cette section les résume de façon transversale et discute dans quelles mesures les fonds de Capital Investissement peuvent promouvoir le développement durable à travers la RSE.

Les Chapitres 1, 2 et 5 contribuent à la littérature sur la RSE. Le Chapitre 1 ancre en effet ce concept en économie et propose un cadre unifié de ses déterminants. Il démontre ainsi la nécessité de prendre en compte la nature multidimensionnelle de la RSE. En s'y appliquant, le Chapitre 2 prouve que différentes politiques de RSE impactent différemment la performance financière. Il introduit également dans cette littérature le model averaging, une méthodologie qui a permis d'estimer simultanément les effets de cinq types de politiques de RSE et leur importance relative pour la performance financière. Cet outil statistique a par ailleurs le potentiel d'être facilement appliqué à d'autres champs empiriques confrontés à des problèmes multidimensionnels et une absence de consensus théorique. Les résultats obtenus ont d'importantes implications pour les praticiens et les académiques, puisqu'ils réconcilient des théories concurrentes sur la RSE et montrent que les diverses politiques de RSE ne sont pas équivalentes. Le Chapitre 5 complète ces résultats en soulignant que les sur- et sous-performances en matière de RSE ont des effets dissymétriques sur la valeur des entreprises.

En utilisant le cadre de la RSE et du Capital Investissement, le Chapitre 4 contribue à la théorie des jeux de signaux en montrant que le contenu du signal impacte la sélection des

équilibres. Alors qu'il existe une littérature conséquente sur la sélection d'équilibre dans les jeux de signaux, la nouveauté de ce travail réside dans l'observation de déviations de l'équilibre causées par les conséquences sociales du signal utilisé, et les motivations intrinsèques qui lui sont reliées. Le design expérimental contribue également à cette littérature en proposant une façon originale de donner du contenu aux signaux testés en laboratoire, les signaux utilisés dans le Chapitre 4 contribuant à un bien public réel (compensation carbone via le site internet d'une ONG).

Les Chapitres 3, 4 et 5 contribuent à la littérature sur les investissements socialement responsables. Leur diffusion au Capital Investissement est démontrée et caractérisée dans le Chapitre 3. La spécificité de ces investisseurs réside dans leur capacité d'engagement actionnarial, plus importante que celle des investisseurs publics. Les investissements socialement responsables dans cette classe d'actifs sont également identifiés comme étant stratégiques et non pas philanthropiques, ce qui va dans le sens du mouvement de généralisation de ces pratiques.

Cette thèse apporte enfin de nouveaux éléments en finance d'entreprise. Le Chapitre 4 apporte une contribution théorique en proposant un modèle de négociation bilatérale avec signal qui montre comment l'asymétrie informationnelle peut être réduite dans les négociations de Capital Investissement. Les Chapitres 3 et 5 démontrent que les modèles de valorisation des entreprises et de financement par capital devraient intégrer en plus des éléments financiers des informations extra-financières, puisque les investisseurs le font actuellement déjà. Ils révèlent donc qu'omettre la performance extra-financière pourrait biaiser les estimations économétriques menées sur la performance et la stratégie des fonds de Capital Investissement.

Pour résumer et rassembler les conclusions des différents chapitres en une réponse globale à la problématique posée par cette thèse, la RSE apparait donc comme étant partiellement compatible avec l'industrie du Capital Investissement. En effet, les investisseurs en capital sont suffisamment impliqués dans les entreprises de leurs portefeuilles pour pouvoir activement promouvoir leur RSE s'ils le décident, et s'ils ont l'expertise nécessaire. Ils peuvent améliorer leur propre performance en améliorant certaines dimensions de la RSE – mais pas toutes. En conséquent, le régulateur peut se reposer sur eux pour contribuer à certains types de biens publics, dans des circonstances spécifiques.

La conclusion de la thèse discute de façon détaillée les implications de ses résultats pour l'industrie du Capital Investissement[4] et les politiques publiques. Du point de vue des investisseurs en capital, elle souligne que la RSE est dès à présent une stratégie que de nombreux fonds conventionnels mettent en œuvre pour améliorer leur business et leur management opérationnel. Toutefois, une bonne gestion des enjeux de RSE n'est pas triviale à développer. Des suggestions sont faites pour aider les sociétés de gestion qui souhaiteraient s'engager en matière de RSE et leur exposer les contraintes associées. Sur ce second point, la nécessité d'acquérir le capital humain indispensable à la bonne appréhension des sujets de RSE est mise en exergue. Ainsi, pour que la RSE ne dérive pas en « greenwashing », il est nécessaire d'y allouer des ressources.

Du point de vue des politiques publiques, cette thèse conduit à des recommandations en termes de régulation de la RSE, de régulation de l'industrie du Capital Investissement, et d'évolution de l'administration publique. En effet, cette recherche montre que les fonds de Capital Investissement ont le potentiel de promouvoir certaines formes de durabilité grâce la RSE, tant que celle-ci fait sens économiquement. L'ensemble des chapitres de la thèse soutient d'une façon ou d'une autre que la RSE ne sera pas implémentée au détriment de la rentabilité ou de la compétitivité. L'optimum social diffère ainsi probablement de l'optimum entrepreneurial. Une question centrale pour les politiques publiques est donc d'évaluer les conséquences sociales et la contribution réelle au bien commun des investissements socialement responsables et de la RSE.

En l'état actuel des connaissances sur ce point, la RSE apparait comme un outil très efficace pour répondre à une partie des objectifs de développement durable, particulièrement dans cette période de restriction budgétaire publique. En termes de régulation de la RSE, la conclusion de la thèse recommande donc que la régulation de la RSE se focalise sur la transparence, par exemple via la promotion de normes et de certifications indépendantes. En effet, il est crucial de renforcer la crédibilité de la RSE en s'assurant que les allégations environnementales et sociales ne soient ni trompeuses ni mensongères, en ligne avec la réglementation de la publicité.

La transparence est également le point principal discuté pour la régulation de l'industrie du Capital Investissement vis-à-vis de la RSE. La conclusion souligne que d'importants accords

[4] Cette partie de la conclusion est adaptée du chapitre "L'intégration des Enjeux ESG dans le Capital Investissement" , Forget V.D. et Massut, F., à paraître dans l'ouvrage collectif *Tout Savoir sur le Capital Investissement,* G. Mougenot (Ed.), City & Work, Paris, 2013.

et réglementations la concernant ont été décidés pendant l'écriture de cette thèse de doctorat, dont les effets devraient être évalués avant toute nouvelle suggestion. Parmi ces réglementations, on peut ici évoquer quelques exemples de réglementations nationales visant à renforcer la transparence sur les impacts environnementaux et sociaux des fonds de Capital Investissement (par exemple le CRC Energy Efficiency Scheme au Royaume Uni depuis 2008 ; et les décrets 224 et 225 de la loi de Grenelle II en France, qui seront mis en œuvre début 2013). Si ces réglementations ont et auront dans les années à venir d'importantes conséquences sur les marchés, leur portée sera limitée par leur ancrage national. Une extension de ces démarches au niveau européen est proposée afin d'atteindre les objectifs fixés en matière de développement durable et éviter les distorsions de marché au sein de l'Union.

Enfin, la RSE et les investissements socialement responsables pourraient également s'appliquer aux administrations publiques. La conclusion argumente que l'Etat est un employeur conséquent, financeur de nombreuses entreprises via ses marchés publics, et un investisseur institutionnel très suivi. Par conséquent, le développement durable ne pourrait que bénéficier d'un engagement clair et transversal des administrations publiques pour améliorer leur propre responsabilité sociale.

INTRODUCTION

In *Our Common Future*, also known as the Brundtland report, the World Commission on Environment and Development defined sustainable development as *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (1987). Within a generation, this broad concept widely spread in our society and public policies. The European growth strategy for the on-going decade (Europe 2020) hence consists in becoming a "*smart, sustainable and inclusive economy*" and grounds its sustainability objectives on competitiveness, environmental protection and social inclusion. As core economic actors of growth and employment, enterprises play a crucial role for our societies to reach those objectives. Corporate Social Responsibility (CSR) is the commitment of business to contribute to sustainable economic development (World Bank, 2003) [5] and take responsibility for their impacts on society (European Commission, 2011a).

The financial and economic crisis the world had been undergoing since 2008 both tightens up the basic conditions needed to achieve sustainability as well as the urgency to succeed to do so. Small and Medium sized Enterprises (SMEs), which make up the largest share of our economic, industrial and social fabric, face significant difficulties in obtaining the financing needed to ensure their growth and jeopardize their employment and innovation capacity (European Commission, 2011b). Highlighted as efficient financial tools, Private Equity funds are investment vehicles specialized in unlisted companies. The French Economic Analysis Council (Conseil d'Analyse Economique) stated in 2008: "*The crisis of the financial markets will globally lead to a highly significant reinforcement of this kind of economy financing, up to a major role in the restructuring of the productive fabric of large developed economies. (...) Simply because thousands of SMEs, which make up a large share of our country's productive structure, do not have today, and will even less have tomorrow, any other financing source than Private Equity".* A clear stand was taken for the positive role the Private Equity industry could play for economy and proposals were made to increase in an accelerated way this asset class.

[5] The World Bank (2003) precisely defines CSR as "*the commitment of business to contribute to sustainable economic development, working with employees, their families, the local community and society at large to improve quality of life, in ways that are both good for business and good for development".*

In 2011, Private Equity funds indeed invested about 45.5 billion euros in over 5 000 companies in Europe (respectively 9.7 billion euros in 1 700 French companies), out of which SMEs accounted for about 85% (EVCA, 2012). Estimations are that over 10 000 European companies are currently hold in Private Equity funds portfolios (European Commission, 2011b). However, strong social criticism has been raised against Private Equity both in Europe and the United Stated since 2007[6], driven by highly-publicized asset striping deals. Criticism targets funds' short-termism, drying-off of investment capacities, negative impact on enterprises' long-term growth, unequal distribution of capital gains, and expropriation of companies' founders. Important academic work was undertaken to assess the actual global impact of the Private Equity industry on employment and wages and results neither support the negative claims in Europe nor in the United states (Boucly et al., 2008, 2009; Amess and Wright, 2007; Davis et al., 2011). Despite long-term positive effects, concerns are grounded as evidence is found that Private Equity investors often accelerate restructuration processes and job reallocation between company sites. Structural changes can lead to strong social tensions, which are not necessarily taken into account and well managed by the Private Equity industry. As put by the French Economic Analysis Council (2008), there is a clear need «*to favor Private Equity while making it more socially acceptable*».

This dissertation explores the coherence of CSR in the Private Equity industry and Private Equity potential for fostering socially responsible behaviors in their investments. Can those investors support sustainable development through CSR? These questions arose from the field, as CSR and responsible investments were emerging topics in the industry when this Ph.D. was set up (2008-2009). Little academic work had been conducted at the time (and still is) on the potentiality of responsible investment in this asset class, somewhat contentious, lacking transparency and yet of strategic importance for SMEs. This research on the novel field of CSR in Private Equity is thus exploratory.

Socially Responsible Investment (SRI) has been defined by Renneboog et al. (2008) as an investment process that integrates social, environmental, and ethical considerations into investment decision making. This niche market triggered considerable academic and media interest over the past decade, essentially focused on the question of its financial performance (Capelle-Blancard and Monjon, 2010). The Private Equity channel has essentially been set aside by academics (Scholtens, 2008), at the exception of the pioneering work of Cumming

[6] This paragraph draws on the chapter "Capital Investissement et Emploi", Forget V.D. and Massut F., forthcoming in *Tout Savoir sur le Capital Investissement*, G. Mougenot (Ed.), City & Work, Paris, 2013.

and Johan (2007). However, there is a strong rationale for the Private Equity setting to be well suited, if not better than public asset classes, to foster CSR. Indeed Private Equity investors are significant or majority shareholders of companies for middle to long term horizon, as they usually hold companies in portfolio for 4 to 7 years. They can thus actively promote CSR at the company board if they decide to, whereas public socially responsible investors are most often limited to voting with their feet. Also, socially responsible investment on financial markets opposes the diversification principle that grounds Markowitz (1952)'s modern portfolio theory (Capelle-Blancard and Giamporcaro-Saunière, 2006). Conversely, Private Equity is anchored in improved portfolio company selection rather than diversification. Responsible investment in Private Equity thus seems to be a consistent concept.

However, it is no accident that responsible investment in Private Equity was so little tackled by academics so far. It is rather the consequence of a complete lack of available data. Measuring CSR is hard enough when researchers work on public companies, which have transparency and reporting requirements and can be rated by specialized agencies. It becomes even trickier with unlisted firms, particularly SMEs. Additionally, deal values and financial performance of Private Equity funds are – by essence – private information. To get around these issues, the dissertation thus required innovative data sources and various methodologies to process them. Each chapter tackles a different aspect of the research topic and resorted to the data and methodology that best fitted considering relevancy and feasibility. The resulting toolbox encompasses econometrics, game theory and experimental economics.

Chapter 1 disentangles the economic determinants of CSR by reviewing the wide empirical and theoretical literature on the topic. An empirical analysis is further proposed in Chapter 2 to understand how enterprises can manage to be both profitable and sustainable by focusing on the multidimensional nature of CSR. Chapter 3 then empirically assesses where the French Private Equity industry stands in terms of integration of CSR issues, that is sustainable investment, and why. Chapter 4 takes a slightly different standpoint by experimentally testing in the laboratory if CSR can be used by Private Equity investors to better select their investments. Chapter 5 turns to professional Private Equity investors to experimentally estimate if sustainable and unsustainable corporate practices impact equity access, and measures to which extent. Finally, the Conclusion section interweaves results to answer the research question, discusses limits of the dissertation, research paths opened, and lastly implications for the Private Equity industry and public policies.

The following sections briefly detail each chapter, motivate its methodology choice and limits, and provide background to contextualize contributions to the CSR, responsible investment, game theory and corporate finance literatures.

WHAT ARE THE ECONOMIC DETERMINANTS OF CSR?

As a starting point, Chapter 1 reviews the theoretical and empirical CSR literature and provides a unified framework of the forces driving CSR using an economic lens. It is based on a working paper co-written with Patricia Crifo: "The Economics of Corporate Social Responsibility: A Survey" (submitted to a peer-review journal).[7]

Such a literature survey is a crucial foundation stone for the understanding of CSR in Private Equity, as considerable knowledge on CSR has already been amassed in other fields. Beyond a sole catalogue of existing research, Chapter 1 aims at proposing a creative synthesis of the literature to highlight both its consistency and its potential lacks.

A practical definition of CSR is first proposed, based on the European Commission (2011a) framework. Whereas the concept of CSR aligns with sustainable development aspirations, the question of why would firms engage in it and its actual impact is far from trivial. Understanding CSR drivers is core to analyze why and how would firms engage in CSR and how this engagement is likely to impact their activities and society as a whole.

In turn, CSR may arise from three categories of market imperfections, which structure the review. The first source of market failures driving CSR is the existence of externalities and public good, whose provision can be motivated by deterring public regulations, responding to social pressure or exerting one's own moral duty to undertake social activities. The second category of CSR behavior determinants lies in imperfect competition, which generates product differentiation, subsequent market structures and the misuse of information asymmetry under the form of greenwashing. The third category of market imperfections behind CSR strategies is anchored in imperfect contracts, CSR

[7] Chapter 1 updates and builts upon the book chapter *"A Survey of the Literature on Corporate Social Responsability & Financial Performance" (*Forget V.D, in *CSR: From Compliance to Opportunity?*, P. Crifo and J. P. Ponssard (Eds), Editions de l'Ecole Polytechnique, 2010), published in the first year of the Ph.D. Here we take a broader and newer perspective on CSR, anchoring it in economics aside the sole question of performance.

being considered as the delegated responsibility of firm shareholders, firm employees and firm managers. For each motive, theoretical arguments and their empirical test are surveyed.

The literature on CSR impacts on both firm performance and society is then reviewed. A twofold discrepancy is thus highlighted in the literature: first, a disconnection between our understanding of CSR drivers and impacts; and second, a knowledge gap between CSR financial and social consequences, the latter having received little attention.

Among the research paths suggested, the multidimensional nature of CSR and its implications for performance appears little investigated. This research is the focus of Chapter 2.

How Can Firms Succeed on Both Financial and Extra-Financial Levels?

The literature survey highlighted that the link between financial and extra-financial performance triggered a substantial body of research over the past thirty years. Beyond the question of the existence of such a link, which has been agreed upon (Margolis et al., 2009), the mechanism linking profitability to CSR is complex and still academically debated. It is also core for investors who wish to foster sustainability. Chapter 2 builds on the idea (developed in Chapter 1) that CSR encompasses many diverse policies with variant effects on profitability that need disentangling. This chapter thus aims at understanding the relative importance of corporate extra-financial policies for firm performance. It is based on the working paper "Doing Well and Doing Good: A Multidimensional Puzzle" (HAL-00672037; submitted to a peer-review journal).

Contrary to other chapters, data was readily available to tackle Chapter 2 research question. The non-financial rating agency Vigeo had indeed granted us access to their database, which we matched with the financial performance database Orbis Bureau Von Dijk. The resulting database covers 461 large and medium European capitalizations over 1998-2007. CSR data encompasses a fairly complete range of policies, namely: environmental performance, good business behavior with customers and suppliers, implication in local communities, human resources management and governance.

Once the database ready, solving this multidimensional puzzle still remained far from trivial. Indeed, the link between financial performance and multiple CSR dimensions

encounters model uncertainty because theories are not explicit enough on which CSR dimension belongs to the "true" regression (and under which specification). The influential work of Sala-i-Martin et al. (2004) discusses a similar issue in growth economics, a field in which researchers are faced with a multiplicity of possible regressors. Ignoring model uncertainty generally results in biased parameter estimates, overconfident standard errors and misleading inference.

Thus to tackle the multidimensional nature of CSR, the chapter introduces model averaging, a formal statistical framework that explicitly accounts for model uncertainty. Model averaging weights simultaneously all possible models depending on their quality and provides a probability distribution for each coefficient estimates. It has already proven insightful in several research fields. Beyond its original application to CSR, the methodology here presented is a variant that has the potentiality to be relevant to many economists for its straightforward implementation. However, as the methodology requires large datasets, Chapter 2 is limited to the study of the relationships between CSR and financial performance and cannot tackle the causality issue.

Chapter 2 unveils which CSR dimensions are significantly related to financial performance, and which are not. It hence supports that CSR policies do not equally matter to do well and do good. In particular, good business behaviors with customers and suppliers stand out as core among all CSR dimensions. Environmental performance and human resources management are weakly associated with profitability in the studied data, whereas implication in local communities and governance are not. Strong evidence is also provided on the co-existence of policies with optimal levels for financial performance (good-business behaviors with customers and suppliers and environmental performance) and policies with monotonic relationship (human resources management).

Findings hence suggest that different CSR dimensions bear different optimums to be reached for corporations to manage to do well and do good. Hereby CSR does not come as bundle to be blindly promoted, but rather calls for a strategic analysis of the business model to carefully select an appropriate policy mix for the firm to be both profitable and sustainable. For Private Equity investors, these results imply a need for expertise on CSR as grasping where it may yield profits is not obvious.

WHERE DOES THE PRIVATE EQUITY INDUSTRY STAND IN TERMS OF CSR, AND WHY?

Chapter 3 presents literature on socially responsible investment (namely investments integrating extra-financial considerations) and highlights its focus on public financial markets at the expense of the Private Equity channel. It sets up to characterize the responsible investment movement in Private Equity and to analyze its drivers. It is based on a paper co-written with Patricia Crifo: "Think Global, Invest Responsible: Why the Private Equity Industry Goes Green" (forthcoming in the *Journal of Business Ethics*).

As pointed out earlier in this introduction, there was neither theoretical guidance nor datasets available on CSR in Private Equity. Nevertheless, it was fairly easy to gather anecdotal evidence on the issue. Chapter 3 thus first defines and provides historical insights on socially responsible investments and Private Equity, contextualizing the integration of responsible investment in Private Equity. The fast integration of Environmental, Social and Governance issues by mainstream Private Equity investors is thus unveiled and appears to have benefited from the maturation of socially responsible investment on public financial markets and the impetus of large conventional actors.

Moreover, hypothesis on the movement characteristics and drivers could be drawn from previous CSR, socially responsible investment and corporate finance literatures. Further on, the only possibility to effectively characterize this movement was to build a dataset that would enable hypotheses testing. Thus public data on 309 French Private Equity management firms (99% of the French industry) was hand collected in 2011 using specialized media, press releases and firm websites. To get an insider perspective, survey data was also collected in partnership with Novethic (Caisse des Dépôts et Consignations) on 74 firms. This painstaking work limited data and thus the analysis to the French market.

Empirical findings support that Private Equity responsible investing is characterized by investor engagement and strategically driven by a need for increased risk management and differentiation. In particular, results show that independent funds, which need to attract investors, are more likely than captive funds to develop socially responsible practices. The integration of CSR issues in the Private Equity industry therefore appears in line with shareholders' value maximization and consistent with business improvement. A strong limit of the chapter is its exploratory nature. Research extensions should consider building more solid a theoretical framework on responsible Private Equity investing.

CAN INVESTORS RELY ON CSR TO IDENTIFY PERFORMING FIRMS?

Making money out of CSR is not an easy road, as highlighted in Chapters 1 and 2. Chapter 4 aims at investigating an alternative explanation of Private Equity interest for CSR that was not tested in Chapter 3. Recent work supports that firms with higher financial performance might be those who can afford to use their slack resources for CSR (Baron et al., 2011). Using signaling theory, Chapter 4 builds on these stylized facts to theoretically and experimentally investigate whether environmental performance (and more generally corporate public good provision) can perfectly substitute to other types of money-burning signals to reduce information asymmetry in Private Equity negotiations. Chapter 4 is based on the working paper: "Green Signaling in Experimental Private Equity Negotiations".

The selected approach quite strongly differs in methods from previous chapters. Empirically determining the effectiveness of a corporate signal on Private Equity financing is already challenging from a data availability point of view, but it becomes even harder when signals involve public good provisions. On a more theoretical level, Chapter 4 shows that environmental performance can be modeled as a money-burning signal, but it remains unclear whether it constitutes a perfect substitute for any money-burning signal. This chapter hence turns to the experimental laboratory, which allows controlling the financial decision environment and observing behaviors and has thus already enabled many developments of financial theory (Pouget, 2001). As usual in laboratory experimental economics, since we aim at testing underlying mechanisms and not personal experience, experiment participants were not Private Equity specialists. This research was conducted in partnership with the CIRANO (Montreal, Canada), whose experimental economics laboratory hosted the experimental sessions with the help, advice and support of Jim Engle Warnick.

A two-signal non-cooperative model of negotiated Private Equity financing was first proposed. Theoretical negotiations between Private Equity investors and firms (which could be high or low types) occurred sequentially and involved both a price signal and a money-burning signal. The experimental design then contextualized the money-burning signal by allowing firms to either purchase a "green" signal (providing a public good) or a "brown" signal (a standard advertisement). Money-burning signals had equivalent monetary incentives but differed in their social consequences, as the "green" signal actually contributed to a real public good (online carbon offset). The experimental design encompassed 6 treatments

depending on the money-burning signal content (green, brown or choice between both) and price, which could either be expensive (only affordable by high type firms) or cheap (affordable by both firm types); plus a control treatment without signaling. In all treatments, model parameters were chosen so that money-burning signals should theoretically never be purchased and subjects should converge to a (non-signaling) pooling equilibrium. 296 subjects took part in the experiment.

Experimental results are that green signaling is not preferred to standard advertisement and money-burning signals are not purchased, in line with theoretical predictions. However, equilibrium selection still differs depending on the money-burning signal content. While the availability of the brown signal leads to the predicted pooling equilibrium, subjects deviate in presence of the green signal and converge to a dominated separating equilibrium that occurs through prices. Chapter 4 hence contributes to signaling theory by showing that money-burning signals that provide public good are not perfect substitute for standard money-burning signals. The presence of the public good signal appears to crowd-in actors' intrinsic motivation to reveal their type through prices and converge to a separating equilibrium. In this experimental setting, information asymmetry is reduced in Private Equity negotiations but public good is not provided. Implications are discussed in terms of equity market transparency.

Do Sustainable and Unsustainable Practices Impact the Access to Equity Financing?

The last chapter of this dissertation aims at measuring the impact both sustainable and unsustainable corporate practices have on Private Equity financing. More specifically, its purpose is to quantify whether CSR is rewarded by Private Equity investors in terms of firm value and investment attractiveness. Chapter 5 is based on a working co-written with Patricia Crifo and Sabrina Teyssier: "The Price of Unsustainability: An Experiment with Professional Private Equity Investors" (submitted to a peer-review journal).

As in Chapter 4, the methodology choice was constrained by the fact that Private Equity deal prices are not public information. Even if they were, if would be extremely difficult to isolate the effect of CSR among all other factors that influence equity financing negotiations. Once

again, we thus turned to experimental economics. Contrary to Chapter 4, to be able to quantify the actual effect of CSR on firm valuation and Private Equity financing, it was core for experiment participants to be investment specialists. We thus built a unique framed field experiment in which 33 professional Private Equity investors competed to acquire fictive firms. This research was made possible by a partnership with the Sustainable Club of the French Private Equity Association and the Private Equity firm Eurazéo PME who supported the project, worked with us on the fictive firm case studies to ensure credence and triggered participants' involvement.

The experimental setting allowed controlling the information that grounds firm-value and focusing on the impact of three CSR pillars: Environment, Social and Governance factors. The experimental design was based on a model of first-price sealed-bid auctions with embarrassment cost, which we show to be incentive compatible. Contrary to Chapter 4, here the experiment does no test the model. It rather uses the auction model as a foundation stone to ensure firm price revelation. Four treatments were run based on three firm case studies carefully built to ensure realism. One treatment was run through a website we developed.

Results on 330 observations highlight that non-financial performance matters for Private Equity financing, both in terms of equity price and access. Main finding is the existence of an asymmetrical effect of non-financial performance, entrepreneurs having more to lose from unsustainable practices than to gain from sustainable ones. When investors' heterogeneity is controlled for, results unveil that unsustainable policies decrease firm valuation by respectively 11%, 10% and 15% for environmental, social, and governance issues. Sustainable environmental and social policies only increase firm valuation by 5%, governance having no significant impact. Unsustainable practices also decrease investment likelihood by about 30%. Chapter 5 concludes that unsustainable corporate policies might both prevent equity financing and increase its cost, sustainability thus consisting in a defensive strategy to protect firm value and equity access.

CHAPTER 1

THE ECONOMICS OF CSR: A SURVEY

What are the economic determinants of CSR?

Abstract

This chapter analyzes the economics of CSR behaviors, namely business commitments to contribute to sustainable development and take responsibility for their impacts on society. The issues of why would firms engage in CSR and of its actual impacts have triggered academic debate over the past three decades. We give coherency to this literature by analyzing CSR as an answer to three types of market imperfections: the existence of externalities and public goods, imperfect competition and incomplete contracts. For each driver, theoretical arguments and their empirical tests are surveyed. Our framework enables us to highlight a twofold discrepancy in the literature: firstly, a disconnection between our understanding of CSR drivers and impacts; and secondly, a knowledge gap between CSR financial and social consequences, the latter having received little attention.

Résumé

Ce chapitre analyse les déterminants économiques des comportements de RSE, définie comme l'engagement des entreprises à contribuer au développement durable et à assumer la responsabilité de leurs impacts sur la société. Pourquoi les entreprises s'engagent dans des démarches de RSE, et quels en sont les impacts, sont deux questions académiquement débattues depuis trois décennies. Nous donnons de la cohérence à la littérature issue de ce débat en analysant la RSE comme une réponse à trois types d'imperfections de marché : l'existence d'externalités et de biens publics, la compétition imparfaite, et les contrats incomplets. Pour chacun de ces déterminants, nous passons en revue arguments théoriques et tests empiriques. Notre cadre analytique nous permet de mettre en exergue deux failles de la littérature : d'une part, une déconnection entre notre compréhension des déterminants de la RSE et de ses impacts ; et d'autre part, un déséquilibre entre notre connaissances des conséquences financières et sociales de la RSE, ces dernières n'ayant que peu été explorées.

Chapter 1 is based on a working paper co-written with Patricia Crifo (same title; HAL-00720640) submitted to a peer-reviewed journal.

1.1. INTRODUCTION

The last fifty years have witnessed striking net gains in global economic development and human wealth creation. However, the Millennium Ecosystem Assessment (2005) established that this growth was achieved at the costs of a ”*substantial and largely irreversible loss in the diversity of life on Earth* (...), *the degradation of many ecosystem services, increased risks of nonlinear changes, and the exacerbation of poverty for some groups of people*”. Hereby the international panel of experts concluded that the ability of the planet ecosystems to sustain future generations was jeopardized unless those problems were soon addressed by our society.

From an economic perspective, the world imbalance depicted by the Millennium Ecosystem Assessment can be analyzed as a market failure, with some economic agents (including future generations) suffering negative externalities arising from other agents’ activity and wealth growth. Inefficient allocations resulting from market failures often justify political intervention in the market place (Ledyard, 2008). However, a large body of literature highlights that governments also suffer failures and might not necessarily be more efficient than markets when attempting to fix allocations (for a review on the specific case of environmental policy, see Hepburn, 2007).

This paper asks whether firms, which ground our economic activity, can be part of the solutions for sustainable development through Corporate Social Responsibility (labeled CSR hereafter). Friedman (1970)’s answer to this issue is that the sole responsibility of businesses is to increase profits. Corporations should not substitute for elected government to provide public goods and spend shareholders’ money for “doing good” without benefiting from the required political legitimacy. Yet Bénabou and Tirole (2010) argue that CSR represents a response to market and redistributive imperfections because of government failures or in order to promote values that are not shared by law makers.

The objective facts are that over the past two decades, corporations have struggled to become, or at least to appear as socially responsible. Almost two thirds of the biggest firms in industrialized countries have published a report on CSR or on sustainable development policies (KPMG, 2011). At the same time, a considerable attention in the literature has been given to the definition of CSR, the analysis of its determinants and the measure of its impact on firm performance, especially in the field of management sciences and economics of organizations. Unfortunately, a critical observer of this large and evolving literature will

necessarily note that the concept of CSR is used, explained and supported by a wide array of contradictory evidences and arguments between authors. The literature is also blurred by the interweaving of terminologies such as corporate sustainability, business sustainability, business ethics and CSR, relying on overlapping concepts (van Marrewijk, 2003).

We here chose to focus on the CSR concept to capture corporate efforts towards sustainable development, thus acknowledging and reflecting the international spread of the terminology in both business and institutional spheres (OECD 2011, World Bank 2003). Multiple CSR definitions have been proposed, either from an economic (Baron, 2007; Bénabou and Tirole, 2010) or a managerial perspective (Carroll, 1979; McWilliams and Siegel, 2001). This paper takes a clear and practical stand by using the CSR definition proposed by the European Commission in 2011. Indeed, this regulatory cornerstone is likely to shape corporate understanding and further efforts towards sustainable development. For the European Commission, being responsible means that, beyond legal constraints, firms take responsibility for their impacts on society. A prerequisite is the respect for applicable legislation and collective agreements between social partners. In our framework, contrary to early definitions (such as Carroll's 1979), CSR thus goes beyond obeying law. Further on, socially responsible enterprises should integrate social, environmental, ethical, human rights and consumer concerns into their business operations and core strategy with the double aim of maximizing the creation of shared value for their shareholders, stakeholders and society; and identifying, preventing and mitigating their possible adverse impacts.

This official definition hides in practice a large range of socially responsible behaviors. The Global Reporting Initiative, one of the most prevalent CSR reporting framework worldwide, promote for instance performance disclosure on strategy and profile (including corporate governance, stakeholder management and performance indicators implementation); economic (that is flows of capital among stakeholders and the main economic impacts throughout society); environmental; social (labor practices, training, and decent work); respect of human rights; impacts on local communities (including bribery and corruption) and lastly product responsibility (directly affecting consumers). The sole environmental category encompasses thirty performance indicators, clustered in ten items: materials used and recycling; energy consumption and efficiency; water consumption; biodiversity protection; emissions, effluents and waste; impact mitigation of products and services; compliance with environmental laws; transport and finally global environmental expenditures. In the financial sphere, for the

purpose of tractability, CSR policies are often clustered into three wide domains: environmental, social and governance (ESG) factors.

Hereby the reality of the CSR concept, while being aligned with sustainable development aspirations, is utterly complex and the questions of why would firms engage in CSR and what are its actual impacts are far from trivial. The broadness of the literature dealing with CSR reflects this complexity. In this article, we present a survey of the theoretical and empirical literature on the determinants and consequences of CSR using an economic lens. We give it coherency by analyzing CSR as an answer to different types of market and government failures, and we organize the literature along those. In turn, CSR may arise from three categories of market imperfections, which structure our review: externalities and public goods; imperfect competition and incomplete contracts. For each motive, theoretical arguments and their empirical test are surveyed. This economic perspective enables us to provide a unified framework of the forces driving CSR. We then review the literature on CSR impacts on both firm performance and society. We thus highlight a twofold discrepancy in the literature: first, a disconnection between our understanding of CSR drivers and impacts; and second, a knowledge gap between CSR financial and social consequences, the latter having received little attention. Figure 1.1 illustrates how we analyze the literature.

Section 1.2 tackles a first source of market and government failures, which is the existence of externalities and public good. Governments may provide such goods or correct such externalities at the optimal level only in the case of perfect information. Otherwise, privately providing public goods or internalizing externalities may occur under the pressure of the regulator, activists such as NGOs, or altruistic actors. Section 1.3 develops the literature on CSR driven by imperfect competition, generating product differentiation and market competition strategies. Section 1.4 presents imperfect contracts as a third source of market failure that motivates CSR as the delegated responsibility of shareholders, employees or firm managers in the presence of contract incompleteness. We then present in section 1.5 the literature main conclusions on the impacts of CSR on firm performance on the one hand, and on society as a whole on the other hand, hereby highlighting the lack of knowledge on the latter. Future research paths are finally suggested in section 1.6.

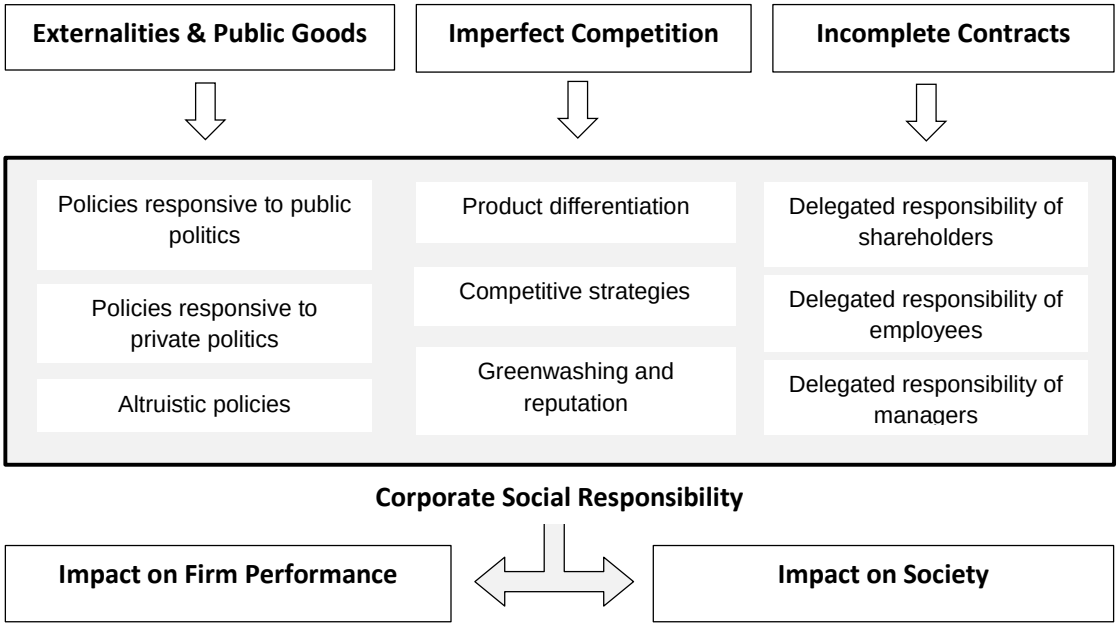

FIGURE 1.1 - Structure of the CSR literature

Structure of the literature on CSR drivers (top), subsequent policies (middle) and consequences (bottom)

1.2. CSR AS EXTERNALITY INTERNALIZATION AND PUBLIC GOOD PROVISION

Most CSR activities, based in particular on environmental and social factors, aim at reducing negative externalities (e.g. pollution abatement) or generating positive externalities (e.g. financing hospitals). Privately providing public goods hence is an important part of CSR activities. We present in this section three types of motivations for such private provision of public goods: deterring public regulations or public politics, responding to social pressure or private politics, or exerting one's own moral duty to undertake social activities. Table 1.1 summarizes the key literature on CSR as an externality Integration and private provision of public good and highlights how each motive relates to a different source of market and government failure and yields a different CSR policy.

1.2.1. CSR, PUBLIC POLITICS AND REGULATION PREEMPTION

A first determinant of firms' responsible behaviors arises from the regulator action. The threat of fines, new regulation compliance and other regulatory costs may induce higher CSR activities, but CSR may also be a response to government failure. Friedman (1970)'s view on CSR, according to which spending someone else's money for a general social interest amounts to taxes and proceeds squandering for "social" purpose without political legitimacy, in fact vanishes when either government fails or wishes not to crowd-out private provision of public goods. So do CSR activities actually substitute for or complement public regulations in terms of public good provision, in particular when government fails?

On the one hand, CSR may substitute to the regulation when it preempts it. Lutz et al. (2000) propose a duopoly model of vertical product differentiation in which a minimum quality standard increases welfare but negatively impacts industry profits because reduced quality differentiation intensifies price competition. Thus to reduce regulatory costs, firms seek to preempt regulations before their promulgation, inducing the regulator to weaken its standards: welfare falls but profits increase. In the context of "corporate environmentalism", Maxwell et al. (2000) identify conditions under which firms can profitably preempt regulatory threats and find that preemption occurs when industry organizing and lobbying costs are high. Empirical tests of the preemption theory are often based on case studies (see Arjaliès and Ponssard, 2010). Focusing on the metal-finishing industry, Brouhle et al. (2009) econometrically

evaluate the respective influence on carbon emissions of a voluntary program and of the threat of formal regulation. Participation in the program and significant emission reductions were shown to be related to several forms of external pressure, including the regulatory threat.

On the other hand, Maxwell and Decker (2006) note that many environmental investments seem to be aimed at reducing the costs of complying with existing regulations, thereby suggesting that firm's environmental performance and regulation are complements rather than substitutes. Here the regulator acts as an enforcer of existing environmental regulations and responds to voluntary environmental investments by reducing the frequency with which it monitors the firm. The firm is motivated to take action because of the reduction of its expected fine. Sam and Innes (2008) empirically support this reinforcement theory by showing that participation in a toxic waste reduction program (US 33/50) was motivated by the expectation of relaxed regulatory scrutiny. Using data on approximately 4000 facilities in seven OECD countries, Johnstone and Labonne (2009) provide strong evidence that environmental certification serves as a signal to regulatory authorities.

Beyond reinforcement theory, CSR might also complement regulations in cases of government failures, which have multiple origins (Bénabou and Tirole, 2010): for instance capture by lobbies and other interest groups; territoriality of jurisdiction (as for child labor for instance); or a combination of inefficiency, high transaction costs, poor information and high delivery costs. For instance, the regulator may share the desire to reduce costs of regulation and thus be willing to negotiate voluntary agreements (Lyon and Maxwell, 2008).

1.2.2. CSR as a Response to Social Pressure and Private Politics

Citizens and social activists can also make direct demands for firms to integrate their negative externalities, such as water pollution or toxic air emissions. Hence a major determinant of CSR activities would be to respond to social pressure or deter private politics. According to Baron (2003), the term 'private' means that the parties do not rely on public order (lawmaking), while 'politics' refers to individual and collective action. As emphasized by Van den Berghe and Louche (2005) « *companies are facing a new invisible hand, that is non-market forces exerted by NGOs, media trade-union and others, and influenced by this new invisible hand, they start to consider CSR as prerequisite for sustainable growth and welfare* ». When CSR activities consist in private social redistribution and partial

internalization of firm externalities, our society might consider the activity and use of public goods by less responsible firms as socially unfair and thus withdraw its "license to operate" (Post et al., 2002). When does a corporation become contestable and how can CSR mitigate contestability? How do social activists exert pressure on firms? Why are some firms targeted and others not?

The theory of contestable management states that anticipated threats of social protest can effectively discipline firm's behavior. Using the instructive case of the Genetically Modified Organism industry boycott in France, Hommel and Godard (2001, 2002) consider that a firm's contestability is characterized by its exposure to two types of threats: contestation of its social license to produce and innovate, based on environmental or health-related risks to the community attributed to the firm's products or processes; and economic contestation from competitors. Hence for a corporate activity to become contestable, firms need to either be innovators of belong to notoriously dirty industries, and be significant actors on their market. The link between firm visibility on its market and CSR level has been found in many empirical studies (Margolis and Walsh, 2001). As such, CSR can be a strategic policy to prevent social contestability and protects the firm long term interests (Hommel and Godard, 2001).

Recent contributions from the economics of networks and social capital enrich the previous idea by supporting that CSR can modify business and social networks, thus providing firms with strategic flexibility. Burt (2001, p.32) defines social capital as "*the contextual complement to human capital. The social capital metaphor is that the people who do better are somewhat better connected*". The author also defines holes in structural social networks and argues that individuals whose relationships span such holes gain competitive advantage (p.34). Quenneville-Éthier and Sinclair-Desgagné (2010) demonstrate that CSR enables firms to do so. Using the case of the multinational Rio Tinto Alcan in remote Canadian and French communities, the authors analyze how CSR may alleviate multinationals' high exit costs from mono-industrial regions by reducing community dependence to these multinationals.

Most often, social pressure is not directly exerted by citizens but rather by social activists, such as Non-Governmental Organizations (NGOs). Defined by Baron (2001) as private politics, NGOs make direct demands on corporations enforced either by threats (boycott, negative propaganda) or rewards (endorsements), without reliance on public institutions or shareholders. Baron and Dirmeier (2007) highlight that the former is likelier than the latter, threats being more likely to decrease the level of the targeted activity. NGOs campaigns are a

powerful lever of social pressure designed to negatively impact sales, employee morale and corporate recruitment efforts. Moreover, Sinclair-Desgagné and Gozlan (2003) theoretically show that when NGOs wield big threat, it can induce "green" firms to distinguish themselves by issuing a detailed CSR report; whereas if weak, they release only moderately informed CSR reports as other firms do. Based on signaling theory, Feddersen and Gilligan (2001) also point out that information-supplying activist can alter the decisions of firms and consumers and enhance the social welfare of market exchange. A framework for consumers' motivations for boycott participation has been proposed and tested on a case study by Klein et al. (2004). Focusing on facilities reporting to toxic release inventory from 1988 to 1994, Sam and Innes (2008) find empirical evidence that participation in voluntary programs and pollutant reductions were prompted by a firm's likelihood of becoming a boycott target.

However, not all contestable firms become the target of social activists. Visibility is increased by the extent of the public contact, as in consumer-oriented industries (Margolis and Walsh, 2001) or notoriously dirty industries (Brown et al., 2006). Siegel and Vitaliano (2007) add that firms selling experience goods (whose quality cannot be observed before use, but is ascertained upon consumption, such as a bottle of wine) or credence goods (whose quality cannot be evaluated in normal use, such as bioorganic wine) are more likely to be socially responsible than firms selling search goods (whose quality is easily ascertain, such as a wine glass). In this literature, social pressure appears as a major driver of CSR for large, consumer-oriented or notorious firms which commit to it in order to protect their license-to-operate.

NGOs do not necessarily target firms with highest levels of negative externalities. Baron and Dirmeier (2007) indeed develop a theory of adversarial NGOs campaigns displaying that NGOs prefer to target sequentially one firm rather than multiple firms simultaneously, pick up issues with high social values, and finally target firms more likely to be responsive to the campaign. Baron (2009) also highlights that if citizens do not distinguish between morally motivated CSR and CSR induced by social pressure, the activist is more likely to target the softer, morally motivated firm. In other words, this soft firm hypothesis states that social activists may in fact target their campaign against morally-managed firms because they have more to lose from the campaign than do self-interested firms. Empirical support is brought by Baron et al. (2008) on a large sample of firms over the 1996-2004 period.

TABLE 1.1 - Literature on CSR as externality integration and private public good provision

Market and government failure sources				CSR policy	Literature on this CSR driver		Related CSR impacts on firm performance		Related CSR impacts on society	
Information asymmetry (regulator / firm)	Firm negative externalities	State territoriality of jurisdiction	Other		Theory	Empirical tests	Theory	Empirical tests	Theory	Empirical tests
yes	yes	no	Government capture by lobbies or interest groups	Voluntary agreement before regulation	*Regulation Preemption* (Lutz et al. 2000; Maxwell et al. 2000)	Brouhle et al. 2009	Lutz et al. 2000		Lutz et al. 2000, Fleckinger and Glachant 2011	Brouhle et al. 2009
yes	yes	no	Government high transaction/ monitoring costs	Voluntary agreement after regulation	*Regulation reinforcement* (Maxwell and Decker 2006)	Sam and Innes 2008; Johnstonne and Labonne 2009			Maxwell and Decker 2006	
yes	yes	yes	-	Shield from citizens' pressure	*Contestability* (Hommel and Godard 2001)	Hommel and Godard 2001				
yes	yes	yes	Monopole	Investments in community	Social capital (Burt 2000)	Quenneville-Éthier and Sinclair-Desgagné 2010				
yes	yes	yes	-	Shield from citizens' pressure	*License-to-operate* (Post et al. 2002)	Brown et al. 2006; Siegel and Vitaliano 2007				
yes	yes	yes	-	Shield from activists' pressure	*Private politics* (Baron and Dirmeier 2007, Sinclair Desgagné and Gozlan 2003)	Sam and Innes 2008		Baron et al. 2008	Feddersen and Gilligan 2001, Heyes and Maxwell 2004	
no	yes	no	-	Profit sacrifice in social interest	Bénabou and Tirole 2010, Baron 2010					

1.2.3. CSR, Altruism and Pro-social Behaviors

Finally, recent developments in psychology and behavioral economics can be used to examine CSR as a behavior of *'sacrificing profits in the social interest'* (Bénabou and Tirole, 2010). In this interpretation, CSR is a prosocial behavior which reflects managers' willingness to engage in philanthropic activities, provide public good and internalize the negative externalities of their corporation. Typically this corresponds to Milton Friedman (1970)'s view that CSR amounts to spending others' money for individual pro-social motivations.

Economic agents may want to promote values that are not shared by law-makers. Because preferences are heterogeneous, it is inevitable that some managers' values will not be fully reflected in policy and projected onto their corporate decisions. Pro-social behaviors result from several interacting motivations, from intrinsic (genuine) altruism to extrinsic (material) motivation, social and self-esteem concerns (Bénabou and Tirole, 2010). Image concerns may hence act as a cheap incentive device to induce responsible behaviors. For Baron (2010) as well, CSR may be viewed as self-regulation motivated by moral concerns. More precisely, he characterizes the scope of self-regulation as a function of the form and strength of moral preferences and analyzes how free-riding problems may be mitigated in this context. Empirically, tests of managers' pro-social behaviors most often merge with tests of the agency theory in which CSR is considered as a management perquisite (Baron et al., 2008; Brown et al., 2006).

Yet, pro-social motivation may also be subject to offsetting effects. Searching out excessive social prestige may crowd out the incentive provided by publicity on pro-social behaviors. The more advertised CSR activities are, the more they might be discounted as mere image-seeking rather than altruism. In this line, Bénabou and Tirole (2006) develop a theory of pro-social behavior that combines heterogeneity in individual altruism and greed with concerns for social reputation or self-respect. Moreover, 'buying' social prestige with CSR may be a zero-sum game. For instance, the buyer of a hybrid car feels and looks better, but makes his neighbors (both buyers and non-buyers of hybrid cars) feel and look worse (Bénabou and Tirole, 2010). From a public policy perspective, pro-social behaviors stemming from image concerns imply another externality. In fact, the image value 'bought' by a responsible firm increases the private individual return of the firm and partly reduces the negative social externality costs to be corrected. Hence, CSR motivated by altruism or pro-social behaviors may substitute partly to publicly provided public good.

Finally, individuals can express their moral concerns about the ethical behavior of companies by means of ethical buying or ethical consumption. How firms can strategically exploit this consumer preference anchored in pro-social behavior is the focus of next section.

1.3. CSR AS A BUSINESS STRATEGY IN IMPERFECT COMPETITION

The second category of determinants of CSR behaviors lies in product market structure and imperfect competition. In a world populated by heterogeneous consumers including 'green' actors, a subset of producers can be expected to take voluntary steps to improve their environmental or social performance in order to obtain a label and extract a green premium. Basically, firms competing in imperfect markets may, and often do, over-comply with existing laws, thereby developing CSR activities (Reinhardt and Stavins, 2010). We successively consider product differentiation generated by consumers' heterogeneity, subsequent market structures, and the misuse of information asymmetry under the form of green-washing. Table 1.2 summarizes the key literature on CSR driven by imperfect competition and highlights how each motive relates to a different source of market failure and yields a different CSR policy.

1.3.1. CSR, CONSUMER HETEROGENEITY AND PRODUCT DIFFERENTIATION

If a firm can identify customers willing to pay for ethical goods and if it can defend the resultant niche against imitators, business strategy in this context is like any other form of product differentiation, with the same basic economics (Reinhardt and Stavins, 2010): the opportunity arises because of asymmetric information, economies of scale, and intellectual-property protection.

A large number of articles consider CSR as a product differentiation strategy, with firms privately producing public goods to attract ethically oriented consumers. Arora and Gangopadhyay (1995) propose a standard model of vertical product differentiation to capture consumer heterogeneity in willingness-to-pay for environmental attributes. More recently, Besley and Ghatak (2007) examine the optimal level of CSR provision in competitive market equilibrium where CSR corresponds to the creation of public goods and curtailment of public bads jointly with the production of private goods, and firms compete for "ethical" and neutral

consumers. They show that in equilibrium, firms sell both ethical and neutral brands, consumers self-select according to their valuation of the public good, and CSR creates a Pareto improvement (see also Baron, 2007; Becchetti et al., 2005; Graff Zivin and Small, 2005).

Empirically, opinion polls indeed tend to report an increasing concern for ethical consumption (De Pelsmacker et al., 2005). For instance, 46% European consumers claim to be willing to pay substantially more for ethical products (MORI, 2000). Consumer's willingness to pay appears asymmetric between sinners and saints products (the former inducing stronger reactions) and dependent on the CSR issue tackled, product quality and individual factors (Sen and Bhattacharya, 2001). In the food sector, Giraud-Héraud and Hoffman (2010) point out how consumers might be willing to have safe and healthy food but are having difficulties to practically pay for it. Loureiro and Lotade (2005) also reveal using a face-to-face survey that consumers are willing to pay higher premiums for fair trade and shade grown coffee labels than for organic coffee.

From this perspective, labels and certification play a core role in product differentiation strategies to reduce information asymmetry. Indeed, Darby and Karni (1973) point out that when consumers cannot observe the quality of a firm product, there are strong incentives for opportunistic behavior, and the resulting equilibrium does not maximize social welfare. As they cannot be evaluated in normal use, as is the case of CSR, credence qualities need additional costly information for consumers to believe in them. Labels can be awarded by social activists, as in the signaling model of Feddersen and Gilligan (2001). For Baron (2010), various types of organizations providing assurance (certification) and information (social labels) on CSR have different impacts on free-riding. Social labels allow individuals with stronger moral preferences to separate from those with weaker moral preferences, but are not able to expand the scope of self-regulation beyond that with unconditional altruism. Certifications can do so and attract individuals with both stronger and weaker moral preferences. Illustrating this effect, Bjorner et al. (2004) followed a large panel of Danish consumers over 1997-2001 and quantified at +13-18% the price premium for certified (the Nordic Swan) toilet paper. In the same line, Eichholtz et al. (2010) assembled a sample of about 10 000 US office buildings and evaluated that "green" (energy efficiency) certification increased effective rents by 7% and selling prices by about 16%.

TABLE 1.2 - Literature on CSR as business strategy in imperfect competition

Market failure sources				CSR policy	literature on this CSR driver		Related CSR impacts on firm performance		Related CSR impacts on society	
Consumer heterogeneous preferences	Information asymmetry	Entry barriers	Other		Theory	Empirical tests	Theory	Empirical tests	Theory	Empirical tests
yes	no	no	-	Product differentiation	Reinhardt and Stavins 2010, Arora and Gangopadhyay 1995	De Plelsmacker et al. 2005, Sen and Bhattacharya 2001, Giraud Héraud and Hoffman 2010	Besley and Ghatak 2007		Besley and Ghatak 2007	
yes	yes	no	-	Product differentiation with label and certification	Feddersen and Gilligan 2001; Baron 2010	Bjorner et al. 2004; Eichholtz et al. 2010		Bjorner et al. 2004; Eichholtz et al. 2010		
yes	yes	no	Market concentration	Differentiation in concentrated markets	Bagnoli and Watts 2003, Hull and Rothenberg 2008	Fernandez-Kranz and Santalo 2010				
yes	yes	no	-	Communication and/or greenwashing	Lyon and Maxwell 2011	Kim and Lyon 2011, Elfenbein et al. 2009				
no	yes	yes	First-mover advantage	Innovation and change of processes	*Porter's hypothesis* (Porter and van der Linde 1995;Cerin 2006)	Ambec and Barla 2006, Derwall et al. 2006, Lanoi et al. 2011				
no	yes	yes	First-mover advantage	Creation of non-tariff barriers by certification	Chambolle and Giraud-Héraud 2005					

1.3.2. CSR and Imperfect Market Structures

We analyze in turn CSR determinants pertaining to competition intensity, reduction of production costs, entry barriers, and market opening following innovation.

Comparing examples of censured activities, Shleifer (2004) identifies that, when unethical behavior cuts costs, competition drives down prices and entrepreneurs' incomes, thereby reducing their willingness to pay for ethical conduct. Thus unethical corporate behavior might arise from competition rather than pure greed. However, when firms compete for socially responsible consumers by linking the provision of a public good to sales of their private goods, social activities can become a by-product of product-market competition. Bagnoli and Watts (2003) hence theoretically show that the level of private provision of public good vary inversely with the competitiveness of the private-good market. Empirical support of this prediction is brought in Fernandez-Kranz and Santalo (2010)'s explicit test of the link between product market competition and CSR. They find that market concentration appears negatively related to environmental and social ratings and that increased competition due to higher import penetration leads to superior CSR performance. In the same line, Hull and Rothenberg (2008) also show that CSR most strongly affects performance in low-innovation firms and in industries with little differentiation.

Reducing production costs to increase profitability is another rationale of market pressure. The famous Porter's hypothesis (Porter and Van der Linde, 1995) upholds that environmental regulation triggers innovation and production cost reduction (for instance increased input / output efficiency), leading to competitive advantage. Widely investigated, empirical evidence on Porter's hypothesis appears mixed, as detailed in the thorough review of Ambec and Barla (2006). Margolis et al. (2009)'s meta-analysis concludes on a positive link between corporate environmental policies and profitability, driven by studies such as Derwall et al. (2005) that focuses on eco-efficiency. Nevertheless, recent works jointly taking into account multiple dimensions of CSR (environment, human resources, community involvements, etc.) contradict those findings (Barnett and Salomon, 2006; Brammer et al., 2006). More directly, Cerin (2006) heavily puts into question the theoretical fundamentals of the Porter's hypothesis.

A related determinant of CSR activities lies in raising entry barriers and competitors' costs. Enforced social or environmental corporate policies can raise regulatory barriers for firm

competitors. An insightful path is opened by Chambolle and Giraud-Héraud (2005) who formalize product certification as a non-tariff barrier. By reducing competition intensity on the protected market, CSR entrance barriers can increase firm profitability. An illustration is recounted in Lyon and Maxwell (2008): the Florverde Program would have enabled the European cut flower market suppliers to be chosen based on pesticides use, thus inducing Columbian producers to promote environmentally friendly practices. However, empirical evidence beyond specific case studies is scarce in the literature.

The last element of competition related to CSR is innovation, which has been the focus of several empirical papers. Lanoie et al. (2011) use data on 4200 facilities in seven OECD countries and find strong support for environmental regulation stimulating environmental innovations. Wagner (2008) also finds that environmental management systems are associated with process innovation, while product innovations are more induced by information to consumers and eco-labeling. Based on survey data, Demirel and Kesidou (2011) show that eco-innovation is driven by the need for increased efficiency; whereas environmental regulation stimulates end-of-pipeline technologies and environmental research and development. Market innovation can also take social forms, as in the Bottom-of-the-Pyramid strategies. For instance, Murphy et al. (2012) highlight how firms can invest in social issues to prepare new market opportunities in emerging countries.

1.3.3. Information Asymmetry, Reputation and Greenwashing

Whereas ethical consumption and agent heterogeneity can ground product differentiation and strategic market competition, the credence good property of CSR makes it very dependent on information asymmetry and increases the risk of free-riding. However, free riding on CSR can turn out to be highly damageable for firm reputation.

As an increasing number of firms nowadays make a lot of effort to appear as socially responsible, many of them are criticized for being “greenwashers”. Greenwashing is a term generally used when significantly more money or time has been spent advertising being green (that is, operating with consideration for the environment), rather than spending resources on environmentally sound practices. Greenwashing in a sense echoes Bénabou and Tirole (2006)’s theory of pro-social behavior that combines heterogeneity in individual altruism and greed with concerns for social reputation. Those authors show how doubt is thus created about

the true motive for which good deeds are performed, which can lead to a reduction of social welfare (the reputation-stealing effect). A theoretical model of greenwash has been proposed by Lyon and Maxwell (2011), who characterize it as the selective disclosure of positive information about a company's environmental or social performance, while withholding negative information on these dimensions.

As put by Walley and Whitehead (1994), "it is not easy being green". Indeed, if the consumer's willingness to pay for CSR is insufficient, ethical standard adhesion costs represent a competitive disadvantage. An illustration is provided by Bagnoli and Watts (2003) who show that if conventional products are highly competitive with low prices, fewer consumers wish to buy "green". Moreover, CSR being in essence a transparent activity, even if the early mover advantage does enhance profits, it soon erodes as competitive strategies copy it (Hoppe and Lehmann-Grube, 2001; McWilliams and Siegel, 2001). Beyond anecdotes, greenwashing has already been pinned down in a few empirical papers. In particular, Kim and Lyon (2008) compare voluntary disclosures of reductions of greenhouse gas emissions in the electric utility sector against actual emissions and demonstrate that, in the aggregate, the program had no effect on carbon intensity.

Yet protecting firm reputation is an important motive for CSR activities beyond greenwashing. Consumers' memory can indeed be long-lasting. Kotler and Lee (2005) hence develop a framework that explains why charitable activities are good for business from a marketing perspective. Portney (2008) highlights that the firms' belief that beyond compliance behavior will help curry favor with current and potential future customers is particularly true for firms in the food and consumer product businesses. Linking advertising, competition and CSR, Fisman et al. (2006) present a signaling model in which CSR may serve as a means of vertical differentiation in a market where quality is difficult to observe. Analyzing natural experiments on eBay where sellers offer identical products with and without charity donations, Elfenbein et al. (2009) observe behaviors in line with Fisman et al. (2006)' predictions. Based on a sample of over 150,000 auctions, they observe that in the presence of little information about the reliability of a seller, charity commitments play a significant role in establishing trust. Also supporting Fisman et al. (2006)'s theoretical predictions, Brown et al. (2006) find that firms that advertise more intensively also give more to charity, while Hines and Ames (2000) report that 68% of interviewed consumers claimed to have bought a product or service because of a firm CSR reputation. CSR thus appears as a lever to build up firm reputation, considered as a strategic intangible asset.

1.4. CSR AS DELEGATED RESPONSIBILITY IN IMPERFECT CONTRACTS

The third category of market imperfections grounding CSR strategies is anchored in contract incompleteness. Corporations indeed consist in a nexus for a set of contractual relationships between individuals (Jensen and Meckling, 1976). Yet when two parties enter into a relationship in which assets will be used to generate income, it might be too costly to detail all specific rights of control (Grossman and Hart, 1986), yielding distortions and inefficiencies. To reduce these inefficiencies, organizations (such as firms) create institutions to allocate ownership over physical assets (Hart and Moore, 1990), authority (Aghion and Tirole, 1997) or power (Rajan and Zingales, 1998). Firm contract incompleteness particularly affects relationships between shareholders, employees and managers, which might require the extension of corporate responsibility towards environmental, social and governance issues. This section hence surveys the literature on CSR considered as the delegated responsibility of successively firm shareholders, then firm employees and lastly firm managers. Table 1.3 summarizes the key literature on CSR driven by imperfect contracts and highlights how each motive relates to a different source of market failure and yields a different CSR policy.

1.4.1. CSR AND RESPONSIBLE INVESTORS

Shareholders hold a major stand with full legitimacy to ask, in addition to fiduciary duties, the firm they own to engage in CSR. In a review of shareholder activism to promote CSR, Sjöström (2008) underlines that five key themes emerge in the literature: (i) shareholder proposals in the United States; (ii) the effects of shareholder activism on corporate policy and practice; shareholders activism by respectively: (iii) NGOs; (iv) unions and (v) pension funds. In a recent empirical work, Dam and Scholtens (2012) demonstrate that ownership types matter for CSR policies in Europe. We here focus on the literature about shareholder delegated responsibility undertaken by socially responsible investors. We first present literature describing those investors and then their impacts on CSR.

In both Europe and the United States, about 1 dollar out of 9 is estimated to incorporate environmental, social and governance considerations in the investment decision process (Eurosif, 2010; Social Investment Forum, 2010). The socially responsible investment markets is often described as having a « striking » growth, but recent work suggests it to rather be a

niche market "less growing than buzzing" (Capelle-Blancard and Monjon, 2010). A survey of the sustainability and ethical indices usually used by investors is provided by Hoti et al. (2007), along their risk evaluation. The impact of socially responsible investors on firms' business strategies can be a very powerful determinant of CSR policies (Lee, 2008). Chatterji et al. (2009) distinguish four motivations of social investors: financial (believing that CSR increases firm performance), deontological (not willing to profit from unethical or heinous actions), consequentialist (rewarding good behavior and providing incentive) and expressive (expressing personal identity to yourself or others). Delegated responsibility covers essentially those last three points. Investors are also highly aware of regulatory context and opportunities, as illustrated in Takeda and Tomozawa (2008)' investigation of stock price reactions to the release of environmental management ranking (issued by a Nikkei newspaper) in Japan from 1998 to 2005. Their results indicate that market reactions were changed between 2001 and 2002, when the Japanese government showed its strong commitment to environmental policies.

From a theoretical perspective, the impact of responsible investors on CSR strategies relates to the abundant literature on the links between financial performance and CSR that will be detailed in section 1.5. This literature focuses on the trade-off between different types of performance. One possibility is that environmental or social performance improves to the detriment of classical financial performance. Another possibility is that both types of performance are correlated, in the short run, or at least in the long run. One way to answer these issues is to analyze the impact of responsible practices on the cost of capital. Heinkel et al. (2001) demonstrate that 20% of social activists are needed in the market for it to impact firm's capital cost, which is empirically verified by Hong and Kacperczyk (2009). Also in line with these findings, Gollier and Pouget (2012) theoretically show that socially responsible investors can affect corporate strategy via voting (or via engagement) and analyze how activist investors can design profitable and socially effective strategies.

Other types of studies provide insightful information on the link between socially responsible investments and performance. Modeling socially responsible investments as a composite commodity which combines a financial investment product with a charitable giving vehicle, Graff Zivin and Small (2005) show that rents are not necessarily lower in case of natural monopolies, niche markets, imperfect information, regulatory distortions, anti-takeover laws and other market imperfections. Empirically, Van de Velde et al. (2005) display no performance difference between socially responsible and conventional funds when they

control for style differences within the portfolio. Barnett and Salomon (2006) combine modern portfolio and stakeholder theories, and hypothesize that the financial loss born by a socially responsible fund due to poor diversification is offset as social screening intensifies because better-managed and more stable firms are selected into its portfolio. Focusing on French mutual funds, Capelle-Blancard and Monjon (2012) support this finding. Galema et al. (2008) explain why so studies find a significant relationship between socialIy responsible investments and performance by showing that they impacts stock returns by lowering the book-to-market ratio and not by generating positive alphas in a linear regression model. In view of those studies, socially responsible investments thus appear as an increasing and effective lever which can penalize firms with insufficient CSR, at least without harming investors' profitability, likely improving it on the long run.

1.4.2. CSR AS DELEGATED RESPONSIBILITY OF EMPLOYEES

The second category of firm stakeholders whose responsibility can be delegated through CSR is the labor force. We first present the literature on the interactions of global CSR and employees, before focusing on proactive human resources policies.

As a starting point, CSR can appear as a signal for corporate culture and thus contribute to shaping worker identity and incentives (Akerlof and Kranton, 2005). Brekke and Nyborg (2008) demonstrate in their model that "green" firms can recruit motivated employees with team work values and hereby secure firm survival and long-term performance. Based on propositions from social identity theory and signaling theory, Turban and Greening (1997) also propose that CSR can attract good employees, which is empirically supported by Backhaus et al. (2002). Albinger and Freeman (2000) nonetheless precise that CSR attractiveness only concerns highly qualified employees. High level of CSR can also reduce costly employee turnover (Portney 2008). Motivated employees might also be likely to accept lower wages than the fair market value because they are compensated through the knowledge that their work satisfies their personal values, as illustrated by Frank (1996) in an experiment on Cornell University graduates. Lanfranchi and Pekovic (2011) also observe that employees working for "green" firms are significantly more likely to report a higher feeling of usefulness in their job and to describe themselves as fairly valued than other workers in France in 2006. Whereas those employees do not claim to be more actively involved in their job, they are

nevertheless significantly more likely, ceteris paribus, to work uncompensated for supplementary work hours.

Proactive human resources policy in itself appears to increase firm performance through productivity. This positive link is found by Jones and Murrell (2001) on the stock returns of the 51 firms included in the 'Working Mother List'; by Galbreath (2006) on employee treatment in Australia; or by Edmans (2011) on the stock returns of the '100 Best Companies to Work For in America'. Analyses tackling joint CSR dimensions also find a positive link between the human resources dimension and financial performance (Barnett and Salomon, 2006; Brammer et al., 2006).

In sum, while socially responsible investment appears as an effective lever to penalize firms for insufficient CSR, proactive CSR can enhance employee productivity through various paths. Both are linked to what investors and potential future employees believe the firm true CSR level is. People beliefs and firm reputation are also deeply related to the level of pressure society exerts on companies.

1.4.3. CSR as the Delegated Responsibility of Firm Managers

Finally, CSR can be the delegated responsibility of those who manage the firm: CEOs and the boards of directors, the latter linking the former to shareholders. The whole purpose of governance is to organize the relationships and responsibilities between those three layers. A specific case is CEOs-owners, which we first detail, before surveying the literature on CSR and respectively firm managers and boards.

Regarding the role of CEOs in CSR strategies, founding and owning CEOs have all power to choose their firm's CSR level in line with their business model and personal objectives. Examples of such owners involve Yvon Chouinard, founder of the outdoor company Patagonia, or Frank Riboud, CEO of the food and water company Danone. Nevertheless, putting aside the large population of small and medium size enterprises, firms are seldom both owned and managed by the same people. Baron (2007) discusses a model of social entrepreneurship in which social entrepreneurs prefer to create CSR firms. For them and their shareholders, corporate giving is then a good substitute for personal giving. Managers might also be asked by pro-social shareholders to allocate efforts between financial and extra-financial targets, raising issues of relevant incentive structures. Interesting insights are

brought to this expanding case by the multi-tasking literature (Holmstrom and Milgrom 1991). For instance, Cavaco and Crifo (2010) provide a theoretical framework in which shareholders delegate CSR to managers, CSR decisions being formalized as a multi-task agency problem with moral hazard.

When CEOs are neither owners nor backed up by philanthropic shareholders, according to Friedman (1970), their responsibility is then to ensure profitability. If CEOs embark firms on CSR, they might misappropriate shareholder funds for opportunistic reasons. Anchored in the agency theory, such a CSR could thus be a perquisite for managers who like the accolades of the advocates of broadened social performance (Baron et al., 2008). Bringing the argument a step forward, Cespa and Cestone (2007) build an entrenchment theory portraying CSR strategies as a way for inefficient managers to ensure stakeholders' support to reinforce their own position at the expense of the shareholders. The authors provide several illustrations of how incumbent CEOs relied on activists and media support to buttress their positions, for instance in takeover battles in the European telecom, banking and energy industries. However, company value and manager rotation increase when shareholders engage in an explicit protection of the stakeholders that does not go through the manager, hence depriving her of activists' support. Such a finding provides a rationale for the emergence of specialized institutions (social auditors and ethic indexes) that help firms commit to stakeholder protection even in the case of managerial replacement.

If the agency theory proves right, a twofold prediction should be empirically verified: first, CSR increases with slack resources and discretion available to management; second, the causality is orientated from firm performance to CSR. If Baron et al. (2008) indeed find that responsive corporate social performance increases with slack resources, few other studies successfully investigated yet the true causality (Margolis et al., 2009). Using a different approach, Reinhardt et al. (2008) suggest that the relationship between CSR and CEO compensation may be close to flat at some levels of firm performance, and that CEOs may trade off compensation against CSR activities.

TABLE 1.3 - Literature on CSR as delegated responsibility in imperfect contracts

Sources of market failures			CSR policy	Literature on this CSR driver		Related CSR impacts on firm performance		Related CSR impacts on society	
Contract incomplete	Costly detailed rights of controls	Heterogeneous preferences		Theory	Empirical tests	Theory	Empirical tests	Theory	Empirical tests
yes	yes	of shareholders	Shareholder activism, responsible investments	Sjöström 2008, Chatterji et al. 2009, Heinkel et al. 2001; Gollier and Pouget 2012.	Takeda and Tomozawa 2008, Hong and Kacperczyk 2009, Dam and Scholtens 2012	Heinkel et al. 2001	Capelle-Blancard and Monjon 2012, Hong and Kacperczyk 2009, Galema et al. 2008	Gollier and Pouget 2012	
yes	yes	of employees	Shaping of employee identity and incentives	Turban and Greening 1997, Brekke and Nyborg 2007	Backhaus et al. 2002, Lanfranchi and Pekovic 2011	Brekke and Nyborg 2005	Jones and Murrel 2001, Galbreath 2006, Edmans 2011		
yes	yes	of managers	Social entrepreneurship	Baron 2007					
yes	yes	of managers	Perquisite for managers and agency costs	*Agency theory* (Baron *et al*. 2008)	Baron et al. 2008, Brown et al. 2006		Baron et al. 2008, Frye et al. 2006		
yes	yes	of managers	Managers' entrenchment and agency costs	*Entrenchment theory* (Cespa and Cestone 2007)	Frye et al. 2006				

However this is not empirically verified by Frye et al. (2006) in their comparison of CEOs' compensations of firms listed in the Domini Social Index with other firms in similar industries. Socially responsible firms nonetheless have a higher CEO turnover when firm performance is bad, which put into question the entrenchment theory. Moreover, stock option grant does not increase CEO risk taking behaviors in socially responsible firms as it does in conventional ones. Reinhardt et al. (2008) conclude that it might be anyway less costly for investors and shareholders to accept a degree of principal-agent slack than to eliminate it completely, because excessively constrained managers may be ineffective.

Firm management does not only hold on its CEO, but also on its board of directors. The board's impact on CSR activities seems to have seldom been tackled both empirically and theoretically. Some empirical studies nonetheless display a link between CSR and governance, which raises questions about the link between governance and performance. Indeed, Brown et al. (2006) show that firms with larger boards of directors are associated with significantly more cash giving and with the establishment of corporate foundations, whereas Jo and Harjoto (2011) highlight that engagement in CSR is positively associated with board independence and institutional ownership. Gompers et al. (2003) support the hypothesis that well-governed companies outperform their poorly governed counterparts by about 8.5%. However, Core et al. (2006) challenge their results. An interesting input on the impact of regulatory environment is brought by Bauer et al. (2003) in their examination of the impact of corporate governance on firm valuation in Europe. They find substantial differences between the U.K. market and the Eurozone markets: the lower the governance standards, the stronger the relationship between governance and firm value.

1.5. CSR AND PERFORMANCE

In previous sections, we identified and surveyed the major determinants of CSR, showing they were anchored in market and government failures. Understanding those drivers is core to analyze why and how firms would engage in CSR and how this engagement is likely to impact their activities. We now precisely focus on this impact by surveying the large literature investigating the link between CSR and firm performance, before discussing research on the actual impact of CSR on society.

1.5.1. CSR and Corporate Financial Performance

The link between CSR and firm performance has triggered considerable academic work, as witnessed by the numerous surveys dedicated to this literature (e.g. Griffin and Mahon, 1997; Margolis and Walsh, 2003; Orlitzky et al., 2003; Portney, 2008; Scholtens, 2008; Van Beurden and Gossling, 2008). The active debate on whether this link actually exists can be considered as closed by the extensive meta-analysis conducted by Margolis et al. (2009) on 251 studies: ”*The effect of corporate social performance on corporate financial performance is small, positive and significant. Corporate social performance does not destroy shareholder value, even if its effect on the value is not large*”. However, many scholars still consider that much research is still needed to fully understand the drivers of this relationship, or, put differently, how firms succeed on both financial and social levels (Horváthová, 2010; Surroca et al., 2010). In the same line, Blanco et al. (2009) provide an in-depth review of empirical studies that analyze the relationship between voluntary environmental management of manufacturing firms and their economic results over thirty years. They conclude on a prominent absence of penalty for being green, which is affected by the typology of the firm, the methods utilized for implementing environmental initiatives, the intensity of the abatement efforts and stockholders’ valuation of green firms.

Our economic analysis of the CSR literature allowed the identification of its distinct drivers anchored in various market failures, yielding different CSR policies. Little work (particularly empirical) on CSR impacts actually clearly relates to CSR driver and avoids overlooking the theoretical mechanisms behind the relationship. Tables 1.1, 1.2 and 1.3 present by CSR driver key theoretical and empirical papers that shed led on these mechanisms.

Empirical research on the topic should also avoid the numerous biases and problems of previous work that have been pointed out in the literature among which: omitted variables in the determinants of profitability (McWilliams and Siegel, 2000); model misspecification and endogeneity (Garcia-Castro et al., 2010); limited data (small samples, old periods; Horváthová, 2010); cross-sectional analysis invalid in the presence of significant firm heterogeneity (Elsayed and Paton, 2005); linearity assumptions (Barnett and Salomon, 2006 ; Capelle-Blancard and Monjon, 2012); and wide diversity of measures used to assess financial performance (Margolis and Walsh, 2003). Another problem also lies in the direction and mechanisms of causation. Whether CSR would lead (or not) to superior firm performance, or whether financial performance would rather be a necessary condition for CSR is a major stake

to investigate (see Margolis et al., 2009). For instance, Wagner (2010) uses panel data to disentangle the effects of CSR, advertising and R&D over time. Problems of measurement of CSR have also been pointed out and are core to understand the potentiality of CSR as a sustainable development tool. Iwata and Okada (2011) consider the effect of two different environmental issues (waste and greenhouse gas emissions) on financial performance using panel data on Japanese manufacturing firms from 2004 to 2008 and show that the responses of financial performance are different depending on each environmental issues.

The complex nature of CSR leads to another promising empirical research path. Recent work suggests that it should be a specific combination of firm policies that would likely lead to superior corporate performance. During the 1990s, this complementarity between different managerial practices has proven a useful explanation of the Solow paradox, whereby "*you can see the computer age everywhere but in the productivity statistics*" (Solow, 1987). Indeed, several researchers have shown that only those firms that have adopted both computerization and complementary innovative human resources management practices (teamwork, multi-tasking, quality circles, etc.) did enjoy superior performance (e.g. Ichniowski and Shaw, 2003). By analogy, the apparently ambiguous relationship between CSR and firm performance could presumably be explained by taking into account the complementarity between the multi-dimensional facets of CSR, which relate to the different mechanisms we reviewed. Taking into account CSR as a multi-dimensional strategy is all the more important since, as pointed out by Bénabou and Tirole (2010), firms can do well on some dimensions and poorly on others. Such a research would renew the debate on the link between CSR and performance.

1.5.2. CSR and Extra Financial Performance

If CSR amounts to privately provided public goods, it is important to be able to evaluate its impact not only on economic and financial performance, but also on social performance. Lee (2008) and Abeysuriya et al. (2007) already called for more attention to the social side of the equation. The key question of whether firms can be efficient actors of sustainable development definitely needs to be tackled, all the more as it has drawn little attention in the CSR field. We first present the theoretical literature on CSR impact on welfare depending on its origin (public politics; private politics; product differentiation), before analyzing some

empirical findings. Tables 1, 2 and 3 present by CSR driver key papers on these issues. We conclude by proposing research paths to extend the required toolbox for more comprehensive analysis.

Theoretical results on the impact of CSR on social welfare are mixed (Lyon and Maxwell, 2008), as CSR is not necessarily beneficial, depending very much on the context in which it occurs. For Besley and Ghatak (2007) who examine the optimal level of CSR provision, CSR can create a Pareto improvement in equilibrium. Whereas CSR can be a less costly substitute for government mandates and hence increase welfare, it can also distort regulatory decisions in a way that lowers it. Maxwell and Decker (2006) found in their enforcement theory that, despite the fact that all agents in the model act voluntarily, their actions may lead to a suboptimal level of environmental investment. Fleckinger and Glachant (2011) demonstrate in their model that the impact of self-regulation on social welfare depends on the set of policy instruments available to the regulator (mandatory regulation or voluntary agreements). For Lyon and Maxwell (2008), overall, the impact of preemptive CSR depends upon whether it is undertaken unilaterally or through a voluntary agreement with the regulator, and whether the regulator is welfare-maximizing or influenced by particular interest groups.

In terms of private politics, is social pressure from NGOS beneficial for the society as negative externalities are reduced? To answer this issue, Heyes and Maxwell (2004) compare the relative merits of two types of self-regulation mechanisms: mandatory through an international organization setting a constraining (environmental or social) standard, and voluntary through an NGO operating labeling schemes. Their model shows that the level of industry resistance to the standard is greater when an NGO exists than when it does not (voluntary labels being more attractive when defeating the international organization proposal). In turn, though the anticipation of industry resistance leads the international organization to decrease the stringency of its standard, the NGO may serve a ‘back-stop’ function and encourage more stringent international standard. Moreover, the authors show that when both the voluntary and mandatory schemes coexist, the existence of NGOs increases welfare. However, by inducing firms to lobby against government standards, it is also possible that the existence of NGO labeling schemes can undermine government regulatory programs that would be of even greater value (Lyon and Maxwell, 2008).

CSR used as a pure market tool lacks studies on its actual impact on society. Intuitively, CSR certification might increase the sales of environmentally (e.g. recycled) or socially (e.g. fair trade) friendly products, thus increasing the utility of consumers who switch from

conventional to green products. If green products substitute to conventional ones, as on a mature market with stable sales, social welfare might increase. However, if the market is expanding, the increasing overall sales might generate social damage. One can think for instance of the debate generate by green products whose global life-cycle analysis turn out to be more polluting than conventional products. Moreover, Faucheux and Nicolai (1998) argue that the state intervention is needed to avoid firm competition driven technological lock-ins. Applying the Coase theorem and thus bringing transactions costs and property rights to fore, Cerin (2006) also highlights that strong public support is necessary to create private incentives for exploring significant economic and environmental win-win innovations.

Empirical tests of those theoretical predictions are still scare in the CSR literature, at least from the economics and management science perspective. An interesting example is the evaluation done by Brouhle et al. (2009) of two environmental policy levers (a voluntary program and the threat of formal regulation) on emissions in the metal-finishing industry. They find that participation in the voluntary program yielded little, if any, additional reductions in emissions. However, while participants do not appear to take advantage of the program initially, they make greater strides in reducing emissions than non-participants in later years. Another input is brought by Dam and Scholtens (2008) who demonstrate that firms with high level of CSR are less likely to relocalize their production in countries with weak environmental regulation (the pollution heaven hypothesis). However, little studies tackle the impacts of CSR on multiple aspects simultaneously, as conducted for instance in product life-cycle analysis.

From this perspective, the toolbox to evaluate CSR impact on society could likely benefit from the experience gathered in other fields. For instance, lessons from public policy analysis and development economics might be drawn and transferred to analyze the respective impact of various CSR policies on public welfare. Methodologies such as impact evaluation methods relying on experimental and quasi- experimental designs could also be insightful.

1.6. CONCLUSION

This chapter proposed a comprehensive framework to analyze the economic determinants of CSR, giving coherency to a broad and expanding literature. We surveyed how CSR is driven by market imperfections, namely the existence of corporate externalities and public goods, imperfect competition and contract incompleteness. Understanding the economics of CSR is core to take a step out of the long lasting debate of whether engaging in CSR generates profits for corporations and to provide directions to understand how firms can succeed on both financial and social levels. Our review highlighted two crucial gaps in the literature, which open further research paths.

First, a disconnection appears between the analysis of drivers of CSR and of its actual impacts, the latter most often lacking anchorage in the former. We highlighted several market and government failures driving distinct CSR policies, but the respective consequences of these policies are seldom disentangled. At a micro scale, long-term empirical studies at the industry level might yield relevant data to succeed to do so. At a more macro level, a new research avenue is also triggered by the trade issues raised by the worldwide expansion of CSR, particularly under the impulse of multinationals. Indeed, while CSR can answer some market failures (such as negative externalities), economists might wonder whether it might not be used to create other distortions, such as entry barriers in developed countries. If so, what are the global consequences of CSR on welfare? Analyzing the extent to which governments are responsible for and should or not regulate private provision of public good is a challenge for academics.

The second gap identified lies in the imbalanced evaluation of the financial and social impacts of CSR. Further analyses of the social consequences of CSR are needed, as they have been most often set aside. A lack of relevant data likely grounds this literature orientation. New methodologies drawn from development economics and field experimental economics might contribute usefully to such research. In its 2009 report, the Global Environment Outlook of the United Nations Environmental Program stated that efforts to slow the rate or extent of change to enhanced resource efficiency and mitigation measures have resulted in moderate successes but have not succeeded in abating the scope and speed of adverse environmental changes. It also highlights that ”*the lack of reliable and consistent time-series data on the state of the environment is a major barrier to increasing the effectiveness of policies and programs. (...) All countries should undertake to monitor and assess their own environment*

and integrate social, economic and environmental information to inform decision-making processes". No less can be said about CSR and corporations, as it has become core to evaluate whether CSR achieves its promises to society.

CHAPTER 2

DOING WELL AND DOING GOOD: A MULTI-DIMENSIONAL PUZZLE

How can firms succeed on both financial and extra-financial levels?

Abstract

How to generate profits while providing public good is still academically debated. This chapter argues that CSR encompasses many diverse policies with variant effects on profitability. As theoretical guidance lacks to predict which most matters economically, this multidimensional puzzle is shown to encounter model uncertainty which is solved by applying a model averaging methodology to a unique database matching the economic and social performances of large European firms. Results support that CSR policies do not equally matter to do well and do good, good business behaviors with customers and suppliers being core. Strong support is also brought to the co-existence of policies monotonically related to profitability (human resources) and policies with an optimal level (environmental policies).

Résumé

La possible conciliation de la rentabilité et de la provision de bien public fait l'objet d'un important débat académique. Ce chapitre soutient que la RSE englobe des politiques diversifiées, dont les effets sur la rentabilité sont variables. En l'absence de cadre théorique prédisant quelle politique prédomine économiquement, ce puzzle multidimensionnel rencontre un problème d'incertitude de modèle. Le chapitre le résout par une méthode de model averaging, qui est appliquée à une base de données unique sur la performance économique et sociale de grandes entreprises européennes. Les résultats montrent que les politiques de RSE n'équivalent pas économiquement, les bonnes pratiques commerciales avec les clients et fournisseurs étant cruciales. La coexistence de politiques liées de façon monotone à la rentabilité (ressources humaines) avec des politiques présentant un niveau optimal (environnement) est mise en évidence.

Chapter 2 is based on a working-paper (same title, HAL-00672037) submitted to a peer-reviewed journal. I am grateful to Vigeo for granting me access to their data on extra-financial rating.

2.1. INTRODUCTION

According to the European Commission (2011a), a 'socially responsible' firm takes responsibility for its impact on society beyond legal constraints. More precisely, the promoted socially responsible firm should integrate social, environmental, ethical, human rights and consumer concerns into its business operations and core strategy with a double aim: maximizing the creation of shared value for its shareholders, stakeholders and society; and identifying, preventing and mitigating its possible adverse impact. Corporate Social Responsibility (labeled CSR hereafter) hence amounts to firms privately providing public good and reducing their negative externalities. Decades of active academic debate cover the ground between such a definition and Friedman's famous New York Times Magazine article title, back in 1970: *'The social responsibility of business is to increase its profits'* (Friedman, 1970). Most research developed the argument along which a firm providing public good might neither be sacrificing profits nor, as put by Friedman, doing '*hypocritical window-dressing'*, but rather creating value on the long run.

Indeed, a large corpus of empirical literature tested over the last three decades the link between firm financial performance and social performance (see for literature surveys Orlitzky et al., 2003; Margolis and Walsh, 2003; Portney, 2008). In the most extensive survey and meta-analysis up-to-date, Margolis et al. (2009) conclude that corporate social performance has a small, positive and significant effect on corporate financial performance and that it does not destroy shareholder value. However, the mechanisms behind this relationship are complex and not well understood. Thus many scholars along these authors, such as Horváthová (2010) and Surroca et al. (2010), underline the need to investigate further how organizations can succeed in both economically "doing well" *and* socially "doing good".

Imagine a firm manager whose task precisely is to succeed in "doing well and doing good", or, put in the European Commission words, to create shared value for her shareholders, stakeholders and society. Hereby her job consists in the selection and implementation of corporate policies both generating profits (at least achieving financial equilibrium) and providing public good (or reducing a social ill). Such policies might encompass highly diverse actions, for instance: investment in pollution abatement processes; publication of a sustainable development report; nondiscrimination in the workplace; or long-term partnerships with local

suppliers. Of course, each policy will differently impact both firm and society. CSR is thus in essence a multidimensional construct (Carroll, 1979; Wood, 1991).

The few empirical analyses tackling the multidimensional nature of CSR simultaneously estimate the effects of different clusters of policies on firm performance and find that they diverge. Hillman and Keim (2001) distinguish direct stakeholders management, positively related to financial performance, from social issues, negatively linked. Brammer et al. (2006) observe that environment and local community involvement appear negatively correlated with financial performance, whereas human resources are weakly positively linked. Using panel data and a supermodularity approach, Cavaco and Crifo (2010) observe the existence of a complementarity premium on specific CSR dimensions (human resources and business behaviors towards customers and suppliers), while other practices are relative substitutes (environment and business behaviors). Hereby, to understand how firms can profit from socially responsible policies, it appears core to consider their specific effects.

This chapter argues that it is also essential to understand the *relative importance* of the multiple dimensions encompassed in the CSR concept for firm economic performance. Indeed, previous literature shed light on the diverging effects the multiple CSR dimensions might have on CSR. Yet among these effects, which is likely to dominate? In other words, among the wide range of socially responsible policies, which most matter economically – and which do not? This question is crucial for shareholders, but also for firm stakeholders and society as it is likely to impact the type of public good provided by the firm.

Yet such a multidimensional puzzle is not trivial to solve as theoretical guidance lacks to predict how various CSR dimensions are linked to financial performance when taken simultaneously. Indeed, most theoretical work either analyzes CSR as a whole (e.g. Cespa and Cestone, 2007; Baron, 2009) or focuses on one specific dimension (e.g. environment in Sinclair Desgagné and Gozlan, 2003). Reflecting theoretical knowledge, most empirical studies use either data on a single CSR dimension (such as eco-efficiency in Derwall et al., 2005) or aggregate CSR performance measures (based of the widely-use KLD data for instance), either in a linear way (as in Hillman and Keim, 2001), or using weights (for a review and a discussion of efficient composite CSR performance indicators, see Chen and Delmas, 2010).

Theoretical predictions might even compete. For instance, product differentiation based on environmental attributes might create a market opportunity (Porter and Van der Linde, 1995) while generating agency costs (perquisite) for managers who like the accolades of environmentalists (Baron et al., 2011). Potential theories are not mutually exclusive, a phenomenon referred to as "open-endedness" of theories by Brock and Durlauf (2001). Specification of the link between CSR and financial performance is also debated: while most literature investigated a monotonic relationship between social and financial performances, Barnett and Salomon (2006) and Capelle-Blancard and Monjon (2012) made instead a strong case of a hump-shape relationship.

The "doing well and doing good" research hence typically encounters two dimensions of model uncertainty, namely theory and specification uncertainty (Doppelhofer and Weeks, 2009), which have not been dealt with so far in the literature. The link between financial performance and multiple CSR dimensions encounters model uncertainty because theories are not explicit enough on which CSR dimension belongs to the "true" regression (and under which specification). The influential work of Sala-i-Martin et al. (2004) discusses a similar issue in growth economics, a field in which researchers are faced with a multiplicity of possible regressors. As stated by the authors, in many applications "*we do not have the luxury of having a large enough sample size to allow us to draw conclusions on the importance of potential regressors.(…) Some empirical economists have therefore resorted to simply "trying" combinations of variables which could be potentially important determinants of growth and report the results of their preferred specification. Such "data-mining" could lead to spurious inference".* Indeed, ignoring model uncertainty generally results in biased parameter estimates, overconfident standard errors and misleading inference (Doppelhofer, 2008).

This chapter sets out to tackle model uncertainty in the "doing well" and "doing good" debate and to acknowledge the multidimensional nature of CSR. To do so, it introduces in the literature a formal statistical framework that explicitly accounts for model uncertainty, namely model averaging. Model averaging was designed to specifically address model uncertainty by simultaneously weighing evidence for multiple models depicting alternative working hypotheses (Doppelhofer, 2008). It allows researchers to examine all possible models, to weigh each model according to quality, and to provide a probability distribution for each coefficient estimate (Eicher et al., 2012).

This powerful technique has already proven insightful in several research fields hampered by model uncertainty, such as growth economics (Sala-i-Martin et al., 2004), macroeconomic forecasts (Wright, 2008), policy evaluation (Brock and Durlauf, 2007) and finance (Pesaran et al., 2009). Other fields of applications include trade flows (Eicher et al., 2012), labor economics (Tobias and Li, 2004) and health economics (Jackson et al., 2009).

Various methodologies have been proposed to succeed in implementing model averaging. This paper develops an approach built on information-theoretic model averaging and thick modelling (as proposed by Kapetanios et al., 2008, and Pesaran et al., 2009). In particular, corrected Akaike Information Criteria model averaging (AICc MA) and Schwarz Bayesian Information Criteria model averaging (SIC MA) are discussed. Beyond their original application to the CSR literature, these methods have the potentiality to be relevant to many empirical economists for their relevancy and their straightforward implementation. They are here applied to a database that matches the economic performance of 461 large European firms over the 1998-2007 period with CSR measures provided by the non-financial rating agency Vigeo. This original data enables the study of a fairly complete range of socially responsible corporate policies, namely: environmental policy, good business behaviors with customers and suppliers, implication in local communities, human resources management and governance. However, data availability limits the analysis to the question of the relationship between CSR dimensions and financial performance, causality being beyond its scope.

The introduction of model averaging in the “doing well” and “doing good” debate brings novel and robust results. First, it unveils the composition of profitably-linked CSR. This composition appears heterogeneous, with different CSR dimensions having different importance. In particular, good business behaviors with customers and suppliers are shown to remain crucial. Results also provide strong evidence of the coexistence of corporate policies monotonically linked to economic performance (human resources management) and policies with optimal levels (environment), hence reconciling competing theories. Consequences for corporations and policy makers are discussed.

The remainder of the chapter is organized as follows. Section 2.2 details the methodology. Section 2.3 presents data. Section 2.4 displays results and discusses main findings. Section 2.5 concludes.

2.2. METHODOLOGY

This section first presents the basic empirical framework to study the link between CSR and financial performance, before introducing model averaging and thick modelling. Finally, it discusses their inputs and limits.

2.2.1. BASIC EMPIRICAL FRAMEWORK

Following previous literature (Orlitzky et al., 2003; Margolis et al, 2009), the basic model to estimate the link between firm performance and CSR is as follows:

$$Base\ Model: FP_{it} = \alpha + \beta_1 CSR_{it} + \beta_2 RISK_{it} + \beta_3 LEVERAGE_{it} + \beta_4 SIZE_{it} + \beta_5 R\&D_{it} + \gamma_j\ INDUSTRY_j + \delta_k\ COUNTRY_k + \theta_t\ YEAR_t + \varepsilon_{it} \quad (1)$$

with *i* the number of firms and *t* the year of observation.

FP_{it} is the firm financial performance, measured in this paper either by returns on assets (ROA) or returns on capital employed (ROCE). CSR_{it} is a global CSR measure (here the global Vigeo rating).

$RISK_{it}$ is a solvability ratio control that captures the fact that the more stable a firm, the likelier it is to engage in CSR. $SIZE_{it}$ controls for firm size and is measured as the logarithm of net sales. Larger firms are indeed more likely to encounter major environmental hazards (Konar and Cohen, 1997), to have larger resources devoted to social investments and to be more exposed to social pressure. $R\&D_{it}$ controls for research and development intensity. Based on a large corpus of theoretical literature linking research and development to long term economic performance, Waddock and Graves (1997) and later on McWilliams and Siegel (2000) highlight its importance as a control variable. Risk, firm size and R&D intensity are expected to have positive estimates. $LEVERAGE_{it}$ controls for the firm financial leverage (debt-to-equity ratio) and provides a good indicator of management risk tolerance, which can impact decision making and arbitrage between short and long term performances (Waddock and Graves, 1997). As such it is expected to negatively impact ROCE and ROA.

Industry dummies (*j*) are introduced because industrial processes, scale savings, associated pollution levels, stakeholders' activism, exposure and financial risks are sector specific (Margolis et al., 2009). Country (*k*) is also controlled for as regulations, social demand and

stakeholders' pressure vary between European countries. Year dummies account for the evolution over the studied period of CSR regulation, public awareness and firm involvement. Finally $\boldsymbol{\varepsilon_{it}}$ is the time variant error term of firm *i* at year *t.*

In this model, data is considered cross-sectional whereas firms count in average three observations over the studied period of time. Yet a panel approach taking temporality into account is prevented by data availability, as discussed in section 2.3. Both White's test and Breusch-Pagan's test show some heteroscedasticity in the data. Hence Rogers (1993)'s estimators based on clusters (firms) are used instead of standard OLS to account for dependent and non-identically distributed error terms. Results are presented in Tables 2.3 and 2.4.

CSR is now disaggregated into five dimensions: ENV_{it} (environmental performance), CS_{it} (good business relationships with customers and suppliers), GOV_{it} *(*corporate governance), HR_{it} (human resources policy) and ILC_{it} (involvement in local communities). These variables will be discussed in section 2.3. Overlooking the model uncertainty issue, we could make the random assumption that all CSR dimensions matter to explain financial performance (i.e. belong to the true model explaining financial performance) and test the following model:

$$Base\ Model\ 2: FP_{it} = \alpha + \beta_1 ENV_{it} + \beta_2 CS_{it} + \beta_3 GOV_{it} + \beta_4 HR_{it} + \beta_5 ILC_{it} + \beta_6 RISK_{it} + \beta_7 LEVERAGE_{it} + \beta_8 SIZE_{it} + \beta_9 R\&D_{it} + \gamma_j\, INDUSTRY_j + \delta_k\, COUNTRY_k + \theta_t\, YEAR_t + \varepsilon_{it} \quad (2)$$

Results for ROA and ROCE are presented in Table 2.5. Estimates obtained with this method will be compared to those obtained with model averaging, now presented.

2.2.2. Model Averaging and Thick Modelling

This section presents the chosen theoretical framework of model averaging and thick modelling. It limits itself to discussing the properties relevant to this paper. For a comprehensive discussion, the reader is referred to Pesaran et al. (2009) and Kapetanios et al. (2008).

Let us start with a set of models. This set is denoted $M = \bigcup_{i=1}^{m} M_i$ where M_i is the *i*-th of the *m* models considered. In this paper, the space of models M consists of all the possible subsets

of candidate regressors potentially explaining financial performance, including all five CSR dimensions considered. Our interest is a parameter Δ. The Bayesian framework provides a probability distribution for Δ given M and the observed data *D*. The relevant information data set at time t is denoted D_t. The probability distribution $pr(\Delta|D_t, M)$ of the parameter of interest over the space of models considered is given by:

$$pr(\Delta|D_t, M) = \sum_{i=1}^{m} pr(\Delta|M_i, D_t) pr(M_i|D_t) \quad (3)$$

where $pr(\Delta|M_i, D_t)$ is the conditional probability distribution of Δ given a model M_i and the data D_t. It can easily be obtained from standard model specific analysis. $pr(M_i|D_t)$ is the posterior probability of Mi, that is the conditional probability of the model M_i being the true model given the data D_t.

In the Bayesian Model Averaging (BAM) framework, weights used to combine the models under consideration are their respective posterior probabilities $pr(M_i|D_t)$. This approach requires specifications of the prior probability of model M_i and has been the focus of a large corpus of literature.

An alternative to BAM consists in approximating the weights $pr(M_i|D_t)$ by information criteria weights, such as Akaike weights or Schwartz weigths. This approach is developed in Kapetanios et al. (2008) as the information theoretic Model Averaging, building on the influential work of Burnham and Anderson (2002). Applications are expanding and include growth economics (Wagner and Hlouskova, 2009), finance (Hansen, 2008), tourism development (Wan and Zhang, 2009), health economics (Claeskens et al., 2006) and environmental economics (Layton and Lee, 2006).

A first weighting scheme proposed in the literature and implemented in the paper is based on Akaike's information criteria (1973, 1974), known as AIC. AIC is defined as:

$$AIC = 2k - 2\ln(L) \quad (4)$$

AIC has two components: the negative loglikelihood *–ln (L),* which measures the lack of model fit to the observed data, and a bias correction factor, which increases as a function of the number of model parameters *k*. More technically, this criterion is an extension of the log-likelihood theory and is based on the Kullback–Leibler information, which can be conceptualized as a 'distance' between full reality and a model. Difference in AIC between two models can thus be analyzed as an estimate of the difference between the Kullback–

Leibler distance for the two models. For in-depth analysis of AIC's theory, uses and limits, see Konishi and Kitagawa (2007).

AIC has been criticized for its propensity at over-fitting models, meaning that it tends to select too many variables. Hurvich and Tsai (1989, 1995) hence introduced the corrected AIC (AICc), which is AIC with a second order correction for small size samples:

$$AIC_c = AIC + (2(k+1)(k+2))/(n-k-2) \qquad (5)$$

with k the number of model parameters and n the number of observations. As n increases, AICc converges to AIC and is asymptotically efficient in both regression and times series. For linear regression, AICc has better bias properties than does AIC. Burnham and Anderson (2004) thus advocate employing AICc regardless of sample size, which is done in this paper. The reader can refer to McQuarrie and Tsai (1998) for further comparisons of AIC and AICc with several competitor criteria for linear regression problems.

Difference between information criteria φ_i is used to rank models. Following Burnham and Anderson (2002), the likelihood of the model M_i given the data is equivalent to $\exp(-\frac{1}{2}\varphi_i)$. Model likelihoods are normalized to sum up to 1 and referred to as Akaike weights. Akaike weight w_i for model M_i writes:

$$w_i = \exp(-\varphi_i/2)/\sum_{r=1}^{P}\exp\left(-\varphi_r/2\right) \qquad (6)$$

where $\sum_{i=1}^{m} w_i = 1$. w_i can be interpreted as the probability of selecting model i as being the best if analyses were repeated using independent samples from the same population. This paper implements the use of corrected Akaike weights, based on AICc.

Let us now go back to our parameter of interest Δ. Following Burnham and Anderson (2002), the averaged estimate $\hat{\bar{\Delta}}$ of Δ is provided by

$$\hat{\bar{\Delta}} = \sum_{i=1}^{m} w_i\,\hat{\Delta}_i \qquad (7)$$

with Δ_i the parameter of interest in model M_i and $\hat{\Delta}_i$ the estimate of Δ_i in model M_i. Δ unconditional standard error is given by:

$$\widehat{se}\left(\hat{\bar{\Delta}}\right) = \sum_{i=1}^{m} w_i \sqrt{\widehat{var}\left(\hat{\Delta}_i\right) + \left(\hat{\Delta}_i - \hat{\bar{\Delta}}\right)^2} \qquad (8)$$

The second weighting scheme considered in this paper is based on the Schwarz Bayesian Information Criteria (Schwarz, 1978), further on SIC, defined as:

$$SIC = -2\ln(L) + p\log(n) \tag{9}$$

Baltagi (2001) points out that SIC is consistent, meaning that as the sample goes to infinity, the probability that it will choose the correct model from a finite number of models goes to 1. A drawback of this property is that in small samples, SIC tends to select underfitting models. Consequently model selection based on SIC tends not to pick up enough variables in the 'best' models. Hereby SIC based model averaging tends to bias downwards variable weights.

This paper considers both approaches to information-theoretic model averaging: the corrected Akaike weights model averaging (AICc MA) and the SIC weights model averaging (SIC MA).

Other weighting schemes have been discussed in the model averaging literature. Hjort and Claeskens (2003) discussed the Focused Information Criterion. Hansen (2007) proposed Mallows model averaging (MMA). Wagner and Hlouskova (2009) compare AIC MA, SIC MA and MMA. They further introduce, for any given weighting scheme, the so-called inclusion weight as the classical counterpart of the Bayesian posterior inclusion probability of a variable.

A last refinement used in this paper is the combination of information-theoretic model averaging with thick modelling. As detailed in Pesaran et al. (2009), thick modelling consists in applying model averaging not to all of the models but only to a given number of top performing models. Individual models are here ranked according to the AICc or SIC criteria. The space of models M under consideration for model averaging is thus reduced to the top performing M' space of models (say the top 25%). Thick modelling has been proposed, among others, by Granger and Jeon (2004). Applications include Stock and Watson (1999)'s in the context of macroeconomic time series and Aiolfi et al. (2001)'s on forecasts of excess returns.

In this chapter the Base Model (1) is first estimated using OLS. Then AICc MA is applied as a benchmark to the Base Model set of variables with global CSR. As year, industry and country

controls are kept in all models, the model population counts 2^5= 32 possible models based on five variables (global CSR, Risk, Leverage, Size and R&D) and all are considered, including Base Model (1). In a second step, global CSR is disaggregated into five CSR dimensions (Environment, Business behavior towards clients and customers, Community involvement, Human resources and Governance). Base Model (2) is estimated using OLS. The new model population counts 2^{4+5} = 512 models and model averaging combined with thick modelling is done on the top 100 models based on AICc and SIC rankings. Base Model (2) might be or not in these top 100 models, depending on its quality.

2.2.3. Inputs and Limits of the Approach

This paper implements thick modelling, AICc model averaging and SIC model averaging to account for model uncertainty. This section discusses the inputs and limits of the approach (beyond the issue of model uncertainty, which has already been discussed in the introduction).

As highlighted by Doppelhofer (2008), the use of model averaging was limited until recent developments in computing power and statistical methods. Here, model fitting and subsequent model averaging is done thanks to the R / java *glmulti* package (Calcagno and de Mazancourt, 2010), which renders the implementation of those tools highly straightforward.

A second input of the approach deals with the multicollinearity likely to arise when one considers simultaneously many dimensions of CSR. Calcagno and de Mazancourt (2010) found that BIC variable selection successfully distinguishes the effects of variables correlated at 70% (which exceeds the 62% correlation between CSR dimensions observed in data here). The proposed methodology can thus help bypass the multicollinearity issue when present. We should nevertheless note that this issue is limited in the dataset here used (see section 2.3).

Moreover, this paper tests for curvilinear versus monotonic relationships between the different CSR dimensions and financial performance. Indeed, CSR dimensions are here introduced as three-level factors (below average / average / above average). The effect of being above sector average on one CSR dimension is thus separately estimated from the effect of being bellow sector average. This paper hence tests for the existence of optimal levels and identifies different specifications for different CSR dimensions.

Limits of the tools presented are essentially given by data availability. Indeed, model averaging and thick modelling need large datasets for estimations to be reliable. To ensure

sufficient data availability, it was not here possible to use data as panel data. Hence causality between corporate social and financial performance is beyond the scope of this paper. Similarly, data availability constrained control variables used in the regressions. For instance, advertisement intensity could not be controlled for.

The relevancy of model averaging is thus anchored in data availability, completeness and quality and restricted to empirical fields with sufficient observations.

2.3. DATA

Two sources of data are matched in this research. CSR data is provided by the leading European extra-financial rating agency Vigeo and financial data comes from the database Orbis (Bureau Von Dijk). The database obtained is a non-cylindrical panel. Firm is the primary stratification level with 1 to 8 observations per firm (3 observations in average) over the 1998 – 2007 time period. The sample contains 1577 observations on 457 large European listed firms belonging to 17 different countries and 14 industrial sectors. Data is survivorship-bias-free in the sense that Vigeo systematically rates firms of the Dow Jones Stoxx 600 (a quarterly-reviewed index that covers large, mid and small European capitalizations), including firms that exited the index, merged or disappeared over the studied period of time.

The availability of data on research and development expenses limits the sample to 622 observations on 207 firms. Estimations will thus be done on both the restricted sample (with the R&D intensity control) and the full sample (without). Differences between the samples are essentially twofold. First, firms of the restricted sample have communicated their R&D expenses, likely implying an increased transparency. Second, firms of the restricted sample have significantly higher global CSR rating than other firms. Little difference is observed in terms of industry, year or country distributions between full and restricted samples.

Vigeo measures extra-financial performance and provides firm ratings based on disclosed information, dialog with the firm and international or European reference frameworks. In particular, this paper uses data on five CSR dimensions: *Environment* (integration of environmental issues into corporate policy, product manufacturing, distribution, use and disposal); *Governance* (balanced power within the board of directors, respect of shareholders' rights, remuneration of key executives and directors, audit and internal controls); *Customers and Suppliers* (respect of business integrity, including sustainable and transparent

relationships with customers and suppliers); *Community Involvement* (integration of the firm's impacts on local communities and responsible societal behavior) and *Human Resources* (proactive human resources corporate policy, including career development, continuous improvement of labor relations, quality of working condition). Weak multicollinearity between CSR dimension ratings is assessed by variance inflation factors (VIF) ranging from 1.12 to 2.19 (see Table 2.1).

As a starting point, this paper postulates that all five CSR dimensions equally matter. Consequently, a *Global CSR* rating is calculated as their arithmetic mean as usually done on such data in this literature (e.g. Hillman and Keim, 2001). Secondly, CSR dimensions are considered separately. For the purpose of the paper, their ratings are transformed into three-level categorical factors: *Worst* (worst-in-class firms; 30%); Average (40%); and *Best* (best-in-class firms; 30%).

Financial measures are given in 2005 USD. Financial performance is measured by two accounting-based ratios: return on assets (ROA) and return on capital employed (ROCE). ROA is the operating income divided by total assets. As such, it measures firm efficiency in generating income from its assets and thus indicates firm profitability, financial leverage put aside. ROCE is the net operating profit after tax divided by capital employed. It thus provides shareholders with a comparison of earnings with capital invested in the firm.

Descriptive statistics can be found in Table 2.1 and comparisons of ROA and ROCE means and medians by CSR dimension in Table 2.2. For a complete description of variables and data, the reader can refer to the Appendix A.

TABLE 2.1 - Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.	VIF
Global CSR rating	1578	3.04	0.66	1.17	4.83	
Human resources rating	1578	3.03	0.91	1.00	5.00	1.59
Best	516	4.12	0.32	4.00	5.00	
Worst	484	1.91	0.27	1.00	2.00	
Corporate governance rating	1578	2.97	0.92	1.00	5.00	1.14
Best	463	4.13	0.34	4.00	5.00	
Worst	498	1.86	0.35	1.00	2.00	
Customers & suppliers rating	1578	3.05	0.89	1.00	5.00	1.59
Best	534	4.10	0.30	4.00	5.00	
Worst	472	1.93	0.26	1.00	2.00	
Community involvement rating	1578	3.07	0.95	1.00	5.00	1.46
Best	556	4.17	0.37	4.00	5.00	
Worst	498	1.93	0.26	1.00	2.00	
Environment rating	1578	3.06	0.91	1.00	5.00	1.65
Best	517	4.17	0.38	4.00	5.00	
Worst	475	1.92	0.28	1.00	2.00	
ROA	1577	7.86	6.81	-21.29	34.80	
ROCE	1566	14.65	11.44	-77.47	98.41	
Risk (Solvency ratio)	1578	35.54	15.86	-12.66	82.72	
Financial Leverage (Debt to equity ratio)	1578	0.79	0.99	-2.85	7.48	
R & D intensity	622	5.04	6.51	0.00	71.55	
Size (Ln(sales))	1578	15.76	1.43	6.77	19.55	

Table 2.1 presents the number of observations, mean, standard deviation, minimum and maximum of the variables used. The Variance Inflation Factor (VIF) measures multicollinearity between the ratings of the five dimensions of CSR taken into account. “Best” (respectively “Worst”) indicates the ratings of the 30% top (bottom) firms above (under) sectoral average.

TABLE 2.2 - Comparison of ROA and ROCE means and medians by CSR dimension

CSR dimension	ROA				ROCE			
	Obs.	Mean	Std. Dev.	Median	Obs.	Mean	Std. Dev	Median
Human resources rating								
Best	516	7.62	6.96	6.31	512	14.10	12.11	12.73
Worst	483	7.53	6.93	6.77	478	11.66	11.23	12.77
Corporate governance rating								
Best	463	8.32	6.94	7.15	459	15.37	12.11	13.47
Worst	497	7.56	6.70	6.46	491	14.13	11.23	12.07
Customers & suppliers rating								
Best	534	8.13	6.88	6.86	530	15.03	11.65	13.39
Worst	471	7.53	6.64	6.69	469	14.15	11.17	12.53
Community involvement rating								
Best	556	7.60	6.72	6.20	552	14.03	10.27	12.53
Worst	498	7.78	6.96	7.03	494	14.46	11.76	12.84
Environment rating								
Best	517	7.60	6.73	6.72	518	13.73	11.45	12.61
Worst	474	7.76	6.56	6.71	466	14.80	14.80	13.60

Table 2.2 presents means (with standard deviations) and medians of respectively ROCA and ROCE by CSR dimension.

TABLE 2.3 - OLS and AICc model averaging estimations for Return On Assets (ROA) with global CSR predictor

	OLS (i)						AICc Model Averaging (ii)					
Explanatory	Restricted sample (with R&D)			Full sample (without R&D)			Restricted sample (with R&D)			Full sample (without R&D)		
Global CSR	1.20	**	(0.56)	0.29		(0.36)	0.59	++	(0.40)	0.25		(0.13)
Risk	0.20	***	(0.04)	0.14	***	(0.02)	0.21	+++	(0.00)	0.22	+++	(0.00)
Financial leverage	-0.67	*	(0.36)	-0.46	**	(0.22)	-0.09		(0.04)	-0.81	++	(0.16)
Size	0.56		(0.36)	0.25		(0.29)	1.07		(0.10)	0.32		(0.08)
R&D intensity	-0.03		(0.11)			No	0.10		(0.01)			No
R^2	39.45			24.83			No			No		
F-statistic	9.46	***		7.13	***		No			No		
Observations	622			1577			622			1577		
No. firms	207			461			207			461		
No. models	1			1			32			16		

Table 2.3 compares the OLS estimations of the base model (1) explaining ROA to the AICc Model averaging results based on the set of variables used in model (1) with a global CSR variable. Two different samples are used in each case: a sample restricted to data with R&D intensity variable available; and the full sample without the R&D variable.

(i) For OLS, figures in brackets are standard errors. P-values are corrected with Roger's estimator. *p<0.10;**p<0.05; ***p<0.01.

(ii) For AICc Model Averaging, estimates are the averaged parameter estimates ($\hat{\bar{\Delta}}$ in equation (6)) produced by model averaging. Figures in brackets are the unconditional variance ($\widehat{se}\left(\hat{\bar{\Delta}}\right)$ in equation (7)). Weight significance is obtained by permutation test: + p<0.10; ++ p<0.05; +++ p<0.01.

TABLE 2.4 - OLS and AICc model averaging estimations for Return on Capital Employed (ROCE) with global CSR predictor

	OLS (i)						AICc Model Averaging (ii)					
Explanatory	Restricted sample (with R&D)			Full sample (without R&D)			Restricted sample (with R&D)			Full sample (without R&D)		
Global CSR	2.11	***	(0.86)	0.60		(0.46)	1.37	+++	(1.03)	0.40		(0.13)
Risk	0.10		(0.06)	0.03		(0.03)	0.05	++	(0.00)	0.15	+++	(0.00)
Financial leverage	-2.56	***	(0.82)	-2.09	***	(0.44)	-2.69	+++	(0.48)	-3.24	+++	(0.47)
Size	0.37		(0.68)	-0.19		(0.35)	0.89		(0.33)	-0.22		(0.13)
R&D intensity	-0.04		(0.16)	No			0.08		(0.02)	No		
R^2	32.29			16.36			No			No		
F-statistic	6.88	***		8.00	***		No			No		
Observations	618			1566			618			1566		
No. firms	206			457			206			457		
No. models	1			1			32			16		

Table 2.4 compares the OLS estimations of the base model (1) explaining ROCE to the AICc Model averaging results based on the set of variables used in model (1) with a global CSR variable. Two different samples are used in each case: a sample restricted to data with R&D intensity variable available; and the full sample without the R&D variable.

(i) For OLS, figures in brackets are standard errors. P-values are corrected with Roger's estimator. *p<0.10;**p<0.05; ***p<0.01.

(ii) For AICc MA, estimates are the averaged parameter estimates ($\hat{\bar{\Delta}}$ in equation (6)) produced by model averaging. Figures in brackets are the unconditional variance ($\widehat{se}\left(\hat{\bar{\Delta}}\right)$ in equation (7)). Weight significance is obtained by permutation test: + p<0.10; ++ p<0.05; +++ p<0.01.

TABLE 2.5 - OLS estimations for Return On Assets (ROA) and Return On Capital Employed (ROCE) with CSR dimensions

Explanatory		ROA						ROCE					
		Restricted sample (with R&D)			Full sample (without R&D)			Restricted sample (with R&D)			Full sample (without R&D)		
Human Resources	Best	0.30		(0.66)	-0.31		(0.41)	-0.74		(1.14)	-0.31		(0.77)
	Worst	-1.33	**	(0.71)	-0.76	*	(0.46)	-2.19	**	(1.08)	-1.44	*	(0.85)
Customers & Suppliers	Best	0.24		(0.62)	0.11		(0.41)	0.41		(1.06)	0.55		(0.77)
	Worst	-1.31	*	(0.78)	-1.03	**	(0.50)	-2.14	*	(1.10)	-1.57	*	(0.86)
Governance	Best	1.27		(0.61)	0.41		(0.40)	1.62	*	(0.97)	0.34		(0.73)
	Worst	0.37	**	(0.66)	0.01		(0.43)	0.38		(1.04)	0.05		(0.73)
Environment	Best	-1.46	**	(0.68)	-1.02	**	(0.41)	-1.87	*	(1.06)	-2.11	***	(0.69)
	Worst	0.17		(0.83)	-0.29		(0.44)	0.15		(1.19)	-0.15		(0.76)
Community Involvement	Best	0.02		(0.69)	-0.72		(0.42)	0.09		(1.02)	-1.43	*	(0.78)
	Worst	-0.75		(0.76)	-0.36	*	(046)	-1.56		(1.13)	-0.74		(0.81)
Risk		0.20	***	(0.03)	0.15	***	(0.02)	0.11	*	(0.06)	0.04		(0.05)
Financial leverage		-0.65	*	(0.37)	-0.46	**	(0.22)	-2.48	***	(0.81)	-2.07	***	(0.47)
Size		0.71		(0.42)	0.34		(0.28)	0.66		(0.69)	0.10		(0.51)
R&D intensity		-0.03		(0.11)			No	-0.03		(0.16)			No
R^2		40.15			25.82			33.81			17.70		
F-statistic		8.39	***		7.60	***					5.28	***	
Observations		622			1577			618			1566		
No. firms		207			461			206			457		
No. models		1			1			1			1		

Table 2.5 provides the OLS estimations of the base model (1) for ROA and ROCE. Two different samples are used for each performance variable: a sample restricted to data with R&D intensity variable available; and the full sample without the R&D variable.
Figures in brackets are standard errors. P-values are corrected with Roger's estimator. *p<0.10;**p<0.05; ***p<0.01.

TABLE 2.6 - AICc model averaging results on 100 best models explaining return on assets (ROA) with CSR dimensions

		Restricted sample with R&D				Restricted sample without R&D				Full sample without R&D			
Explanatory:		Estimate	Uncond. Var.	No. Models	Weight	Estimate	Uncond. Var.	No. Models	Weight	Estimate	Uncond. Var.	No. Models	Weight
Human Resources	Best	0.48	(0.50)	50	0.57++	0.57	(0.57)	55	0.69++	-0.15	(0.09)	44	0.22
	Worst	-0.76	(0.82)	50	0.57++	-1.01	(0.93)	55	0.69++	-0.15	(0.09)	44	0.22
Customers & Suppliers	Best	0.07	(0.07)	43	0.26	0.06	(0.06)	49	0.24	-0.17	(0.31)	55	0.85++
	Worst	-0.33	(0.33)	43	0.26	-0.29	(0.28)	49	0.24	-1.35	(0.58)	55	0.85++
Governance	Best	0.08	(0.03)	40	0.11	0.08	(0.03)	40	0.11	0.03	(0.01)	42	0.10
	Worst	0.03	(0.02)	40	0.11	0.03	(0.01)	40	0.11	0.01	(0.00)	42	0.10
Environment	Best	-0.63	(0.75)	45	0.42	-0.64	(0.77)	45	0.42	-0.33	(0.28)	46	0.32++
	Worst	-0.32	(0.39)	45	0.42	-0.30	(0.37)	45	0.42	-0.21	(0.15)	46	0.32++
Community Involvement	Best	-0.04	(0.02)	38	0.09	-0.05	(0.02)	42	0.10	-0.13	(0.07)	44	0.20
	Worst	-0.04	(0.01)	38	0.09	-0.04	(0.02)	42	0.10	-0.15	(0.08)	44	0.20
Risk		0.21	(0.00)	100	1.00+++	0.21	(0.00)	100	1.00+++	0.22	(0.00)	100	1.00+++
Financial Leverage		-0.11	(0.05)	44	0.28+	-0.13	(0.07)	48	0.32+	-0.87	(0.15)	62	0.94++
Size		1.13	(0.09)	100	1.00+++	1.17	(0.10)	58	1.00+++	0.33	(0.08)	51	0.71+
R&D intensity		0.10	(0.01)	35	0.60	No				No			
Observations		622				622				1577			

Table 2.6 presents AICc Model Averaging results for the 100 best models explaining Return on Assets (ROA) using CSR dimensions. Three different samples are used to ensure results robustness: a sample restricted to data with R&D intensity variable available; the same restricted sample without the R&D intensity variable; and the full sample without the R&D variable.

"*Estimate*" is the averaged parameter estimate ($\hat{\bar{\Delta}}$ in equation (6)) produced by model averaging. "*Uncond. Var*" is the unconditional variance ($\widehat{se}\left(\hat{\bar{\Delta}}\right)$ in equation (7)). "*No. models*" is the number of models in which a variable is present. "*Weight"* refers to Akaike's weights (equation (5)).
Weight significance is obtained by permutation test: + p<0.10; ++ p<0.05; +++ p<0.01.

TABLE 2.7 - SIC Model Averaging results on 100 best models explaining Return on Assets (ROA) with CSR dimensions

		Restricted sample with R&D				Full sample without R&D			
Explanatory		Estimate	Uncond. Var.	No. Models	Weight	Estimate	Uncond. Var.	No. Models	Weight
Human Resources	Best	0.04	(0.01)	41	0.07	-0.00	(0.00)	41	0.01++
	Worst	-0.09	(0.03)	41	0.07	-0.01	(0.00)	41	0.01++
Customers & Suppliers	Best	0.00	(0.00)	32	0.02+	-0.02	(0.01)	44	0.13+++
	Worst	-0.02	(0.00)	32	0.02+	-0.22	(0.15)	44	0.13+++
Governance	Best	0.00	(0.00)	23	0.00	0.00	(0.00)	40	0.00
	Worst	0.00	(0.00)	23	0.00	-0.00	(0.00)	40	0.00
Environment	Best	-0.02	(0.00)	33	0.02++	-0.01	(0.00)	42	0.01++
	Worst	-0.02	(0.00)	33	0.02++	-0.00	(0.00)	42	0.01++
Community Involvement	Best	-0.00	(0.00)	26	0.00	-0.00	(0.00)	41	0.01
	Worst	-0.00	(0.00)	26	0.00	-0.01	(0.00)	41	0.01
Risk		0.21	(0.00)	100	1.00+++	0.22	(0.00)	100	1.00+++
Financial Leverage		-0.02	(0.00)	43	0.06	-0.54	(0.27)	51	0.59+++
Size		1.23	(0.08)	70	1.00+++	0.17	(0.06)	48	0.35++
R&D intensity		0.06	(0.00)	39	0.35+++	No			
Observations		622				1577			

Table 2.7 presents SIC Model Averaging results for the 100 best models explaining Return on Assets (ROA) using CSR dimensions. Two different samples are used to ensure results robustness: a sample restricted to data with R&D intensity variable available; and the full sample without the R&D variable.

"*Estimate*" is the averaged parameter estimate ($\hat{\bar{\Delta}}$ in equation (6)) produced by model averaging. "*Uncond. Var*" is the unconditional variance ($\widehat{se}\left(\hat{\bar{\Delta}}\right)$ in equation (7)). "*No. models*" is the number of models in which a variable is present. "*Weight"* refers to Akaike's weights (equation (5)).
Weight significance is obtained by permutation test: + p<0.10; ++ p<0.05; +++ p<0.01.

TABLE 2.8 - AICc Model Averaging results on 100 best models explaining Return on Capital Employed (ROCE) with CSR Dimensions

Explanatory		Restricted sample with R&D				Restricted sample without R&D				Full sample without R&D			
		Estimate	Uncond. Var.	No. Models	Weight	Estimate	Uncond. Var.	No. Models	Weight	Estimate	Uncond. Var.	No. Models	Weight
Human Resources	Best	0.03	(0.08)	34	0.22+	0.03	(0.12)	45	0.28+	0.12	(0.10)	44	0.16
	Worst	-0.39	(0.50)	34	0.22+	-0.53	(0.79)	45	0.28+	-0.10	(0.09)	44	0.16
Customers & Suppliers	Best	0.27	(0.41)	46	0.41+	0.24	(0.38)	47	0.40+	-0.46	(0.91)	51	0.66++
	Worst	-0.84	(1.49)	46	0.41+	-0.80	(1.42)	47	0.40+	-1.76	(2.47)	51	0.66++
Governance	Best	0.12	(0.08)	28	0.11	0.13	(0.09)	38	0.12	-0.05	(0.04)	42	0.10
	Worst	0.09	(0.06)	28	0.11	0.09	(0.06)	38	0.12	0.01	(0.01)	42	0.10
Environment	Best	-0.40	(0.52)	36	0.23	-0.39	(0.50)	40	0.23	-0.88	(1.54)	47	0.40+
	Worst	-0.24	(0.02)	36	0.23	-0.24	(0.31)	40	0.23	-0.42	(0.63)	47	0.40+
Community Involvement	Best	0.01	(0.04)	31	0.15	0.01	(0.06)	44	0.19	-0.02	(0.03)	43	0.13
	Worst	-0.22	(0.20)	31	0.15	-0.28	(0.31)	44	0.19	-0.11	(0.07)	43	0.13
Risk		0.04	(0.00)	54	0.61+++	0.05	(0.00)	50	0.69+++	0.15	(0.00)	64	0.99+++
Financial Leverage		-2.69	(0.47)	100	1.00+++	-2.66	(0.50)	98	1.00+++	-3.28	(0.47)	100	1.00+++
Size		1.16	(0.25)	80	0.94	1.22	(0.24)	59	0.96	-0.18	(0.10)	47	0.36+
R&D intensity		0.12	(0.02)	44	0.53	No				No			
Observations		618				618				1566			

Table 2.8 presents AICc Model Averaging results for the 100 best models explaining Return on Capital Employed (ROCE) using CSR dimensions. Three different samples are used to ensure results robustness: a sample restricted to data with R&D intensity variable available; the same restricted sample without the R&D intensity variable; and the full sample without the R&D variable.

"*Estimate*" is the averaged parameter estimate ($\hat{\bar{\Delta}}$ in equation (6)) produced by model averaging. "*Uncond. Var*" is the unconditional variance ($\widehat{se}\left(\hat{\bar{\Delta}}\right)$ in equation (7)). "*No. models*" is the number of models in which a variable is present. "*Weight"* refers to Akaike's weights (equation (5)).
Weight significance is obtained by permutation test: + p<0.10; ++ p<0.05; +++ p<0.01.

TABLE 2.9 - SIC Model Averaging results on 100 best models explaining Return on Capital Employed (ROCE) with CSR dimensions

		Restricted sample with R&D				Full sample without R&D			
Explanatory		Estimate	Uncond. Var.	No. Models	Weight	Estimate	Uncond. Var.	No. Models	Weight
Human Resources	Best	0.01	(0.00)	28	0.02++	-0.00	(0.00)	35	0.00
	Worst	-0.04	(0.00)	28	0.02++	-0.00	(0.00)	35	0.00
Customers & Suppliers	Best	0.03	(0.00)	35	0.04+++	-0.03	(0.00)	40	0.03+
	Worst	-0.09	(0.03)	35	0.04+++	-0.08	(0.03)	40	0.03+
Governance	Best	0.01	(0.00)	20	0.00	-0.00	(0.00)	32	0.00
	Worst	0.00	(0.00)	20	0.00	0.00	(0.00)	32	0.00
Environment	Best	-0.01	(0.00)	26	0.01	-0.01	(0.00)	38	0.01
	Worst	-0.02	(0.00)	26	0.01	-0.02	(0.00)	38	0.01
Community Involvement	Best	0.01	(0.00)	26	0.01++	-0.00	(0.00)	34	0.00
	Worst	-0.03	(0.00)	26	0.01++	-0.00	(0.00)	34	0.00
Risk		0.02	(0.00)	49	0.27+++	0.15	(0.00)	64	0.97+++
Financial Leverage		-2.89	(0.43)	93	0.99+++	-3.23	(0.48)	100	1.00+++
Size		1.22	(0.27)	63	0.91++	-0.03	(0.00)	46	0.07
R&D intensity		0.07	(0.01)	35	0.29	No			
Observations		618				1566			

Table 2.9 presents SIC Model Averaging results for the 100 best models explaining Return on Capital Employed (ROCE) using CSR dimensions. Two different samples are used to ensure results robustness: a sample restricted to data with R&D intensity variable available; and the full sample without the R&D variable.
"*Estimate*" is the averaged parameter estimate ($\hat{\bar{\Delta}}$ in equation (6)) produced by model averaging. "*Uncond. Var*" is the unconditional variance ($\widehat{se}\left(\hat{\bar{\Delta}}\right)$ in equation (7)). "*No. models*" is the number of models in which a variable is present. "*Weight*" refers to Akaike's weights (equation (5)).
Weight significance is obtained by permutation test: + p<0.10; ++ p<0.05; +++ p<0.01.

2.4. RESULTS

This section presents and discusses main findings: CSR policies do not appear to equally matter to do well and do good (section 2.4.1), business behaviors with customers and suppliers standing out as core (section 2.4.2). The coexistence of CSR policies with and without optimal level is highlighted (section 2.4.3.). Section 2.4.4. discusses result robustness, including regarding endogeneity issues. Implications for corporations seeking to do well and do good and for public policies are suggested in section 2.4.5.

As a benchmark, Table 2.3 and Table 2.4 compare Base Model OLS (using Global CSR rating) results to AICc MA results for respectively ROA and ROCE. CSR is then disaggregated into five dimensions, which are used as explanatory variables. Table 2.5. presents OLS results for ROA and ROCE. Then AICc MA and SIC MA are used with the five CSR dimensions on top 100 performing models (thick modelling). Tables 2.6 and 2.8 respectively present AICc MA results for ROA and ROCE and can be compared with tables 2.7 and 2.9 displaying SIC MA results for ROA and ROCE. Table 2.10 presents models used to test for endogeneity robustness.

2.4.1. CSR POLICIES DO NOT EQUALLY MATTER TO DO WELL AND DO GOOD

Results obtained with the Global CSR measure support the existence of a positive link with financial performance. Indeed, global CSR rating parameter is estimated to be positive and significant at the 5% level for ROA (1.20) and at 1% for ROCE (2.11) with standard OLS on the restricted sample only. The global CSR averaged estimate is also positive (0.25 to 0.59 for ROA in Table 2.3, 0.40 to 1.37 for ROCE in Table 2.4) but CSR importance (as measured by Akaike's weight) only exceeds 0.50 for the restricted sample. However, further results obtained by disaggregating CSR into multiple cluster of policies (dimensions) show that this global positive relationship hides divergent effects.

To explain ROA, CSR dimensions that stand out as important variables with AICc MA on the full sample are Customers and Suppliers, which clearly stands out (weight 0.85, Table 2.6), weakly followed by Environment (weight 0.2, Table 2.6). On the restricted sample, important variables are Human resources (weight 0.57 to 0.69, Table 2.6) and more weakly Environment (weight 0.42, Table 2.6). With SIC MA, only Human Resources on the restricted sample and

Customers and Suppliers on the full sample are not driven to null weight (Table 2.7). To explain ROCE, Customers and Suppliers (weight 0.40 to 0.41, Table 2.8) stand out as the important variable both on the restricted and the full samples, weekly followed by Environment (weight 0.40, Table 2.8), particularly on the full sample. Human Resources comes third with a weaker effect than observed for ROA. SIC MA once again proves very selective but Customers and Suppliers dimension is the only CSR dimension kept (Table 2.9).

Hereby a main finding of the paper is that all CSR dimensions do not equally matter to do well and do good. A hierarchy clearly stands out between CSR dimensions, robust and consistent across various samples. This hierarchy is dominated by the Customers and Suppliers dimension. The Human Resources and Environment dimensions appear to have a significant but lesser impact. Finally, the Governance and Community Involvement dimensions do not seem to be linked to financial performance. Let us now focus on the Customers and Suppliers dimension.

2.4.2. Good Business Behaviors with Customers and Suppliers Remain Core

The Customers and Suppliers CSR dimension relates to respect of customers, in terms of information and product safety; sustainable and transparent relationships with suppliers; and more generally, business integrity. This paper shows that, among all CSR dimensions, performance along this policy is the most strongly associated with profitability.

For both performance measures (ROA and ROCE) and for both model averaging methods (AICc MA and SIC MA, on the full sample), a negative link appears between financial performance and both “best” and “worst” business behaviors with customers and suppliers. For instance, AICc MA on full sample shows that being “worst-in-class” on good business behaviors decrease ROA by -1.37% (Table 2.6) and ROCE by -1.76% (Table 2.8) compared with average firms; whereas being “best-in-class” decreases ROA by -0.17% (Table 2.6) and ROCE by -0.46% (Table 2.8.). The existence of an optimal level of good business behaviors with customers and suppliers is thus supported.

Let us note that since causality is not dealt with, we cannot distinguish between mechanisms. For instance, low performance on this dimension (for instance, late payment of suppliers) might decrease profitability (because reactive suppliers will stop working with the firm, preventing quick corporate adaptation to market changes); or conversely, low profitability

might constraint firms to harden their practices with their suppliers (because they don't have sufficient cash flows to pay them on time). However, results show that performance on this CSR dimension has a strong correlation with financial performance.

As early as 1995, Jones (1995) has shown that companies involved in repeated transactions with stakeholders on the basis of trust and cooperation are motivated to be honest, trustworthy and ethical because the returns to such behavior are high. Whereas it seems fairly intuitive that promoting good-business behaviors with suppliers and customers is likely to create value, at least on the long run, few studies actually quantify it. Part of the effect of this CSR dimension might capture the synergies between reputation, advertising and CSR, which have been more studied (e.g. Brown et al., 2006). Disentangling consumer relationships, supplier relationships and advertisement effects on financial performance would thus be an interesting path for further research.

2.4.3. Coexistence of CSR Policies With and Without Optimal Level

The second major finding of this paper is the coexistence of CSR policies monotonically linked to profitability and of CSR policies with optimal levels.

On the one hand, a monotonic relationship is found between the Human Resources variable and financial performance. This dimension here refers to a proactive human resources corporate policy, including career development, continuous improvement of labor relations and quality of working conditions. Being worst-in-class is found to be negatively linked with financial performance whereas being best-in-class in positively related, indicating a monotonic relationship. This finding is in line with previous works showing that human resources policies can help recruiting motivated employees with team work values, securing firm survival and long-term performance (Brekke and Nyborg, 2008) and reducing costly employee turnover (Portney, 2008). Empirically, similar findings are made by Galbreath (2006) who studies employee treatment in 38 top Australian firms; Jones and Murrell (2001) who focus on the stock returns of the 51 firms included in the 'Working mother' list; and Brammer et al. (2006), who use the stock returns on the UK market.

On the other hand, curvilinear relationships between financial performance and respectively environmental performance and good business behaviors with customers and suppliers are found on all samples, for both financial performance measures and with both methods. The

Environment dimension here encompasses the integration of environmental issues into corporate policy, product manufacturing, distribution, use and disposal. This finding is a major step in the CSR literature as it reconciles divergent studies such as Derwall et al. (2005), who find a positive link between corporate environmental policies and financial performance, and Brammer et al. (2006)'s, who found a negative link. In line with Barnett and Salomon (2006) and Capelle-Blancard and Monjon (2012), who made a strong case for a curvilinear relationship, results here point out that the link between environment policies and corporate performance depends on the level considered.

A step further, findings highlight that the specification of the CSR-profitability link (that is curvilinear versus monotonic) depends on the CSR dimension considered. Indeed, an optimum level is here shown for environmental performance and for good business behaviors with customers and suppliers, but not for human resources management. Of course, the linear relationship observed between human resources management and profitability does not imply that corporations can infinitely invest is their employees' well-being and that it would yield infinite profits. A fair assumption could be that firms with slack resources spend some to improve workforce management (by developing training program for instance) and that human capital investment increases linearly with slack resources. Another potential explanation could be that improved human resources management increases productivity and profitability, up to an optimum level with is not reached by firms in the studied sample. Qualifying in more details these relationships by focusing on causality with panel data would appear as a promising extension of this research. In particular, the optimal CSR to implement for corporations to be profitable might depend on specific firm characteristics, such as industry.

2.4.4. Results Robustness

Result robustness can first be assessed by comparing control variable estimations across models and samples. As a benchmark, Base Model OLS estimates are thus compared with AICc MA results on Global CSR (see Tables 2.3 and 2.4). For both methods, the same controls are significant (for OLS) and important (for MA). When significant, control parameters estimated by OLS are of expected signs. Two samples are also used for each variable: a sample limited to the R&D intensity data availability (622 observations) and a full sample without R&D intensity (1577 observations). In both samples and for both financial

performance measures the control estimates are (but for the R&D intensity control for ROCE in full sample) in line with previous literature. The inclusion or not of the R&D variable also little biases the estimations. Most estimations are thus made on the full sample.

When CSR is disaggregated into five dimensions, averaged control estimates remain consistent across methods (AICc MA and SIC MA) and performance measures (ROA and ROCE) as shown by the comparison of Tables 2.6, 2.7, 2.8 and 2.9. For both ROA and ROCE and on both samples, AICc MA results for control variables are consistent in terms of estimate signs, estimate values and variable importance. This consistency supports result robustness.

To evaluate robustness of model averaging estimations and variable weight significance, a specific test is needed. A permutation test (also called randomization test) is thus built and conducted. Test results give us a probability equivalent to a p-value. 1000 permutations were used to compute the test, meaning the smallest possible p-value obtained is 0.001 (weight significance test appears in tables as: " +" $p<0.10$; "++" $p<0.05$; "+++" $p<0.01$).

Finally, endogeneity might bias results. It is a well-known pitfall in many empirical fields, including CSR research (as pointed out by Garcia-Castro et al., 2010), and needs to be tested for and dealt with if important. The idea is that firms might be more likely to engage in CSR policies would their performance allow or encourage them to do so. A lagged performance variable is thus introduced in OLS models and AICc MA models to check whether controlling for endogeneity drastically changes results. A drawback of lagged variables is that they reduce sample size, which is crucial for model averaging performance. Table 2.10 presents results to be compared with Table 2.5 (for OLS on ROA and ROCE), Table 2.6 (for AICc MA on ROA) and Table 2.8 (for AICc MA on ROCE). Results lead to the conclusion that AICc MA estimates are robust to the introduction of the lagged variable, hence to the endogeneity issue.

2.4.5. Implications for Corporations Seeking to Do Well and Do Good and For Public Policies

Clearly, this chapter results do not imply that to succeed in being socially responsible and "doing well" and "doing good" a firm should heavily invest on its business behaviors towards its customers and suppliers, improve its human resources policies, cut down its environmental

performance and drop all policies regarding its community involvement and governance. Indeed, several limits of this study have been acknowledged, starting with the causality between CSR dimensions and financial performance, which ought to be the focus of further work. Indeed, long-term effects of socially responsible policies and reverse causality are here bypassed. For instance, being proactive in environmental policies might be costly at year *t* and only possible for firms with excess cash-flows. However, this environmental policy might be well communicated to customers, which might then be willing to pay more for the firm product at year *t+1*. Supporting the existence of interactions between CSR dimensions, Cavaco and Crifo (2010) found complementarities between good business behaviors and proactive human resources policy, but substitutability between the latter and environmental performance.

However, this chapter establishes that CSR is a heterogeneous construct: policies encompassed in this wide concept are differently associated with corporations' economic performance; some bear optimum levels (environment) while others don't (human resources); some have little impact (governance) while others weight significantly on the accounting ratios (good business behaviors). Hereby CSR does not come as a bundle to be bluntly promoted. Instead, at the corporation level, it calls for a strategic analysis of the firm's business model in order to carefully select the appropriate CSR policy mix, with a special attention to business integrity towards customers and suppliers.

In terms of public policies, results highlight that for CSR to become a mainstay of the Europe 2020 sustainable development strategy, it needs to be detailed at an implementable policy level, as different policies have diverging effects. It also needs to be built with corporations, as they are core actors to identify which dimensions of CSR can penalize their profitability and which are more relevant to create shared value. In particular, these paper findings suggest that policies targeting the supply chain and customers are more likely to be successfully seized by firms as they are strongly linked with profitability. Conversely, since an optimum level has been found for the environmental performance, high levels of performance along this dimension might be harder to reach by voluntary corporate policies.

TABLE 2.10 - Endogeneity robustness test

		OLS (i)						AICc Model Averaging (ii)							
		ROA			ROCE			ROA				ROCE			
Explanatory		Estim.		Std. Dev.	Estim.		Std. Dev.	Estim	Uncond var	Nb model	Weight	Estim	Uncond var	Nb model	Weight
Human Resources	Best	-0.29		(0.34)	-0.46		(0.69)	-0.05	(0.01)	43	0.13	0.07	(0.04)	35	0.10
	Worst	-0.22		(0.40)	-0.54		(0.68)	-0.03	(0.01)	43	0.13	-0.05	(0.03)	35	0.20
Customers & Suppliers	Best	-0.56	*	(0.39)	-0.82		(0.67)	-0.58	(0.12)	48	0.98+++	-0.91	(1.29)	50	0.73+++
	Worst	-1.28	***	(0.33)	-1.85	**	(0.74)	-1.32	(0.15)	48	0.98+++	-2.14	(2.55)	50	0.73+++
Governance	Best	-0.17		(0.37)	-0.31		(0.77)	-0.04	(0.02)	45	0.32	-0.08	(0.06)	34	0.12
	Worst	-0.58		(0.39)	-1.45	**	(0.64)	-0.21	(0.11)	45	0.32	-0.14	(0.09)	34	0.12
Environment	Best	-0.62		(0.39)	-1.43	*	(0.74)	-0.17	(0.08)	44	0.27+	-0.52	(0.76)	46	0.31+
	Worst	-0.12		(0.39)	0.32		(0.78)	0.04	(0.08)	44	0.27+	0.20	(0.28)	46	0.31+
Community Involvement	Best	0.13		(0.41)	-0.07		(0.78)	0.00	(0.00)	43	0.08	0.74	(1.22)	44	0.35
	Worst	0.00		(0.36)	-0.63		(0.74)	-0.00	(0.00)	43	0.08	0.57	(0.86)	44	0.35
Risk		0.08	***	(0.02)	0.01		(0.03)	0.08	(0.00)	95	1.00+++	0.12	(0.00)	47	0.96+++
Financial leverage		-0.26		(0.17)	-1.72	***	(0.44)	-0.13	(0.03)	37	0.40++	-2.44	(0.44)	85	1.00+++
Size		0.28		(0.18)	0.16		(0.32)	0.20	(0.03)	39	0.67+	0.04	(0.01)	36	0.14
ROCE-1 lag					0.55	***	(0.07)					0.38	(0.00)	100	1.00+++
ROA-1 lag		0.60	***	(0.04)				0.60	(0.00)	100	1.00+++				
R^2		56.86			48.11			No				No			
F-statistic		30.18	***		16.68	***		No				No			
Observations		1116			1109			618				1566			
No. firms		382			384			206				457			
No. models		1			1			32				16			

Table 2.10 compares the OLS estimations of the base model (1) to the AICc MA results when lagged variable are introduced in models to control for potential endogeneity issues. Two different samples are used in each case: a sample restricted to data with R&D intensity variable available; and the full sample without the R&D variable.
(i) For OLS, figures in brackets are standard errors. P-values are corrected with Roger's estimator. *p<0.10;**p<0.05; ***p<0.01.
(ii) For AICc MA, estimates are the averaged parameter estimates ($\hat{\bar{\Delta}}$ in equation (6)) produced by model averaging. Figures in brackets are the unconditional variance ($\widehat{se}\left(\hat{\bar{\Delta}}\right)$ in equation (7)). Weight significance is obtained by permutation test: + p<0.10; ++ p<0.05; +++ p<0.01.

2.5. CONCLUSION

This paper contributes to the question of how corporations can profitably become "socially responsible", as defined and promoted by the European Commission. It highlights that this issue constitutes a multidimensional puzzle hampered by model uncertainty, because theory lacks to predict relevant profitability predictors among all CSR dimensions. To account for model uncertainty, model averaging is introduced in the literature.

This powerful tool enables to unveil which CSR dimensions are significantly related to financial performance, and how. In particular, good business behaviors with customers and suppliers stand out as core among all CSR dimensions. Environmental performance and human resources management are also weakly associated with profitability in the studied data, whereas implication in local communities and governance are not. Strong evidence is also provided on the co-existence of policies with optimal levels for financial performance (good-business behaviors with customers and suppliers and environmental performance) and policies with monotonic relationship (human resources management). Findings hence suggest that different CSR dimensions bear different optimums to be reached for corporations to manage to do well and do good.

This research opens a new path to better analyze drivers of how firms can be profitable and socially responsible. Further work taking into account temporality and causality is still needed before providing reliable CSR strategy advice to organizations seeking to profitably adhere to the principles of CSR. However, this paper findings highlight that firms do not necessarily have interest to promote all CSR dimensions to create value for their shareholders. This result raises questions in terms of the value shared with stakeholders and society and the public good effectively provided. Hereby, further research paths could cover the social side of the equation. In particular, little is known about the type and efficiency of the public good privately provided by corporations under the impulse of public policies.

CHAPTER 3

THINK GLOBAL, INVEST RESPONSIBLE: WHY THE PRIVATE EQUITY INDUSTRY GOES GREEN

Where does the Private Equity industry stand in terms of CSR, and why?

Abstract

This chapter sets up to analyze the growth of socially responsible investment (SRI) in Private Equity and shows that it benefited from the maturation of the concept on public markets and the impetus of large conventional actors. Hypotheses on the characteristics and drivers of the movement are proposed and tested on a unique database covering the French Private Equity industry in 2011. Results support that Private Equity SRI is characterized by investor engagement and strategically driven by a need for new value creation sources, increased risk management and differentiation. In particular, independent funds are more likely than captive funds to develop SRI practices.

Résumé

Ce chapitre analyse la croissance de l'investissement socialement responsable (ISR) en Capital Investissement. Il montre qu'elle a bénéficié de la maturation du concept d'ISR sur les marchés côtés et de l'impulsion de grands acteurs conventionnels. Il propose alors des hypothèses sur les caractéristiques et déterminants de ce mouvement et les teste sur une base de données unique couvrant l'industrie française du Capital Investissement en 2011. Les résultats permettent de caractériser l'ISR en Capital Investissement comme étant marqué par l'engagement des investisseurs et stratégiquement déterminé par un besoin de création de nouveaux leviers de valeur, d'amélioration de la gestion des risques et de différentiation. En particulier, les fonds indépendants ont une probabilité supérieure aux fonds captifs de développer des pratiques ISR.

Chapter 3 is based on a paper co-written with Patricia Crifo (same title) and forthcoming in the Journal of Business Ethics (DOI. 10.1007/s10551-012-1443-y). We thank Novéthic for granting us access to survey data.

3.1. INTRODUCTION

Socially Responsible Investment (SRI) is an investment process that integrates social, environmental, and ethical considerations into investment decision making (Renneboog et al., 2008). As such, it differs from conventional investments in a twofold way. First, socially responsible investors apply a set of investment screens to select or exclude assets based on non-financial criteria, in addition to financial criteria. Second, those investors often engage in shareholder activism to foster Corporate Social Responsibility (CSR) strategies in the firms they own. SRI is a niche market that has been expanding over the past decade, reaching in 2010 about 3 070 billion USD in the United States, representing 12.2% of assets under management (Social Investment Forum, 2010) and 3 800 billion EUR in Europe in 2010 (Eurosif, 2010). SRI markets are also expanding in Canada (EIA, 2005), Australia (SIO, 2005) and Asia (ASRIA, 2011).

Consequently, SRI structure, performance and evolution triggered research in management, economics and finance fields. However, most academic work focuses on SRI provided on public financial markets. The potential impact of the Private Equity channel on a firm's non-financial policies and performance has received less attention (Scholtens, 2006; Cumming and Johan, 2007), partly because it is still at its early steps. Discarding from previous literature, this paper unveils responsible investment practices among Private Equity investors and their specificities compared to both standard Private Equity and public markets' SRI. Light is shed on their surprisingly fast integration of Environment, Social and Governance (ESG) criteria and drivers of this movement are empirically analyzed in the French context.

Here, the term 'Private Equity' industry refers to specialized investment firms whose business is to invest in unlisted companies, thus encompassing both venture capital and buyouts. On a theoretical level, Private Equity has been identified as highly efficient at maximizing shareholders' value by reducing agency costs and providing strong incentive to management (e.g. Jensen 1986, 1989; Kaplan and Strömberg, 2009). As such, combining extra-financial and financial consideration through CSR does not appear in direct line with Private Equity investors' practices as it would amount to spend cash flows to provide public good. In fact, on an empirical level, the phenomenal growth curve of the Private Equity industry in Europe and the United States over the 2000-2007 period drew media and regulatory concerns about its effect on business and society. In particular, buyouts have been pointed out for their

potentially negative social impact (Financial Services Authority, 2006; Bocquet Report, 2007).

Hereby, the question of the characterization of a socially responsible investment movement in Private Equity is by far not trivial and the analysis of its drivers is challenging both empirically and theoretically. The pioneering work of Cumming and Johan (2007), first to consider the direct intersection between SRI and Private Equity, analyzes the factors that influence institutional investors to allocate capital to socially responsible Private Equity investments. The authors forecast an increasing demand by institutional investors to invest responsibly and call for further research on the factors that give rise to fund managers offering such investment alternatives to their investors.

This exploratory chapter hence sets up to analyze the responsible investment movement in Private Equity. First, it establishes that the industry benefited from the maturation of SRI on public financial markets. In particular, the Private Equity approach of SRI appears to be a mainstream approach initiated by large conventional players. Hypotheses on the characteristics and drivers of the responsible investment movement in Private Equity are econometrically tested with multivariate analysis on a unique database covering the French Private Equity industry, third world largest after the United States and the United Kingdom. France has also been identified as a proactive SRI market (Arjaliès, 2010). Main findings are that SRI in Private Equity is characterized by investor engagement and strategically driven by a need for new value creation sources (in a lesser extent), increased risk management and differentiation. In particular, results show that independent funds, which need to attract investors, are more likely than captive funds to integrate ESG issues in their investing practices.

The remainder of the paper is organized as follows. Section 3.2 defines and provides historical insights on SRI and Private Equity to establish where this industry stands in terms of socially responsible practices. Section 3.3 builds testable hypotheses. Section 3.4 presents data. Section 3.5 displays results. Main findings are discussed in section 3.6 as well as the potential evolution of the socially responsible Private Equity movement in light of the upcoming regulatory context. Section 3.7 concludes on potential further research paths.

3.2. Private Equity and Responsible Investment: Where Do We Stand?

As a starting point, this section briefly reviews the parallel development of the SRI concept on the one hand and of the Private Equity industry on the other hand, hence contextualizing the integration of responsible investment in Private Equity.

3.2.1. The Socially Responsible Investment Concept, from Margin to Mainstream

SRI involves two main approaches. The first consists in using screens to either avoid (negative screening) or seek out (positive screening) specific investments when building a portfolio. Screens can be ethical, normative (based on social or environmental international norms), sectorial or best-in-class (selecting most CSR proactive firms, whatever their sector). The second main SRI approach is engagement or shareholder activism: shareholders' voting rights are used to directly foster CSR in portfolio companies. Both approaches share the integration of a consideration of ESG issues in investment practices. Eccles and Viviers (2011) add to this definition that this integration be done "with the primary purpose of delivering higher-risk-adjusted financial returns"[8].

Over the 2000's, SRI shifted from a marginal niche market to a mainstream practice, a phenomenon called 'SRI mainstreaming' and based on the progressive penetration of SRI (extra financial) criteria into conventional investment funds focused on financial criteria only (Sparkes and Cowton, 2004; Bourghelle et al., 2009). Dunfee (2003) concludes that SRI has the potential to become a mainstream phenomenon practiced by ordinary investors.

Louche and Lydenberg (2006) precise that this movement is likelier is the European that in the United States' financial landscape. Indeed, Arjaliès (2010) show that this potential has been realized by assets managers in the French market as a result of a deliberative and organized social movement, which aimed at changing the institutional logics of the asset management field. The French legislative context also mattered for the development of long term investing and SRI in France and potentially the emergence of SRI mainstreaming: creation of a Pension trust Fund (Fonds de Reserve des Retraites) in 2001 with a specific SRI policy, Laws on Employee Savings in 2001 and 2003 promoting long term investing, New

[8] Such has not always been the case, as illustrated in Renneboog et al. (2008)'s review of the SRI maturation from the 17th century Quakers ideology to nowadays.

Economic Regulation Act in 2001 and Grenelle 2 Act in 2011 introducing compulsory responsibility reporting for listed and non-listed firms. France therefore constitutes a very interesting market to investigate SRI in other types of assets.

3.2.2. The Surge and Crisis of the Private Equity Industry

Parallel to the development of the SRI market but on a whole different scale, Private Equity witnessed a striking growth curve over 2000s, until the financial crisis. To grasp the economic role of those investors and how responsible investment can fit in their practices, let us first describe their business.

Private Equity holds a key role in our economies because it finances innovation and unlisted companies, most of them being small and medium size enterprises. It acts as a financial intermediary between investors (the 'Limited Partners') and companies. A limited partnership links the Private Equity firm, who acts as 'General Partners' and manages the fund, to the Limited Partners who provide the capital. Limited Partners neither manage the funds they invest in nor intervene at the investee company level, yet they regularly assess the quality of the investments made by General Partners. Typically, Limited Partners are institutional investors (banks, insurance companies and pension funds) but also count family offices, individuals, corporations and Government agencies.

Private Equity funds exist for a fixed period (usually 10 years) over which investment cycles occur: General Partners acquire companies (acquisition stage), hold them in portfolio for 4 to 7 years (holding stage), and sell them (exit stage) to redistribute capital and dividends to the Limited Partners. Private Equity investors are thus significant or majority shareholders of companies for middle to long term horizon [9].

Depending on the growth stage on the company and the complexity of the deal (Morrell and Clark, 2010), the industry can be broken down in different segments. Venture capital usually invests in younger companies in innovative or technological industries as minority shareholders. Buyouts target larger companies in more mature industries and encompass Growth capital, Transmission Capital and Distressed Capital depending on the company stage

[9] Note that while General Partners in Private Equity funds have some discretion in how they value their portfolio, valuation is still subject to the fiduciary duties the general partner owes the fund.

and needs. Leveraged buyouts (LBO), most common in Transmission Capital, are specific deals in which a small share of equity is invested and leveraged by a large acquisition debt.

The surge of Private Equity financing first occurred in the United States over the 1980s, a decade of intense corporate restructuring in the face of international competition and deregulation (Jensen, 1993). It was driven by LBO and often relying on junk bond financing. As the junk bond market crashed, many LBO defaulted and investee companies went to bankruptcy, so that the Private Equity industry nearly disappeared in the early 1990's (Kaplan and Strömberg, 2009). However, remaining Private Equity funds acted as a substitute for weak capital markets over the 1994-2004 period (Boucly et al., 2009) and the industry underwent a steady growth. In 2001, venture capital investments were almost 100 times larger than they were in 1977, whereas bank lending to small firms stayed constant at the best over the same period (Ueda, 2004). The 2000s thus witnessed a new boom of the Private Equity and LBO peaked in the 2006-2007 due to a period of euphoric credit markets (Kaplan and Strömberg, 2009).

The 2008 financial crisis led fundraising and debt markets to plummet and ended the Private Equity surge (Figure 3.1). From then on, competition rocketed up and returns had to increasingly come from value creation, such as selecting underdeveloped companies and accelerating their growth, rather than financial leverage effect (Boucly et al., 2009). Price competition and consequent quest for value creation had nevertheless started prior to the crisis, as shown by Jin and Wang (2002) and Gaspar (2009). This paper conjectures that responsible investing practices are part of this value creation quest.

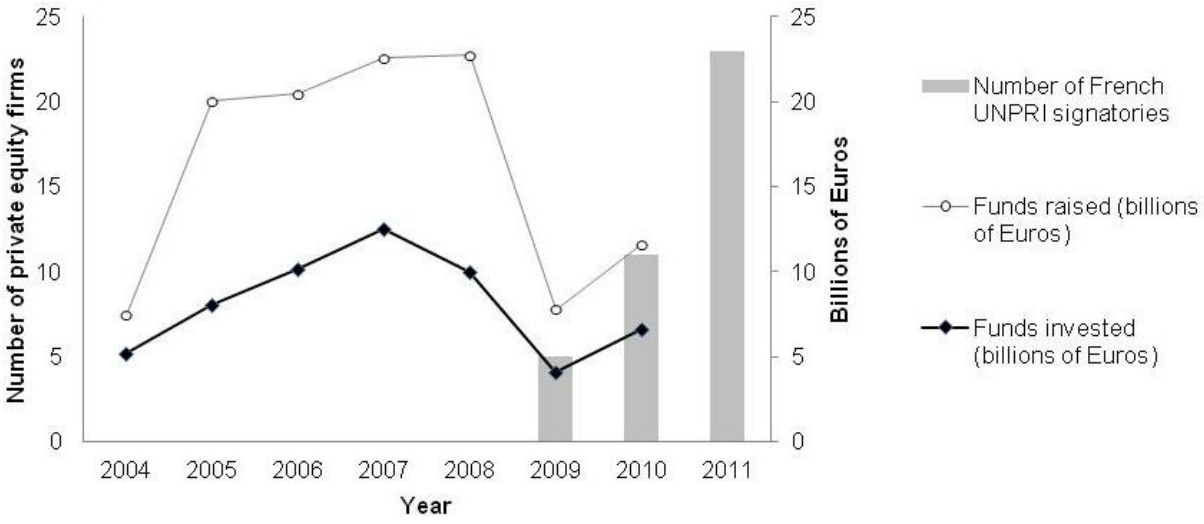

FIGURE 3.1 – French Private Equity market (data AFIC 2011 and UN PRI 2011) in amounts of funds raised, funds invested and UN PRI signatories

3.2.3. Integration of Socially Responsible Practices by Private Equity Investors

The official intersection of Private Equity and SRI can be dated back to 2009, a period of liquidity dearth. Indeed, the first major move towards responsible investment in Private Equity was the adoption (February 10, 2009) of guidelines covering environmental, health, safety, labor, governance and social issues by large conventional players, namely the United States Private Equity Council, representing 13 of the world's largest Private Equity investors. Within a month, the Private Equity United Nations Principles for Responsible Investing (UN PRI) were launched and its Board stated (March 2009):

> "We also need to recognize that investors can, and should, be part of the response to this crisis and that responsible investment has an important role in mitigating future such market failures.(...). This crisis demonstrated a clear lack of understanding of our underlying investments, and how they may have been putting not only the companies involved at risk, but the entire economy."

Between February 2009 and August 2011, 107 Private Equity companies became UN PRI signatories, among which world leader funds of funds and General Partners. National associations are major actors in this change, as witnessed by the Australian Private Equity and Venture Capital Association asking its members to "seriously consider signing the UN PRI" in August 2009 or the responsible investing guidelines provided in June 2010 by the British Association (BVCA, 2010). In France, the Sustainable Development Project of the French Association for Private Equity (AFIC) was launched in April 2010 by conventional Private Equity firms. Key figures also encourage the SRI movement in Private Equity, such as Lord Mandelson, the United Kingdom secretary of state for business, innovation and skills, who emphasized that embracing CSR issues into Private Equity investment approach made "good business sense" (September 2009).

Henceforth, SRI in Private Equity can be conjectured as a mainstream approach initiated by large players and structurally neither thought of nor developed as a niche market. Typically, socially responsible Private Equity hence essentially differs from conventional Private Equity in that it integrates ESG issues in its investing practices.

Let us finally note that despite its quick evolution, SRI in Private Equity is still at its first steps. The UN PRI estimate that the share of total Private Equity market subject to integration by PRI signatories worldwide was 5% in 2009 and 8% in 2011. As about 10% of the AFIC

members are UNPRI signatories, France appears as an active and interesting field to investigate in details the SRI movement in Private Equity.

3.3. Testable Hypotheses on Characteristics and Drivers of the Responsible Investment Movement in Private Equity

Does responsible Private Equity present specificities compared to SRI on financial markets? This section builds testable hypotheses on the characteristics of socially responsible investing in Private Equity and respectively its strategic and responsive drivers. Based on previous section, we here define socially responsible investing in Private Equity as the integration of ESG concerns in conventional investing practices.

3.3.1. Hypotheses on the Characteristics of Socially Responsible Private Equity

A straightforward conjecture is that difference between SRI on financial markets and socially responsible Private Equity might directly arise from the specificities of Private Equity itself. Drawing from the corporate finance literature, four characteristics of Private Equity are hence here detailed: information asymmetry reduction; agency costs cut; governance engineering and operational engineering. Impacts on ESG criteria integration are conjectured and lead to testable hypotheses.

First, asymmetric information between informed managers and the public market has been shown to cause under-investment (Myers and Majluf, 1984). Private Equity investors reduce this information asymmetry by monitoring the companies they select (Holmstrom and Tirole, 1997) and evaluating them better than a standard financial institution would (Ueda, 2004). As such, ESG integration appears as another tool to reduce information asymmetry and improve business.

Second, the agency theory framework has been applied to the Private Equity setting by Jensen (1986, 1989), leading to the free cash flow hypothesis. Jensen argues that managers in companies with excess cash flows have an incentive to waste organizational resources on personal ends, rather than pay out the excess cash to shareholders through dividends. However financing by equity investors leads to high debt level (particularly for leverage

buyouts) which affects the free cash flows of the firm for debt servicing, preventing opportunistic behaviors of managers (see Desbrières and Schatt, 2002). Private Equity tight hand on agency costs will naturally lead investors to carefully consider CSR in their portfolio companies, to avoid managerial entrenchment strategies (Baron et al., 2011; Cespa and Cestone, 2007). Being a socially responsible Private Equity investor hence means fostering CSR in portfolio companies while reducing agency costs.

Both arguments foster the following hypothesis:

H1: Socially responsible Private Equity firms integrate ESG issues in mainstream business (as opposed to considering it as a niche market segment).

Third, governance engineering has been shown to be another Private Equity strength (Kaplan and Strömberg, 2009). Private Equity investors usually have significant impact (if not complete control) on portfolio company board and are much more involved in governance than public companies board. For instance, it is not unusual that they initiate a management change. Managing governance issues is thus already core in Private Equity business. Hereby, the gap between managing "G" to full "ESG" issues is more easily filled in by Private Equity investors than public investors.

H2a: Private Equity firms are more likely to favor Governance aspects within the ESG issues.

Forth, Kaplan and Strömberg (2009) argue that a property of Private Equity investors is operational engineering. Typically, Private Equity firms possess industry and operational expertise by their choice of human capital. They are thus able to advise companies at the core of their business to enhance value creation. Distinguishing value-creation CSR from managerial entrenchment requires a sound understanding of the firm environment and markets, which Private Equity possesses. Engagement thus appears a necessity to consistently be a socially responsible Private Equity investor. The previous hypothesis can thus be completed by:

H2b: Socially responsible Private Equity is characterized by investor engagement.

Understanding CSR potentiality needs sound expertise. Indeed, CSR encompasses many dimensions, with various effects on financial performance (Brammer et al., 2006). Yet expertise on strategic CSR is still scarce, all the more considering the recent interest of the industry for ESG issues. It is thus more likely for large Private Equity firms benefitting from wide human capital resources to be able to appropriately acquire CSR expertise. This firm size effect might also be linked to a form of mainstreaming.

H3: The integration of ESG issues is more likely to be implemented in large Private Equity firms in terms of workforce.

3.3.2. Hypotheses on Strategic Drivers of Socially Responsible Private Equity

The idea of strategic ESG integration refers to the reconciliation of social and long term economic interests of corporations. Experts in profit maximization and agency costs reduction, Private Equity investors would opportunistically analyze CSR as a strategic resource to improve the bottom line performance of companies (McWilliams et al., 2006). In their survey, Cumming and Johan (2007) indeed find that socially responsible institutional investment programs are more common among investors expecting greater economic returns from those investments. The following potential strategic drivers for responsible Private Equity are identified: value-creation; risk management; new market creation; differentiation and related compliance to Limited Partners demand.

Hypothesis on Value Creation as a Strategic Driver

Can a Private Equity fund create value by integrating ESG criteria in investment practices?
As a starting point, empirical comparisons of public SRI performance to standard portfolios lead to rather lukewarm results, the former either achieving similar or lower yields than the latter (Bauer et al., 2005; Kreander et al., 2005) [10].

However, as previously underlined, Private Equity investors structurally differ from public investors. Beyond governance and operating engineering, they typically do not build large and

[10] Recent work suggests that whereas SRI underwent a learning period in which it underperformed standard portfolio, it since caught up with conventional funds performance (Climent and Soriano, 2011).

diversified portfolios based on modern portfolio theory but rather select and follow a few companies in which they are significant active shareholders over a long-term horizon. More specifically, the Private Equity investment cycle consists in: (i) an acquisition stage over which firms can be screened on ESG issues; (ii) a 4 to 7 years of holding stage over which firms are monitored and value can be created; and (iii), an exit stage where investors can benefit from the created value. Value creation in the Private Equity context should thus be analyzed through the lens of the link between CSR and financial performance, rather than SRI versus standards portfolios.

The link between CSR and performance has elicited much interest over the last three decades. Recent literature reviews (Orlitzky et al., 2003; Portney, 2008; Reinhardt et al., 2008; Margolis et al., 2009) converge to a consensus on the absence of a financial penalty associated with CSR. Yet generating over-performance with proactive CSR does not come straightforward, leading academics to advocate research on how corporations can succeed in both performing on social and financial levels. Literature reviews also highlight that value can be created through different channels: increase input-output efficiency to get a competitive advantage (Derwall et al., 2005); reduction of costly employee turnover and the recruitment of motivated, hence more productive, employees (Turban and Greening, 1997; Brekke and Nyborg, 2008); and answer to consumers' demand and increase companies reputation and consumer loyalty, leading to long-term increased brand and company values (Kanter, 1999; Porter and Kramer, 2002; Kotler and Lee, 2005).

The following hypothesis is thus proposed.

H4: Creating value in companies owned is the most important motive of socially responsible investing in Private Equity.

Hypothesis on Risk Management as a Strategic Driver

Another strategic rationale for promoting CSR in companies is improved risk management. As the company's cash flow is used to service the acquisition debt, Private Equity investors' greater risk is that the company will not achieve the cash flow necessary (Le Nadant and Perdreau, 2006). This is particularly crucial in the case of leveraged buyout transactions, in which investors are hence most interested in the company's future capacity to generate large and steady levels of cash flow. Scholtens (2006) identifies three specific risks particularly

associated with ESG management default. A first direct risk is present when the investor takes possession of collateral, would it for instance poses a threat to the environment, as fines, decontamination or compliance to standards can become costly. A second indirect risk arises from changes in environmental or social legislation (or consumer preferences), which can affect company's revenues and thereby its default probability. Finally, a reputational risk is also present where actions of borrowers may negatively feedback on its financiers. Hence the following hypothesis is proposed.

H5: Improving risk-management is the most important motive of socially responsible investing in Private Equity.

Hypothesis on New Markets Creation as a Strategic Driver

Environmental issues can create new business opportunities and offers wide innovation possibilities. This opening up of previously undiscovered market has early been highlighted as a rational for CSR (Porter and Van der Linde, 1995; Porter and Kramer, 2002; Vogel, 2005). The Private Equity industry already seized the opportunity of exploiting this "market for virtue" (Vogel, 2005), as witnessed by their increasing involvement in the renewable energy and clean technology markets. Structurally, part of the Private Equity business exists to finance and support new companies and new markets.

Indeed, business angels, seed capital and more globally speaking venture capital provide equity to managers creating or developing businesses. Typically, venture capital is oriented towards innovative firms (health sector, biotechnologies, informatics, energy sector) that can exploit new market opportunities based on consumers' new demand. Conversely, buyouts usually target more mature markets with steady cash flows (services, consumer goods, chemistry, industry) in which CSR rather consists in a transversal approach than in the development of brand new products [11].The following hypothesis can thus be proposed.

H6: Venture capitalists are more likely than other Private Equity investors to develop specialized green funds in order to open new markets.

[11] However, cleantech funds could sometimes differ from responsible investment "per se". For instance, investing in solar panels might not necessarily imply that a full ESG risk analysis has been conducted. Vogel (2005, p. 3) hence points out that if socially responsible firms can benefit from green markets, "there is also a large place for their less responsible competitors". The gap between green funds and socially responsible investing could also be suggested at the industry level by the co-existence in the French Private Equity Association of a "Sustainable Growth Club" and a "Green Techs Club".

Hypotheses on Differentiation and Related Compliance to Limited Partners Demand as Strategic Drivers

Differentiation can drive responsible investment in Private Equity firms under a twofold motivation: reducing competition intensity and capturing Limited Partners' preferences.

Competition intensity between Private Equity firms rocketed up with the financial crisis and the crash of equity raised worldwide (in France, equity raised dropped by 71% in 2009). and competition for fund raising will keep on increasing over the next years as a consequence of the Basel III global regulatory standard on bank capital adequacy and liquidity, which ranked Private Equity funds as being among the most risky and illiquid assets.

However, competition is likely to be heterogeneously perceived by Private Equity funds depending on whether they are *captive funds* or *independent funds*. A captive fund is significantly owned by its Limited Partners (typically a bank or a corporation); hereby fundraising is eased. On the contrary, an independent fund is owned by the Private Equity firm partners and needs to compete to raise funds. Previous literature already highlighted different behaviors (rather than mimetic processes) between captive and independent funds (Gompers and Lerner, 2000; Hellmann, 2002; Hellman et al., 2008)

Integrating ESG criteria might thus be used by Private Equity firms as a differentiation tool to attract Limited Partners [12]. Since fundraising competition is likely to be tougher for independent funds than captive funds, they might also be more induced to differentiate by offering CSR attributes to their investors.

H7a: Independent funds are more likely than captive funds to integrate ESG issues as a differentiation tool to attract investors.

Another related motivation for CSR differentiation in the Private Equity context might also be to capture Limited Partners' preference. Theoretical and empirical work previously found that individual investors may derive non-financial utility from investing in SRI funds (Bollen, 2007; Renneboog et al., 2008). Moreover, different investors exhibit differences in solvency

[12] CSR has already been shown to be a means of differentiation in otherwise competitive environments (Arora and Gangopadhyay, 1995; Fisman et al., 2007), and to most strongly affect performance in low-innovation firms and in industries little segmented (Hull and Rothenberg, 2008), as is the case of the Private Equity industry.

and returns requirements, extent of regulatory oversight, corporate objectives and accounting rules (Cumming and Johan, 2007). They might also differ in their CSR commitments (Cox et al., 2004; Johnson and Greening, 1999; Waddock and Graves, 1994). Among long-term investors, the regulatory constraints which European Pension funds already face (see Renneboog et al. (2008)' review of Pension funds European regulations) are likely to increase their interest for French responsible investments. The following hypothesis is thus proposed.

H7b: Funds with long-term investors, in particular pension-funds, as Limited Partners are more likely to integrate ESG issues.

3.3.3. Hypothesis on Responsive Drivers of Socially Responsible Private Equity

Strategic drivers of responsible investing are typically opposed to responsive drivers. Whereas the former imply a proactive use of CSR to generate profits, the latter hints that sacrificing profits to provide environmental or social performance will hinder the firm from social pressure. Supporting this dichotomy, Baron et al. (2011) empirically show that responsive CSR increases with the firm's slack resources and not strategic CSR.

The Private Equity industry has been the focus of intense criticism over the past few years, both in Anglo-Saxon and Continental Europe countries, which was blamed for short-termism impacting employees, drying-off of investing capacities and prevalence of short-term financial profits over long-term industrial growth in companies financed by the Private Equity industry. Yet, evidence that non-financial stakeholders suffer Private Equity short-termism is thus at best mixed (Boucly et al., 2009; Davis et al., 2011; Amess and Wright, 2007).

However, the financial crash the world economy underwent drew public attention to the funds' activity. The Private Equity recent surge also made it clearly visible. A General Partner hence stated in the British Venture Capital Association report (2010): "General Partners must accept that, now that they are managing large amounts of money, they face increased scrutiny from governments". Grounded or not, the reputation of Private Equity has been tarnished and its social interest is now contested.

Cases of visible polluting industries increasing their environmental and/or social performance under social pressure are many in the CSR literature. The "license to operate" concept

proposed by Post et al. (2002) well summarizes that a firm can hardly survive long when its social interest is contested and its actions have lost legitimacy.

However, social pressure is likely to focus on specific Private Equity actors, namely large visible firms and/or LBO. Indeed, Cumming and Johan (2007) indicate that socially responsible Private Equity investment programs are more common among larger institutional investors. This finding is in line with larger companies tending to be more scrutinized than smaller ones. Second, LBO have been more subject to social criticism than other types of Private Equity, even though Venture Capital's drawbacks have also been pointed out (Hellmann et al., 2008; Ueda, 2004). LBO and Transmission funds being both larger and more subject to criticism than other Private Equity funds types, the following hypothesis can be proposed.

H8: Large and thus visible Private Equity firms as well as leveraged buyouts specialists are more likely to formalize socially responsible investing and to publicly communicate it to protect their reputation and license-to-operate.

The following section now presents the data on which the established hypotheses are tested.

3.4. Data and Method

3.4.1. The French Private Equity Industry

Second largest market in Europe after the United Kingdom, the French Private Equity market (comprising both venture capital and buyouts) is also the third market worldwide in amounts invested behind the United States market (AFIC, 2010).

The French Private Equity industry is usually segmented in: seed and venture capital (9.4% funds invested), growth capital (35.9%) and transmission capital transactions (54.7%; data AFIC, 2010). Leveraged buyouts (LBO) mainly occur in Transmission Capital and essentially deal with divestments of subsidiaries within groups ("spin-offs"; 64.1%); transmission of family businesses (30.8%) and to a minor extent with stock market-listed companies going private ("PTPs"; 5.1%).

The French Private Equity market is hence representative of the continental European market.

However, some differences appear compared to Anglo-Saxon markets and are worth noticing. For instance, PTPs are limited in France compared to the United States and the United Kingdom industries due to regulatory constraints (Le Nadant and Perdreau, 2006). Another specificity of the French Private Equity market arises from lower debt pressure (Desbrières and Schatt, 2002) as well as the substantial part of their personal wealth French managers usually invest in the company's capital (Desbrières and Schatt, 2002).

3.4.2. Sampling and Structural Data

The sample gathers observations on 309 Private Equity firms in 2011, all located in France. It is thus close to the whole French industry, and include 278 out of the 280 members of the French Private Equity Associations, non-members of the Association and French local Private Equity firms sponsored by the French Sovereign Wealth Funds (FSI). We focus on the Private Equity firm level rather than on the Private Equity fund level. Hence a firm in our sample usually managed several funds simultaneously[13].

Equity Data was collected from the Private Equity firms' website, press releases and specialized media[14]. Data includes main characteristics such as the Private Equity firm age (*Firm Age*) and the number of funds it manages (*Funds*), which both give information on the firm experience (Cumming et al., 2009); as well as the number of companies financed by the firm at the time of data collection (*Companies*). Firm size is measured in terms of asset managed (*Assets managed*) and number of investors (*Workforce*).) The firm activity is given by dummy variables indicating whether it engages in venture capital, transmission (buyouts), growth capital, mezzanine, distressed capital or funds of funds transactions.

Data is also collected on the ownership structure of the Private Equity firms, as it has been shown to impact the provision of capital (Cumming et al., 2008). We distinguish the number of shares owned by another Private Equity firm, individual owners-managers (*Partners*),

[13] We are thus not able to control for style drift (see Cumming et al., 2009) that is the deviation from stated objectives of the funds. Indeed we focus on the Private Equity organization, not the Private Equity fund, and a Private Equity firm may comprise more than one fund and may thereby provide investors investment products across a range of stated investment styles.

[14] Specialized media used to built the database include the 2010 and 2011 Private Equity Firms Guide ("Le Guide des Sociétés de Capital Investissement") and the http://investing.businessweek.com website.

banks, insurance companies, industrial corporations and the French State (via government funds). Limited Partners are accounted for by dummy variables indicating whether the firm manages capital provided by an industrial corporation, a sovereign wealth fund, individual investors, pension funds, family offices or if they are captive. A dummy variable also indicates whether the firm manages at least a fund specialized in sector industry. Management style is grasped by variables on the firm CEO gender and background. Geographical investment scope is also controlled for as a growing body of work suggests that international differences in legal and institutional factors can affect Private Equity and SRI allocations (e.g. Lerner and Schoar, 2005; Cumming et al., 2010). In particular, dummy variables indicate whether the firms invest only in a specific French district, in European countries, or in non-European countries ("international scope").

Data on public responsible investment practices is also gathered: signatory of the UNPRI and of the French National Association Ethics Chart; management of green or social funds; web communication on responsible investment practices; and interest as proxied by answer to responsible investment surveys.

Variable description and descriptive statistics can be found in Table 3.1 and the correlation matrix in Table B.1 in Appendix B. Continuous variables were checked for outliers using the Grubbs test (Grubbs, 1969). To limit influential points, the logarithm of the variable "assets managed" was used in regressions.

3.4.3. Survey Data

Whereas structural and investment data can be collected in the public domain, such is not the case of strategies behind responsible investment practices. To get an insider perspective, the database is thus completed with survey data.

The survey was built in partnership with Novethic[15], a subsidiary of the French public institution and long-term investor Caisse des Dépôts et Consignations, and sent to 308 Private Equity firms in March 2011. The questionnaire comprises items on practical ESG integration and formalization; dedicated resources; greenhouse gas emission assessment; positive or

[15] Our research was conducted in full independence and without any biases for the best representativeness to be obtained. In fact Novethic granted access to their data and did not interfere in our study, nor used our results (they conducted independent descriptive research on this topic, not academic one).

negative screening; support provided to the company portfolio to foster CSR; belief in the importance of ESG integration for Limited Partners and firm reputation. Questionnaires were emailed and filled online. Descriptive statistics can be found in Table 3.2.

We obtained a response rate of 24.0% (74 respondents out of 308 firms). This rate compares favorably with those observed in previous surveys on responsible investing in Private Equity: 7% (100 answers out of 1114 Dutch institutions) in Cumming and Johan (2007); 20% (84 answers out of 415 UK firms) in BVCA (2009). In a survey on Private Equity deal structures in Italy, Cumming and Zambelli (2010; 2011) obtained a 47% response rate (27 out of 57 funds) and note that rates observed in previous surveys in finance range from 19% in the United States (Brau and Fawcett, 2006) to 60% in the United Kingdom (Wright and Robbie, 1996).

To limit social desirability bias, the questionnaire made no reference to "socially responsible investment" or to "ethics" (Neumann, 2003; Vyvyan et al., 2011). To stimulate frank answers, the anonymity of respondents was ensured (Kuckertz and Wagner, 2009). Questionnaire wording (translated from French)[16] is presented in Appendix B.

Another common bias in surveys arises from self-exclusion of respondents. Following Moore and Reichert (1983) and Kuckertz and Wagner (2009), the issue of the survey sample representativeness is dealt with by comparing firm characteristics of the respondents to the non-respondents. As our sample covers the whole French Private Equity industry, this comparison provides us with a robust test of our survey representativeness. Univariate tests were used (t-tests for normally distributed variables; test of proportions for categorical data). Detailed results can be found in Table B.2 in Appendix B.

The conducted tests lead us to conclude that there is no statistical difference between responding and non-responding groups in terms of firm age, structure of ownership, geographical investment scope, and industry sector investment scope. Little bias is observed in terms of spread between activities (venture capital, growth capital, mezzanine, funds of funds, reversal, and leveraged buyouts, the latter being slightly overrepresented) and between Limited Partners categories (funds with institutional Limited Partners being slightly overrepresented).

[16] The original French questionnaire is available upon request.

TABLE 3.1 - Descriptive statistics on public data

Variable name	Definition	Observations	Mean	Standard deviation	Minimum	Maximum
Main characteristics						
Firm Age	Years elapsed since firm foundation[1]	310	13.2	11.7	0	102
Workforce	Number of employees	286	13.2	27.2	1	371
Funds	Number of funds managed by the firm[2]	302	5.0	8.7	0	65
Companies	Number of companies hold in portfolio	288	39.7	74.2	0	700
Assets managed	Millions of Euros of assets managed[3]	295	876.2	2951.7	0	32000
Ownership: Percentage of firms shares...						
Listed	... listed on a Stock market (in %).	303	0.01	0.09	0	1
PE firm	... owned by another Private Equity firm (in %).	274	0.16	0.34	0	1
Partners	... owned by the firm Partners (in %).	274	0.42	0.47	0	1
Bank	... owned by a Bank (in %).	274	0.18	0.33	0	1
Insurance company	... owned by an insurance company (in %)	274	0.03	0.16	0	1
Industry	... owned by an industrial corporation (in %).	274	0.05	0.19	0	1
French state	... owned directly or indirectly by the French State (in %).	274	0.11	0.26	0	1
Other	... owned by other shareholders (in %).	274	0.03	0.14	0	1
Limited Partners: Dummy variable equal to 1 if....., 0 otherwise						
LP Industry	....the firm manages funds provided by an industrial corporation	271	0.19	0.39	0	1
LP Captive	... the firm is captive and essentially manages funds provided by a single bank or insurance	271	0.32	0.47	0	1
LP Sovereign	...the firm manages funds provided by a Sovereign Wealth Funds	274	0.39	0.49	0	1
LP Individuals	... the firm manages funds provided by individuals	273	0.21	0.41	0	1
LP Institutional	... the firm manages institutional funds (except pension funds)	267	0.76	0.43	0	1
LP Pension funds	... the firm manages funds provided by pension funds	267	0.26	0.44	0	1
LP Family offices	... the firm manages funds provided by family offices	266	0.37	0.48	0	1

[1] The age of firms founded in 2011 has been rounded to 0. [2] Depending on their legal form, some firms do not manage « funds » as legally defined. [3] Two firms were in the process of raising fund and did not managed assets in 2011.

TABLE 3.1 continued

Variable name	Definition	Observations	Mean	Standard deviation	Minimum	Maximum
Activity						
Venture Capital	Percentage of funds invested in venture capital	303	0.42	0.49	0	1
Transmission	Percentage of funds invested in transmission capital	303	0.60	0.49	0	1
Growth	Percentage of funds invested in growth capital	303	0.59	0.49	0	1
Mezzanine	Percentage of funds invested in mezzanine	303	0.07	0.26	0	1
Distressed Capital	Percentage of funds invested in distressed capital	303	0.09	0.28	0	1
Funds of funds	Percentage of funds invested in funds of funds	303	0.11	0.31	0	1
Investment scope: Dummy variable equal to 1 if...., 0 otherwise						
Minority	.... the firm invests as a minority shareholder	242	0.78	0.42	0	1
Regional scope	... the firm invests only in a specific French district	311	0.92	0.27	0	1
European scope	... the firm invests in other European countries than France	311	0.58	0.50	0	1
International scope	... the firm invests in other countries than European countries	311	0.21	0.40	0	1
Sector	... the firm manages at least one fund specialized in a sector	302	0.36	0.48	0	1
Management: Dummy variable equal to 1 if the Chairman ..., 0 otherwise						
Gender	... is a woman	299	0.05	0.21	0	1
Founder	... founded the firm	290	0.43	0.50	0	1
Engineer	... has a French “Grandes Ecoles” Engineer background	256	0.28	0.45	0	1
Business school	...has a French Business School background	254	0.47	0.50	0	1
International	... has an international background	254	0.22	0.42	0	1
Other	... has a different French background	254	0.46	0.50	0	1
Public Responsible Investment Practices: Dummy variable equal to 1 if the firm.... , 0 otherwise						
UNPRI	... is a UNPRI signatory	316	0.09	0.28	0	1
AFIC Chart	... is signatory of the French Private Equity Association Ethics Chart	317	0.67	0.47	0	1
Green or Social fund	... manages at least one fund with a social or environmental target	302	0.12	0.32	0	1
Communication	...has a website referring to responsible investing practices	297	0.18	0.38	0	1
Interest	... answered to responsible investment survey	308	0.24	0.43	0	1

Table 3.1 summarizes the public data on the characteristics of French Private Equity firms.

TABLE 3.2 - Descriptive statistics of survey data

	All respondents			UNPRI signatories	
	Number of observations.	Mean	Standard deviations	Number of observations.	Mean
Formalization					
ESG Chart	74	0.35	0.48	22	0.59
ESG formation of PE firm employees	74	0.46	0.50	22	0.73
ESG issues managed by a specialized employee	69	0.20	0.40	22	0.36
ESG issues managed by a non-specialized employee	69	0.35	0.48	22	0.36
ESG issues directly managed by investors	69	0.26	0.44	22	0.23
ESG issues managed by a specialized third party	69	0.03	0.16	22	0.05
Engagement					
ESG Chart sent to portfolio companies	74	0.26	0.42	22	0.36
Monitor E. performance of portfolio companies	74	0.20	0.40	22	0.41
Monitor S. performance of portfolio companies	74	0.53	0.50	22	0.64
Monitor G. performance of portfolio companies	74	0.66	0.48	22	0.68
Demand ESG reporting to portfolio companies	74	0.22	0.41	22	0.41
ESG issues brought to company's supervisory board	74	0.23	0.42	22	0.32
ESG issues in shareholders' pact	74	0.18	0.38	22	0.18
Visit companies and plants	74	0.26	0.44	22	0.27
Screening					
Sectorial or normative exclusion	74	0.84	0.37	22	0.73
Already discarded investment on ESG grounds	74	0.45	0.50	22	0.59
Value financial performance driver					
ESG impact measured	66	0.17	0.38	21	0.29
Already bargained lower company price on ESG grounds	74	0.12	0.33	22	0.18
ESG issues matter for risk management	74	0.64	0.48	22	0.77
ESG issues matter to increase company value	74	0.43	0.50	22	0.54
LP demand driver					
ESG Chart communicated to Limited Partners	74	0.24	0.43	22	0.41
ESG reporting communicated to Limited Partners	74	0.12	0.33	22	0.32
ESG performance matters to Limited Partners	74	0.51	0.50	22	0.73
Reputation driver					
ESG Chart public	74	0.05	0.23	22	0.18
ESG reporting public	74	0.01	0.12	22	0.05
ESG issues matter for reputation and image risk	74	0.46	0.50	22	0.59

Table 3.2 presents summary statistics of the survey data collected. Statistics are given for all respondents and for the sub-sample of respondents which also are signatories of the United Nations Principles for Responsible Investing.

However, as expected (Kuckertz and Wagner, 2009), replies contain a disproportionate number of companies particularly concerned about responsible investing as shown by the significantly larger proportions of UN PRI and AFIC Ethic Chart signatories, firms communicating about CSR on their website; and firms managing green or social funds. Hereby survey answers will be used in further regressions as a proxy for firm's interest in responsible investment practices. Respondents are also significantly larger than non-respondents in terms of assets managed, workforce, number of funds and companies in portfolio. We explain the firm size bias as being related to the overrepresentation of firms interested in responsible investing practices, as discussed in sections 3.1 and 3.3. Nonetheless, the sample still includes a wide range of firm size (from 0.7 to 28 000 millions of Euros managed; median 318 millions of Euros). Those elements lead us to conclude that our survey sample well represents the French Private Equity industry.

3.5. Multivariate Empirical Analysis

Descriptive statistics on public and survey data provide first elements of analysis (Tables 3.1, 3.2 and 3.3). Probit regressions are then used to analyze the factors driving the probability that a Private Equity firm implements responsible investment practices. Three public indicators of responsible investing are empirically investigated: being a UN PRI signatory (Tables 3.4 and 3.5); managing a fund specialized on environmental or social issues (Table 3.6); and communicating on responsible investing on website (Table 3.7). Using those three alternative measures of responsible investing enables us to check whether they have similar underlying drivers.

For all three dependent variable, we also provide four regression models ("model 1" to "model 4" in Table 3.4 to 3.5) to show result robustness to alternative subsets in the sample and alternative explanatory variables (as in Cumming and Johan, 2007). Control variables include other responsible investment practices, so we can identify the specificity of our dependent variables. For instance, when estimating drivers of UNPRI signature (Tables 3.4 and 3.5), we control for four other variables grasping the global fund engagement in responsible practices (namely signature of the AFIC Chat, management of green or social funds, SRI communication and answers to SRI survey). These controls allows us to better identify if UNPRI signature, management of green or social funds (Table 3.6) and

communicating on responsible investing on website (Table 3.7) are each driven by specific factors.

Results are now presented and discussed.

3.5.1. Results on Characteristics of Socially Responsible Private Equity

Results confirm hypothesis H1: Responsible Private Equity firms do not belong to an SRI niche market but rather integrate ESG issues in mainstream business. Indeed, we find that 12% firms manage at least one environmental or social fund (Table 3.1). Yet only 6 firms (less than 2%) specialize on such funds. Most of those who do manage green funds also manage classic funds. Signatories of the UN PRI and firms who answered survey, i.e. firms who have an interest for CSR issues, are widely conventional Private Equity funds.

Results also confirm hypothesis H2a: Private Equity firms are more likely to favor Governance aspects within the ESG issues. Table 3.2 displays that Governance was monitored by 66% responders, significantly exceeding Environment (20%) and Social (53%) issues.

Results support hypothesis H2b: Socially responsible Private Equity investors is characterized by investor engagement. Indeed, we see from table 3.2 that 23% brought ESG issues to company's supervisory board; 53% responders used direct monitoring of social issues in company (64% among UN PRI signatories); 26% visited companies or plants and 22% demanded ESG reporting to portfolio companies (41% for UN PRI). However, ESG issue management is not legally enforced though the shareholders' pact. We can note that engagement is also associated with ESG screening. 84% firms already discarded an investment opportunity of ESG grounds (see Table 3.2). Let us note that this high percentage might be driven up by governance issues, at the core of the Private Equity business.

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TABLE 3.3 - Comparison of means and medians by UN PRI signature

CSR dimension	UNPRI signatory				UNPRI non signatory			
	Obs.	Mean	Std. Dev.	Median	Obs.	Mean	Std. Dev	Median
Age	**281**	**12.96**	**10.87**	**11.00**	**28**	**15.21**	**18.83**	**10.00**
Workforce	**258**	**11.86**	**27.04**	**7.00**	**28**	**25.54**	**26.50**	**14.50**
Companies	**260**	**36.47**	**62.66**	**16.00**	**28**	**70.25**	**140.48**	**20.50**
Log(Assets managed)	**265**	**4.73**	**1.89**	**4.65**	**28**	**6.45**	**1.92**	**6.20**
PE firm	247	0.16	0.34	0.00	26	0.21	0.38	0.00
Partners	**247**	**0.41**	**0.47**	**0.00**	**26**	**0.52**	**0.45**	**0.63**
Bank	247	0.18	0.34	0.00	26	0.10	0.27	0.00
Insurance company	247	0.03	0.16	0.00	26	0.04	0.20	0.00
Industry	247	0.05	0.20	0.00	26	0.04	0.20	0.00
French state	250	0.12	0.26	0.00	26	0.08	0.27	0.00
LP Industry	243	0.19	0.40	0.00	27	0.15	0.36	0.00
LP Captive	243	0.31	0.46	0.00	27	0.41	0.50	0.00
LP Sovereign	246	0.40	0.49	0.00	27	0.30	0.46	0.00
LP Individuals	245	0.20	0.40	0.00	27	0.30	0.47	0.00
LP Institutional	239	0.78	0.74	1.00	27	0.93	0.27	1.00
LP Pension funds	239	0.24	0.44	0.00	27	0.48	0.51	0.00
LP Family offices	238	0.38	0.49	0.00	27	0.26	0.45	0.00
Venture Capital	274	0.43	0.50	0.00	28	0.32	0.48	0.00
Transmission	274	0.60	0.49	1.00	28	0.64	0.49	1.00
Growth	274	0.60	0.49	1.00	28	0.54	0.51	1.00
Funds of funds	274	0.10	0.29	0.00	28	0.19	0.39	0.00
Mezzanine	274	0.07	0.26	0.00	28	0.07	0.26	0.00
Minority	217	0.78	0.42	1.00	24	0.75	0.44	1.00
Regional scope	282	0.18	0.39	0.00	28	0.04	0.19	0.00
European scope	282	0.55	0.50	1.00	28	0.79	0.42	1.00
International scope	282	0.21	0.41	0.00	28	0.18	0.39	0.00
Sector	274	0.35	0.48	0.00	27	0.41	0.50	0.00
Founder	263	0.43	0.50	0.00	27	0.44	0.50	0.00
Engineer	229	0.28	0.45	0.00	27	0.33	0.48	0.00
Business school	227	0.49	0.50	0.00	27	0.33	0.48	0.00
International	227	0.22	0.42	0.00	27	0.22	0.42	0.00
AFIC Chart	288	0.65	0.48	1.00	28	0.89	0.32	1.00
Green or Social fund	275	0.12	0.32	0.00	26	0.15	0.37	0.00
Communication	**270**	**0.14**	**0.34**	**0.00**	**27**	**0.63**	**0.49**	**1.00**
Interest	**280**	**0.19**	**0.39**	**0.00**	**28**	**0.79**	**0.42**	**1.00**

Table 3.3 presents means (with standard deviations) and medians for control variables of respectively UNPRI signatories and non-signatories. Bold lines highlight variables whose medians differ depending on UNPRI signature.

TABLE 3.4 - Multivariant analysis (Probit) on UNPRI signature drivers

		model 1			model 2		
		Marginal effect	z-stat.		Marginal effect	z-stat.	
Firm characteristics	Age	-1.95e-05	-0.06		5.53e-06	0.02	
	Workforce				5.76e-04	2.18	**
	Companies	-9.09e-05	-1.33		-1.49e-04	-1.94	*
	Log(Assets managed)	8.33e-03	2.10	**			
Ownership	PE firm	4.44e-02	1.47		-4.85e-03	-0.40	
	Partners	4.78e-02	1.67	*			
	Bank	4.21e-02	1.28				
	Insurance company	4.71e-02	1.09		1.66e-02	0.71	
	Industry	6.11e-02	1.77	*			
	French state	4.87e-02	1.56				
Limited Partners	LP Industry				-8.87e-03	-1.37	
	LP Captive				-4.79e-03	-0.56	
	LP Sovereign				1.39e-02	1.03	
	LP Individuals	1.98e-02	1.19		4.52e-03	0.40	
	LP Institutional	4.98e-03	1.15		3.20e-03	0.85	
	LP Pension funds	1.03e-02	0.94		7.55e-03	0.77	
	LP Family offices	-1.23e-03	-0.15		-1.15e-02	-1.45	
Activity	Venture Capital	9.43e-03	0.74		4.54e-03	0.42	
	Transmission	-6.27e-03	-0.52		1.15e-03	0.12	
	Growth	-1.97e-02	-1.34		-2.68e-02	-1.65	
	Funds of funds	3.71e-02	0.85		3.40e-03	0.17	
	Mezzanine	2.27e-01	1.94	*	2.11e-01	1.90	*
Investment scope	Minority	1.90e-02	2.02	**	1.97e-02	2.07	**
	Regional scope	5.97e-03	0.28		-5.89e-04	-0.04	
	European scope	-3.36e-02	-1.61		-9.30e-03	-0.77	
	International scope	-6.66e-03	-0.91		-8.37e-03	-1.36	
	Sector	1.22e-03	0.13		1.30e-02	1.12	
	Founder				4.76e-03	0.62	
Management	Engineer	-9.16e-03	-1.24		-8.09e-03	-1.14	
	Business school	-1.29e-02	-1.35		-1.03e-03	-0.12	
	International	1.82e-02	1.11		1.35e-02	0.98	
Responsible investment practices	AFIC Chart	2.17e-02	1.84	*	2.13e-02	1.98	**
	Green or Social fund	-7.70e-03	-1.35		-7.50e-03	-1.45	
	Communication	1.08e-01	2.85	***	9.68e-02	2.64	***
	Interest	1.44e-01	3.45	***	1.69e-01	3.51	***
Nb. of obs.		166			163		
Nb. of obs. where =1		21			21		
Pseudo R2		53.08			52.67		
Loglikehood function (L)		-29.57			-29.64		
LR-Chi-2 statistics		66.91	***		65.97	***	

Maximum-likelihood probit models. Marginal effects on the change in the probability of becoming a UNPRI signatory are reported. Pseudo R2 is calculated by McFadden's formula, which is: Pseudo R2= 1 – log L / log (LR). The LR-Chi2 statistics provides a test of the model robustness by indicating that the model as a whole fits significantly better than a model with no predictors. Two-tailed tests were used. *p<0.10;**p<0.05; ***p<0.01.

TABLE 3.5 - Multivariant analysis (Probit) on UNPRI signature drivers - continues

		model 3			model 4		
		Marginal effect	z-stat.		Marginal effect	z-stat.	
Firm characteristics	Age						
	Workforce						
	Companies						
Ownership	Log(Assets managed)	1.84e-02	3.23	***	1.98e-02	2.86	***
	PE firm	1.40e-01	1.78	*			
	Partners	1.27e-01	1.69	*			
	Bank	1.02e-01	1.30				
	Insurance company	6.09e-02	0.72				
	Industry	1.44e-01	1.71	*			
	French state	1.44e-01	1.79	*			
Limited Partners	LP Industry						
	LP Captive						
	LP Sovereign						
	LP Individuals						
	LP Institutional						
	LP Pension funds						
	LP Family offices						
Activity	Venture Capital				4.73e-03	0.23	
	Transmission				-1.05e-02	-0.46	
	Growth				9.89e-03	0.50	
	Funds of funds				9.74e-03	0.29	
	Mezzanine				6.01e-03	0.17	
Investment scope	Minority						
	Regional scope				-9.57e-03	-0.26	
	European scope				-1.03e-02	-0.40	
	International scope				-3.67e-02	-2.09	**
	Sector						
	Founder						
Management	Engineer						
	Business school						
	International						
	AFIC Chart	5.11e-02	2.05	**	5.39e-02	2.11	**
Responsible investment practices	Green or Social fund	-1.44e-03	-0.05		-1.76e-02	-0.68	
	Communication	1.56e-01	3.69	***	1.97e-01	4.10	***
	Interest						
Nb. of obs.		257			281		
Nb. of obs. where =1		24			26		
Pseudo R2		30.89			31.18		
Loglikehood function		-55.11			-59.63		
LR-Chi-2 statistics (L)		49.27	***		54.03	***	

Maximum-likelihood probit models. Marginal effects on the change in the probability of becoming a UNPRI signatory are reported. Pseudo R2 is calculated by McFadden's formula, which is: Pseudo R2= 1 – log L / log (LR). The LR-Chi2 statistics provides a test of the model robustness by indicating that the model as a whole fits significantly better than a model with no predictors. Two-tailed tests were used. *p<0.10;**p<0.05; ***p<0.01.

TABLE 3.6 - Multivariant analysis (Probit) on Green or Social funds management drivers

		model 1			model 2			model 3			model 4		
		Marginal effect	z-stat.		Marginal effect	z-stat.		Marginal effect	z-stat.		Marginal effect	z-stat.	
Firm characteristics	Age	5.11e-08	1.92	*	4.41e-11	1.71	*						
	Workforce				-6.53e-11	-1.65	*						
	Log(Assets managed)	-2.19e-07	-1.11					-1.91e-02	-2.12	**	-9.13e-03	-1.12	
Ownership	PE firm	-3.40e-07	-0.20		-2.07e-09	-1.47		-7.60e-04	-0.01				
	Partners	-3.10e-08	-0.04					-2.51e-02	-0.31				
	Bank	9.63e-07	0.93					1.14e-02	0.13				
	Industry	4.12e-06	1.90	*				7.94e-02	0.78				
	French state	-3.26e-06	-1.76	*				6.60e-02	0.70				
Limited Partners	LP Industry				6.70e-07	1.22							
	LP Captive				1.13e-11	0.02							
	LP Sovereign				3.32e-10	0.42							
	LP Individuals	-1.69e-07	-0.34		1.47e-05	1.55							
	LP Institutional	5.99e-07	1.66	*	6.69e-10	1.46							
	LP Pension funds	4.86e-04	1.83	*	1.64e-07	1.46							
	LP Family offices	-1.52e-07	-0.24		1.60e-09	0.52							
Activity	Venture Capital	3.24e-05	1.99	**	1.56e-06	1.72	*				5.55e-02	1.99	**
	Transmission	-7.88e-03	-2.16	***	-1.80e-04	-1.72	*				-7.36e-02	-2.35	**
	Growth	7.63e-05	2.08	**	1.49e-05	1.46					7.66e-02	2.68	***
	Funds of funds	4.04e-03	1.56		3.18e-05	1.34					1.85e-02	0.38	
Investment scope	Minority	-1.37e-04	-1.40		-2.75e-09	-0.62							
	Regional scope	-3.49e-07	-0.71		-1.06e-09	-0.96					3.87e-02	0.84	
	European scope	-4.87e-05	-1.37		-1.09e-07	-1.09					-1.63e-03	-0.05	
	International scope	-1.85e-07	-0.45		-1.17e-10	-0.55					2.21e-02	0.64	
	Founder				-5.30e-09	-1.00							

TABLE 3.6 - continued

		model 1			model 2			model 3			model 4		
		Marginal effect	z-stat.		Marginal effect	z-stat.		Marginal effect	z-stat.		Marginal effect	z-stat.	
Management	Founder				-5.30e-09	-1.00							
	Engineer	9.95e-05	1.59		1.03e-07	1.44							
	Business school	6.58e-09	0.01		-1.65e-10	-0.28							
	International	2.05e-04	1.38		1.32e-06	1.70	*						
Responsible investment practices	AFIC Chart	-3.53e-07	-0.26		-7.03e-06	-1.36		6.45e-02	1.77	*	2.82e-02	0.97	
	UNPRI	4.48e-08	0.05		5.10e-06	1.14		-3.57e-02	-0.80		-2.85e-02	-0.82	
	Communication	2.09e-02	2.18	**	1.36e-03	2.00	**	3.95e-01	5.16	***	3.40e-01	5.40	***
	Interest	1.35e-05	1.27		2.27e-07	1.50							
Nb. of obs.		174			167			257			281		
Nb. of obs. where =1		14			14			27			30		
Pseudo R2		65.03			65.97			24.25			32.56		
Loglikehood function		-17.03			-16.37			-65.43			-64.38		
LR - Chi-2 statistics		63.34	***		63.47	***		41.88	***		62.15	***	

Table 3.6 presents results obtained by fitting maximum-likelihood probit models (model 1, model 2, model 3 and model 4). It reports marginal effects on the change in the probability of managing a Private Equity funds specialized on green or social issues (change in the probability for an infinitesimal change in each continuous variable; discrete change in the probability for dummy variables). Pseudo R2 is calculated by McFadden's formula, which is: Pseudo R2= 1 – log L / log (LR). The LR-Chi2 statistics provides a test of the model robustness by indicating that the model as a whole fits significantly better than a model with no predictors. Two-tailed tests were used. *p<0.10;**p<0.05; ***p<0.01.

TABLE 3.7 - Multivariant analysis (Probit) on CSR communication drivers

		model 1			model 2			model 3			model 4		
		Marginal effect	z-stat.		Marginal effect	z-stat.		Marginal effect	z-stat.		Marginal effect	z-stat.	
Firm characteristics	Age	-6.38e-4	-0.31		2.19e-4	0.13							
	Workforce				1.31e-3	1.06							
	Log(Assets managed)	3.92e-3	0.18					3.53e-2	2.99	***	2.65e-2	1.99	**
Ownership	PE firm	-3.31e-1	-2.21	**	-1.04e-1	-1.23		-2.49e-1	-2.34	**			
	Partners	-1.91e-1	-1.49					-1.78e-1	-1.95	*			
	Bank	-3.23e-1	-2.16	**				-2.82e-1	-2.58	***			
	Industry	-7.42e-3	-0.03	*				-8.05e-2	-0.60				
	French state	-3.00e-1	-1.78					-2.07e-1	-1.57				
Limited Partners	LP Industry				-1.49e-3	-0.02							
	LP Captive				1.74e-2	0.28							
	LP Sovereign				4.23e-2	0.60							
	LP Individuals	1.35e-1	1.70	*	9.22e-2	1.36							
	LP Institutional	-9.51e-2	-1.14		-9.25e-2	-1.31							
	LP Pension funds	-3.45e-2	-0.55		-2.33e-2	-0.42							
	LP Family offices	-8.54e-2	-1.41		-1.08e-1	-1.96	**						
Activity	Venture Capital	2.95e-2	0.42		-2.52e-2	-0.37					7.73e-3	0.17	
	Transmission	5.44e-2	0.72		5.96e-2	0.90					1.55e-2	0.35	
	Growth	-6.15e-2	-0.88		-8.54e-2	-1.28					-1.89e-2	-0.45	
	Mezzanine	-8.07e-2	-0.92		-5.88e-2	-0.76					-6.80e-2	-1.00	
	Funds of funds	-4.55e-2	-0.44		-3.23e-2	-0.37					-3.41e-2	-0.56	
Investment scope	Minority	-4.85e-2	-0.52		-5.77e-2	-0.72							
	Regional scope	1.42e-1	0.97		6.78e-3	0.06					-1.18e-2	-0.15	
	European scope	1.95e-1	2.53	**	1.70e-1	2.53	**				6.75e-2	1.25	
	International scope	8.82e-2	1.13		8.92e-2	1.23					5.30e-2	1.00	

TABLE 3.7 - continued

		model 1			model 2			model 3			model 4		
		Marginal effect	z-stat.		Marginal effect	z-stat.		Marginal effect	z-stat.		Marginal effect	z-stat.	
Management	Founder				8.25e-2	1.32							
	Engineer	8.68e-2	1.25		9.57e-2	1.53							
	Business school	-2.12e-2	-0.36		1.83e-2	0.34							
	International	8.04e-2	1.06		7.51e-2	1.10							
Responsible investment practices	AFIC Chart	3.31e-4	0.00		4.23e-2	0.75		6.94e-3	0.14		1.12e-2	0.24	
	UNPRI	3.17e-1	2.54	**	2.10e-1	1.99	**	2.88e-1	2.96	***	3.15e-1	3.38	
	Green or social funds	6.48e-1	3.54	***	7.02e-1	4.04	***	5.17e-1	5.36	***	5.19e-1	5.48	***
	Interest	4.18e-2	0.61		4.63e-2	0.72		4.04e-2	0.77		6.45e-2	1.25	
Nb. of obs.		174			167			257			281		
Nb. of obs. where =1		36			35			43			48		
Pseudo R2		45.34			46.16			33.62			33.51		
Loglikehood function		-48.49			-46.16			-77.06			-85.42		
LR - Chi-2 statistics		80.44	***		79.16	***		78.03	***		86.10	***	

Table 3.7 presents results obtained by fitting maximum-likelihood probit models (model 1, model 2, model 3 and model 4). It reports marginal effects on the change in the probability of the Private Equity firm to communicate on its website about corporate social responsibility, socially responsible investment or the management of ESG issues (change in the probability for an infinitesimal change in each continuous variable; discrete change in the probability for dummy variables). Pseudo R2 is calculated by McFadden's formula, which is: Pseudo R2= 1 – log L / log (LR). The LR-Chi2 statistics provides a test of the model robustness by indicating that the model as a whole fits significantly better than a model with no predictors. Two-tailed tests were used. *p<0.10;**p<0.05; ***p<0.01.

Finally, results partly confirm hypothesis H3: socially responsible investing is more likely in large Private Equity firms in terms of workforce. Indeed, the probability of being a UN PRI signatory (Table 3.4) increases with workforce size, yet in a small extent. Precisely, the probability of being a UN PRI signatory increases by 0.058% for any additional employee (model 2, Table 3.4, $p<0.05$). Moreover, survey descriptive statistics indicate that 46% of survey respondents provide and ESG formation to their employees (Table 3.2). This formation argues both in favor of the current lack of human capital to manage such issues, which might be problematic for ESG management, as well as a real involvement to develop this human capital.

3.5.2. Results on Strategic Drivers of Socially Responsible Private Equity

Results do not support hypothesis H4: Socially responsible investing in Private Equity are partly motivated by creating value in the companies owned, yet this does not appear as the main stated motive. Indeed, survey data highlights that 43% of respondents only agree with ESG issues being important to create value (54% among UN PRI signatories; Table 3.2). We can note that only 12% ever measured ESG impact on their portfolio performance. Hence most investors believing that responsible investing creates value do it on qualitative grounds.

Conversely, hypothesis H5 is partly confirmed by survey answers: socially responsible investing is strongly motivated by risk-management. 64% of the respondents (77% of UN PRI signatories) believe ESG issues matter for risk management (Table 3.2). Whereas risk-management appears to be more important a responsible investing driver than value creation, it should be noted that data does not allow to clearly state whether risk management is more or less important than differentiation.

Strong support is also brought to hypothesis H6: Venture capitalists are more likely than other Private Equity investors to develop specialized green funds in order to open new markets. The probability to manage such funds statistically significantly increases when the firm is a venture capitalist and decreases in transmission capital (buyouts). Precisely, marginal effects reported in Table 3.6 indicate that the probability of managing a green or social fund is 5.55% higher (model 4, $p<0.05$) in venture capital funds and 7.36% lower in transmission capital ($p<0.05$). We can also note that Growth Capital firms are also very active on green techs.

Their activity is indeed more in line with venture capital than with buyouts as they invest in expansion cycles of companies. Consequently, Private Equity firms managing green funds hence show typical characteristic of venture capitalists, as significantly smaller firms in terms of workforce and assets. Probit results also confirm the dichotomy between specialized green funds and responsible investing. Indeed, being a UN PRI signatory does not increase the probability to manage a green fund (Table 3.6), and respectively, managing a green funds does not increase the probability to be a UN PRI signatory (Tables 3.5 and 3.6).

Evidence is mixed on hypothesis H7. As a primer, the belief among General Partners that ESG issues matter for Limited Partners is strongly supported by survey data. 51% of the respondents agree so, up to 73% among UN PRI signatories. A few firms (12%) actually report their ESG performance to Limited Partners, most likely because they are themselves still implementing ESG reporting at their portfolio level.

Hypothesis H7a is strongly confirmed: Independent funds are more likely than captive funds to develop responsible practices as a differentiation tool to attract investors. Indeed, we observe that Private Equity firms owned by their partners, meaning independent, have a 12.7% higher probability of being UN PRI signatories (model 3, Table 3.4, $p<0.10$; effect of 4.78% in model 3). However, no significant effect of specific categories of Limited Partners is found on the probability to be a UN PRI signatory, neither positive nor negative. In particular, Captive funds are not less likely to be signatories. Results also show that Private Equity firms owned by banks (bank captive funds) are less likely to communicate on responsible investing on their website than other firms. Precisely, marginal effects show that they have a 33% lower probability (model 1, Table 3.7, $p<0.05$, effect of 25% in model 3). Similarly, Private Equity firms owned by other Private Equity firms (Private Equity captive funds) also have a 32% lower probability (model 1, Table 3.7, $p<0.05$; effect of 28% in model 3). This finding is in line with Cumming et al. (2008), who find in the context of Japanese venture capitalists that owner-managers provide more advice to entrepreneurs than captive managers (such as bank's venture capital divisions).

However, hypothesis H7b is infirmed: Funds with long-term investors, in particular pension-funds, as Limited Partners do not appear more likely to implement responsible practices. Table 3.4 displays that firms with Pension funds as Limited Partners, as well as Institutional and Sovereign Limited Partners, are not more likely to be UN PRI signatories.

However, ownership seems to matter more than Limited Partners in this regard. CSR Communication is also more impacted by who owns the Private Equity firm rather than who finances it (Table 3.7).

3.5.3. Results on Responsive Drivers of Socially Responsible Private Equity

Results partly confirm hypothesis H8 on responsive driver of socially responsible investing: Large and thus visible Private Equity firms are more likely to engage in socially responsible practices that are well formalized and publicly communicated to protect their reputation and license-to-operate; yet leveraged buyouts specialists do not particularly stand out in this regard.

We previously noted that large Private Equity firms in terms of workforce were more likely to be UN PRI signatories, and this effect appears stronger and more robust when size is captured by the amounts of assets managed. Indeed, marginal effects observed indicate that a 1 unit increase in the logarithm of assets managed increases the probability of being a UN PRI signatory by 1.98% (model 4, Table 3.5, $p<0.01$; effect of 1.84% in model 3). In other words, a 100% increase in assets managed increases the probability of being a UN PRI signatory by 1.98%. Results also show that a 100% increase in assets managed increases the probability of public communication on responsible investing by 3.53% (model 3, Table 3.5, $p<0.01$; effect of 2.65% in model 4). Let us note that despite significance, the size effect magnitude appears small (in particular compared to the independence effect previously discussed).

Survey data also show that ESG Chart, ESG dedicated post, ESG reporting and UN PRI signature come as a bundle (see correlation Table B.1 in Appendix B). Hereby formalizing socially responsible investing appears more likely in large Private Equity firms.

However, being specialized on Transmission capital (hence leveraged buyouts) does not appear to have any significant effect on UN PRI signature and communication.

In our results, geographical scope variables appear to play a significant role negatively for PRI signature (at the international scope), and positively for CSR communication (at the European scope), suggesting that various national contexts may affect SRI behaviors. In

particular, the positive effect of investing at the European scope on CSR communication may suggest a form of mainstreaming of SRI at the European level (for instance influenced by the CSR reporting constraints imposed in various countries); whereas the negative effect of investing at an international scope on PRI signature may suggest that the diversity of institutional contexts does not favor transversal and global SRI engagement.

How to disentangle differentiation from reputation protection? First, let us note that 46% survey respondents believe ESG matter for reputation and image risk (59% UN PRI signatories), which is high but less than the belief in ESG importance for Limited Partners' demand. Second, we observe that very few firms communicate their ESG reporting (1%) and ESG Chart (5%) to the public. Those elements lead us to conjecture that protecting firm's image and reputation matters more for the business than for the public.

3.5.4. Limits of the Analysis and Further Research Paths

This exploratory paper presents exploratory evidence on socially responsible investment at the Private Equity firm level and shows an important role for engagement. Hypotheses test results are summarized in Table 3.8.

Several other factors, which were beyond the scope of our database, are likely to also influence SRI behavior in Private Equity. Compensation terms for instance might influence socially responsible practices. Indeed, a related literature has shown the role of executive compensation in the implementation of CSR in listed companies (e.g. Mahoney and Thorne, 2006; Berrone and Gomez-Mejia, 2009). Besides, Johan and Najar (2010) examine the role of law and culture in setting fund manager fees and show that they are much more significant than manager characteristics and/or market conditions. Interactions between legal conditions, culture, compensation terms and engagement would thus be highly interesting to investigate in further research.

Similarly, we control for education and international experience of the fund manager, but not experience. Whether the fund manager is experienced or a first time fund manager might impact his investment practices. Though fund manager education and international experience do not appear to play a significant role in our approach, experience may affect responsible investment practices (see Cumming and Walz, 2010).

SRI behavior in Private Equity could also be driven by other factors, such as regulatory pressure. An extensive literature has highlighted that the threat of fines and other regulatory costs may induce higher CSR activities (for instance, see Lutz. et al., 2000) Socially responsible practices might thus also have been influenced by regulatory pressure. In particular, in France, the recently published Grenelle II Law (April 2012) now requests non-listed firms to publish ESG reporting (starting respectively from 2012 and 2014 for firms employing above 5000 and 500 employees). Extending our research to other markets, such as the United Kingdom or the United States, would provide an effective test of the importance of the regulatory and institutional context on Private Equity socially responsible investing. Moreover, it would test for the national anchorage of our results.

From a wider perspective, our study highlights important strategic drivers behind socially responsible Private Equity. Hereby ESG concerns tackled by investors are likely to be those identified as having the largest impact on the bottom line of the companies they owned. Testing this hypothesis would constitute a promising extension of our research. Such an analysis could be lead at the company level, for instance by exploring the impact investor engagement has on the company, its stakeholders and society as a whole.

Finally, another level that could be worth investigating would be the Private Equity fund level. Within the same Private Equity firm, it is indeed likely that differences exist between funds managed. Funds can for instance vary depending on their vintage year, since it is related to market conditions and to business cycles and is known to impact company valuations and return expectations (see Kaplan and Schoar, 2005). Here we used the Private Equity firm age as a proxy for market condition, but other controls such as the MSCI returns in the year prior to the establishment of the fund would be more accurate. Funds can also undergo style drift, meaning they can deviate from their stated objectives in terms of the focus for their investments. Cumming et al. (2009) have shown that style drifts are less likely among younger fund managers; are affected by market conditions; and are positively related to investment performance. Focusing on the fund level would enable to identify whether responsible practices are impacted by style drift, and conversely.

3.6. DISCUSSION

We provide a summary of our hypotheses and results in Table 3.8 and discuss below our main observations from this empirical analysis.

3.6.1. SOCIALLY RESPONSIBLE PRIVATE EQUITY: RESPONSIVE OR STRATEGIC?

Our empirical results support that responsible investment in French Private Equity is a mainstream movement which got quickly structured under the impetus of independent large conventional actors, both in terms of human capital and assets managed.

This movement in fact appears characterized by a mix of both ESG screening and engagement, with Private Equity investors typically being much involved in the portfolio company's management.

Socially responsible investing seems essentially strategically driven, Private Equity investors hereby aiming at creating value (event though this motive is not the main one), improving risk management and differentiating to raise fund, especially independent firms. Among all the effects we tested, we found that firm independence was by far the largest in terms of magnitude. SRI as implemented by those investors therefore appears in line with shareholders' value maximization and consistent with a business improvement.

3.6.2. SOCIALLY RESPONSIBLE PRIVATE EQUITY: ENGAGEMENT OR ACTIVISM?

Our approach confirms that engagement on ESG issues quite differs between Private Equity investors and Public investors. On public markets, engagement is usually referred to as shareholder activism. Sparkes (2008) defines shareholder activism as *'the use of the voting rights attached to ordinary shares to influence company management*'. Since they usually are majority or significant shareholders, Private Equity investors have considerable influence as active investors.

TABLE 3.8 - Summary of hypotheses and results

Hypotheses	Test Result	Conclusion (if hypothesis is not confirmed)
H1: Socially responsible PE firms integrate ESG issues in mainstream business (as opposed to considering it as a niche market segment.	Confirmed	
H2a: PE firms are more likely to favor Governance aspects within the ESG issues.	Confirmed	
H2b: Socially responsible PE is characterized by investor engagement.	Confirmed	
H3: The integration of ESG issues is more likely to be implemented in large PE firms in terms of workforce.	Partly Confirmed	The integration of ESG issues is more likely to be implemented in large PE firms in terms of workforce, yet the effect is small.
H4: Creating value in companies owned is the most important motive of socially responsible investing in Private Equity.	Infirmed	Socially responsible investing in PE are motivated by creating value in the companies owned, yet this is not the major motive
H5: Risk-management is the most important motive of socially responsible investing in Private Equity.	Partly Confirmed	Risk-management appears as an important motive, but we cannot assess whether it is more or less important than differentiation
H6: Venture capitalists are more likely than other PE investors to develop specialized green funds in order to open new markets.	Confirmed	
H7a: Independent funds are more likely than captive funds to integrate ESG issues as a differentiation tool to attract investors.	Confirmed	
H7b: Funds with long-term investors, in particular pension-funds, as Limited Partners are more likely to integrate ESG issues.	Infirmed	Funds with long-term investors, in particular pension-funds, as Limited Partners do not appear more likely to implement responsible practices.
H8: Large and thus visible PE firms as well as LBO specialists are more likely to formalize socially responsible investing and to publicly communicated it to protect their reputation and license-to-operate.	Partly confirmed	Large and thus visible PE firms are more likely to engage in socially responsible practices that are well formalized and publicly communicated to protect their reputation and license-to-operate; yet LBO specialists do not particularly stand out in this regard.

This table summarizes our hypotheses, their test results and our conclusions when the hypotheses were only partly confirmed or infirmed.

Moreover, engagement in the specific context of Private Equity is to be distinguished from conventional ethical activism, such as undertook by religious institutional investors in the United States through the Interfaith Center on Corporate Responsibility (Williams, 2007). According to Smith (1996), engagement acts as an implicit threat to the company that if the investor's concerns are not addressed, an exclusionary strategy may be adopted. Sparkes (1998) hence have argued that shareholder activism differs from SRI as advocacy is characterized by a single-issue focus, no financial concerns, and the seeking of confrontation and publicity; whereas SRI is characterized by multi-issue concern, strong financial interest, the seeking of engagement and the avoidance of publicity. However, Private Equity investors are active investors who promote ESG issues on strategic grounds rather than ethical ones. Hereby their engagement does not fit to Sparkes's definition as they target promoting CSR in order to maximize shareholders' value. A possible explanation of this difference might lie in the specificity of the French context, whereby SRI mainstreaming has been taking place under the explicit goal of penetration of ESG criteria into conventional funds, thereby maybe creating a sort of 'ESG externality' on the socially Responsible Private Equity market.

3.6.3. Socially Responsible Private Equity: A Stronger Impact than Public Investors

Finally, this paper's findings on Private Equity investors suggest that those who care for ESG issues might have a stronger impact as active investors than Public investors. Indeed, results are that 23% of respondents brought ESG issues to company's supervisory board, 53% directly monitored those issues and 26% visited plants. Compared to such figures, shareholder advocacy is still in practice limited on public markets. For instance, Lewis and Mackenzie (2000) found little support of hard engagement in their large survey of UK ethical public investors, passive signaling (screening) being most favored. In the United States, Lydenberg (2002) argues that the "Wall Street Rule" generally applies, that is shareholders are expected to regulate managers by selling shares rather than by trying to change management practices through engagement. Indeed, SRI funds which used both screening and advocacy accounted in 2003 for about a fifth of all SRI funds (Social Investment Forum 2003). In Europe, Eurosif (2010 European SRI Survey) estimated €1.5 trillion assets managed were impacted by SRI engagement, representing about 28% of all broad SRI approaches in Europe.

Here we find that conventional Private Equity funds which care for ESG issues appear active at an equivalent level on the French market. Hereby findings hint that this financial industry might have the potential to become a powerful tool to promote sustainable practices in portfolio companies. However, to realize this potentiality, Private Equity firms need to develop a sound expertise of ESG issues and to acquire the corresponding human capital. Considering the current difficulties of the industry related to the financial crisis and liquidity dearth, it seems unlikely that Private Equity firms will currently invest in such competencies. Would that turn out so, the development of an effective and reliable responsible investment movement beyond its current frontiers might be compromised.

3.7. CONCLUSION

Whereas most SRI literature has focused on public markets, this paper highlights that French Private Equity investors recently seized ESG issues and are developing a mainstream responsible investing approach structurally based on engagement. As significant shareholders, Private Equity investors have the potential to actively promote sustainable practices in the firms they own. Findings support that such activism is strategically grounded, as managing portfolio ESG issues might enhance value creation, enlarge risk management and enable Private Equity firms to differentiate to raise funds. Considering the specificities of the studied market, a promising research path would be to explore whether this responsible investing movement is restricted to France or whether drivers and maturation differ between Private Equity markets.

At a time of financial crisis and regulation stringency for Private Equity, responsible investment hence appears to have been “thought global” by large leading actors to improve the mainstream business and provide it with new growth tools. However, most Private Equity companies currently seem to lack the human capital and expertise essential for successfully implementing a profitable ESG issues management. With financial markets still in the crisis turmoil and the upcoming of tougher regulatory standard on bank capital adequacy (Basel III), the European Private Equity industry environment will quickly evolve in the next few months. The question of how the new Private Equity responsible investing movement will react to this shifting context, and potential consequences for firm managers’ access to capital, henceforth still lay wide open.

CHAPTER 4

GREEN SIGNALING IN EXPERIMENTAL PRIVATE EQUITY NEGOTIATIONS

Can investors rely on CSR to identify performing firms?

Abstract

Private Equity investors spending resources on public good by integrating environmental considerations is puzzling for the agency theory. Could public good provision be used as a money-burning signal to better select investments? This chapter presents a signaling investment game and its experimental test in the laboratory using two different types of money-burning signals: a public good provision (carbon offset) and standard money-burning (advertisement). Main finding is that environmental performance, and more generally public-good provision, is not a perfect substitute for standard money-burning signals and impacts equilibrium selection.

Résumé

Du point de vue de la théorie de l'agence, il est curieux qu'un investisseur en capital dépense des ressources pour le bien public en intégrant des considérations environnementales dans ses pratiques. La provision de bien public pourrait-elle servir de signal pour mieux sélectionner les investissements ? Ce chapitre présente un jeu d'investissement avec signal et le teste expérimentalement en laboratoire avec deux types de signaux couteux : une provision réelle de bien public (compensation carbone) et un signal standard (publicité). Le principal résultat est que la performance environnementale, et plus généralement la provision de bien public, ne se substitue pas parfaitement à des signaux couteux standards et modifie la sélection d'équilibre.

Chapter 4 is based on a working paper (same title). I wish to thank the CIRANO experimental economics laboratory (Montreal) for hosting and supporting this research

4.1. INTRODUCTION

Agency cost reduction has long been pointed out as a major strength of Private Equity investors (Kaplan and Stromberg, 2009). Jensen (1986)'s free cash flows hypothesis, along which Private Equity financing prevents opportunistic behaviors of managers (because free cash flows are used for debt servicing), received large empirical support (Opler and Titman, 1993; Desbrières and Schatt, 2002). Henceforth Private Equity investors using corporate slack resources to contribute to public good appears rather puzzling from an agency theory perspective. However, an increasing amount of Private Equity funds management firms are currently showing interest in the environmental and social performance of their portfolio companies, as witnessed by the growing number of United Nations Principles for Responsible Investing signatories (as shown in Chapter 3).

Another illustration of this recent interest was the striking buyout of TXU (discussed in Gollier and Pouget, 2012), a giant energy company based in Dallas that serves about two million customers. The deal was closed in 2007 by Texas Pacific Group, Kohlbert Kravis Roberts & Co and the Private Equity arm of Goldman Sachs for an outstanding 48 billion USD. Also outstanding in this deal was that it included an agreement with environmental activists (Environmental Defense and the Natural Resources Defense Council) to significantly scale back TXU's coal plant building plan and to adhere to a strict set of environmental standards.

Firm profit sacrifice for public good seldom arises from sheer altruism but rather appears strategically implemented (Elhauge, 2005; Reinhardt et al., 2008). The literature linking CSR to profitability is careful enough (Chapter 1; Chapter 2; Margolis et al., 2009) to reasonably rule out the possibility that Private Equity investors might expect direct cash flows out of negative externality reduction. An alternative explanation of their interest for CSR could be grounded in signaling theory. Indeed, recent work supports that firms with higher financial performance might be those who can afford to use slack resources to provide public good (Baron et al., 2011). Could environmental performance hence be used by firm managers to signal their quality to investors?

Using signaling theory, this chapter builds on these stylized facts to theoretically and experimentally investigate whether environmental performance can be used as a strategic signal to reduce information asymmetry between informed firm managers and investors,

which is known to causes under-investment (Myers and Majluf, 1984). Signaling in the sense of Spence (1974) requires the existence of a discriminating activity, more costly for low quality types than for high quality types. These signals have already proved relevant in the Private Equity setting, such as the percentage of equity retained by the entrepreneur (Leland and Pyle, 1977), the level of debt (Ross, 1977) or the choice of underwriter (Carter and Manaster, 1990). Public good provision has already been identified as a possible signal of firm quality in the experiment of Elfenbein et al. (2012) on online charity donations.

In other types of signaling models, called "money-burning" models, differentiation can also be (at least partly) achieved by undertaking a non-discriminating activity, whose marginal cost is unrelated to quality. A classic example of money-burning is product advertising (Milgrom and Robert, 1986). Environmental performance is here considered akin to money-burning signal, in the sense that its cost is assumed to be independent of firm's type. For instance, upgrading a production process to reduce carbon footprint would have the same cost whatever the firm type.

While these results are important, Bernheim and Redding (2001) highlight that there are many ways to dissipate resources observably and are the first to question why a money-burning signal is chosen over another. They show that money-burning activities can be imperfect substitutes under specific assumptions, including the assumption that each money-burning activity dissipates resources at a known rate that is common for all types and uncorrelated with the information that the sender wishes to signal. Their results are applied to corporations signaling financial strength to investors through the use of dividend distributions to shareholders.

This chapter asks whether environmental performance, and more generally corporate public good provision, can perfectly substitute to other types of money-burning signals to reduce information asymmetry. Determining the effectiveness of a signal conditional on its public good contribution is difficult, if not impossible, in the field. This is because contributions to public goods involve preferences and beliefs, both unobservable to the researcher. This is also because so many factors are occurring simultaneously in real life, such as changes in investors and the public's perception of CSR, as well as external financial shocks that are constantly occurring in the economy, which likely alter investors' priorities. One possibility is to turn to the experimental laboratory, where the researcher can abstract from many of these issues, while focusing on the core issue of public good provision through signaling, at the expense of simplification of the investing environment. The experimental laboratory enables controlling

the financial decision environment and observing behaviors and has thus already enabled many developments of financial theory (Pouget, 2001).

A first contribution of this chapter is to propose a model of negotiated equity financing with money-burning signal, which is adapted to the Private Equity setting. Contrary to Bernheim and Redding (2001), the model does not differentiate money-burning activities based on resource dissipation, but rather focus on the activity qualitative content. The experimental design indeed contextualizes money-burning signals by allowing managers to either purchase a "green signal", which contributes to a real public good (actual online carbon offset) or a "brown signal" (advertisement). Both money-burning signals tested in the laboratory are consistent with real-life settings. Whether the signal actually provides the public good is controlled for, so the experimental design allows addressing the simple question: are signals that contribute to public good perfect substitutes to standard signals? Further on, does the existence of a signal that contributes to public good allow for the possibility for firms to signal their types? In other words, can investors rely on a green signal to reduce information asymmetry?

Main result is that public good provision, and more specifically environmental performance, is not a perfect substitute for other types of money-burning signals, such as advertising. The existence of a money-burning green signal (which contributes to public good) enhances firm type separation and equity market transparency. Strikingly, types are revealed through prices when green signals are available, but green signals are not actually used. This phenomenon does not occur with standard "brown" signals (which do not contribute to the public good). The presence of the public good provision seems to crowd-in actors' intrinsic motivation to act in line with their moral values and thus reveal their type. The paper concludes by discussing the positive effect socially responsible investments might have on equity markets and on society as a whole.

4.2. Model

Giammarino and Lewis (1988) had noted that Myers and Majluf's (1984) seminal paper and most of corporate finance theory are implicitly based on a framework in which equity is sold by value-maximizing firm managers to a market populated by atomistic investors through a competitive auction. While this model provided important insights, most transactions in

Private Equity rather involve a process more akin to bilateral negotiation. Giammarino and Lewis (1988) thus proposed a non-cooperative sequential game of equity sales and introduced negotiation by letting firm managers set the price of the issue. This chapter extends their setting, which is specific to Private Equity negotiations, by allowing firm managers to additionally purchase a money-burning signal.

The proposed model does not distinguish between money-burning signals: they will be later on contextualized in the experimental design.

This section limits itself to main properties and results of the model. The reader can refer to Appendix C for proofs.

4.2.1. NOTATIONS

Let us consider a firm that needs E external equity financing to invest in a project (for instance, building a new plant). This external equity (E) can be obtained through the issuing and sale of new shares (capital increase). The firm management aims at maximizing the welfare of the current shareholders. For the purpose of simplicity, let us suppose this firm is all equity financed (***K*** existing shares) and operates in a financial market where there are neither taxes nor transaction costs. The market is made-up of risk-neutral Private Equity investors willing to acquire any asset that they believe will generate at least the market's expected rate of return, which is assumed to be zero.

Investors are faced with information asymmetry as the firm can be of two types ***i***: high value (***h***) with probability ***p*** or low value (***l***) with probability ***1 - p***. The firm's current assets have a value of $a_i > 0$. If the firm obtains E external equity, it can invest in its project. The project generates a state-contingent value (Net Present Value) of $b_i > 0$. The high type firm asset value always exceeds the low type: $a_h + b_h > a_l + b_l$. The value of the firm given that the investment has been exercised is $W_i = a_i + b_i + E$.

The potential investors do not know the firm type, but they are aware of the possible values of a_i and b_i and of the probability ***p*** that the firm is high type**.** The firm type is the private information of the firm's management.

The firm manager presents an offer to issue ***N*** new shares. For the purpose of simplicity, the first model choice variable is ***z*** which is the fraction of all outstanding claims offered by the

manager to the investor: $z = \frac{N}{(K+N)}$. $\boldsymbol{z}$ is thus the firm shares offered to the investor in exchange of the equity she invests in the firm.

The manager can also decide to invest in a money-burning signal, which is a sunk cost. Later on, signaling types will be introduced in the experimental setting. The signal costs $\boldsymbol{C_i} \in]\mathbf{0}; \boldsymbol{W_i}[$ and sends a message $\bar{\boldsymbol{s}}$ to the investors. This cost is borne by the firm itself, so that if the investor rejects the project, the original owners end up with $a_i - C_i$; but if the investor accepts the offer, the final value of the firm to be shared between investor and original owners is $W_i - C_i$. The investor receives the signal $\underline{\boldsymbol{s}}$ if no money-burning signal is purchased ($C_i = 0$). As high type firms have more slack resources to signal than low-type firms, the message $\bar{\boldsymbol{s}}$ can be used by managers to signal their high type.

The investor receives a composite offer (z_i, s_j) made of the share $\boldsymbol{z_i}$, which consists in a price signal and a money-burning signal $\boldsymbol{s_j} = \{\bar{\boldsymbol{s}}; \underline{\boldsymbol{s}}\}$. She can either accept or reject the offer. In this two-signal non cooperative game, the values of E, a_i, b_i, C_i and p are exogenous.

4.2.2. Strategies and Beliefs

Kreps and Wilson's (1982) notion of sequential equilibrium is used to characterize equilibrium behavior: the selection of strategies depends on beliefs, which are updated following Baye's rule. An equilibrium thus consists in both a set of strategies for all players at each information set of the game and a set of beliefs for all players at each information set of the game.

The investor has prior beliefs on which firm types can send which message: $\pi(i|(z_i, s_j))$. For z fixed: $\pi(h|z,\bar{s}) + \pi(l|z,\bar{s}) = 1$ and $\pi\left(h\middle|z,\underline{s}\right) + \pi\left(l\middle|z,\underline{s}\right) = 1$.

The investor chooses actions following the strategy function $\alpha(z_i, s_j)$ that defines the probability with which each possible offer made by the firm manager is accepted by the investor. An offer (z_i, s_j) is thus rejected with the probability $1 - \alpha(z_i, s_j)$. Based on the investor information, taken the firm strategy as fixed and given an offer, $\alpha(z_i, s_j)$ must maximizes the investor's expected payoff of accepting an offer:

$$\begin{cases} EPO_{inv}(z,\bar{s}) = z.[\pi(h|z,\bar{s}).(W_h - C_h) + \pi(l|z,\bar{s}).(W_l - C_l)] - E \\ EPO_{inv}\left(z,\underline{s}\right) = z.\left[\pi\left(h\middle|z,\underline{s}\right).W_h + \pi\left(l\middle|z,\underline{s}\right)W_l\right] - E \end{cases} \quad (1)$$

The investor's expected payoff of rejecting an offer is zero.

A strategy for the firm manager is the function $f_i(z_i, s_j)$ that specifies for each feasible offer (z_i, s_j) the probability with which it will be presented to the investor given the investor strategy. Based on the manager's information, the set of values $f_i(z_i, s_j)$ must maximize the value of the existing shares taken $\alpha(z_i, s_j)$ as given:

$$\begin{cases} EPO_{fm}(z_i, \overline{s}) = \alpha(z_i, \overline{s}).(1 - z_i).(W_i - C_i) + \big(1 - \alpha(z_i, \overline{s})\big).(a_i - C_i) \\ EPO_{fm}(z_i, \underline{s}) = \alpha(z_i, \underline{s}).(1 - z_i).W_i + \Big(1 - \alpha(z_i, \underline{s})\Big).a_i \end{cases} \quad (2)$$

For each feasible offer (z_i, s_j), the belief the investor has about the type of the firm if she observes (z_i, s_j) is updated and satisfies Baye's rule.

4.2.3. Equilibrium Characterization

As in most signaling games, more than one Bayes-Nash equilibrium is found in the model, hence the theoretical prediction is ambiguous. To refine predictions, many refinements of the Bayes-Nash equilibrium concept have been developed (see for refinement comparison Banks et al., 1994). Following Cadsby et al. (1998), the intuitive criterion of Cho and Kreps (1987), also known as equilibrium dominance, is here chosen. This refinement has already successfully been used in finance (see for instance Berkovitch and Khanna, 1990; Eckbo et al., 1990; Chemmanur and Fulghieri, 1994; Chowdhry and Jegadeesh, 1994; Cadsby et al., 1998). It is hence assumed that players will not select an action that is dominated and beliefs will reflect this.

The intuition of theoretical results is presented below. The reader can refer to Appendix C.1 for detailed proofs and propositions of the equilibrium characterization.

This game is consistent with four types of pure strategy sequential equilibria. Equilibria selected (dominant equilibria) are contingent to the set of parameters used.

(i) The first pure strategy sequential equilibrium is *a price separating and money-burning equilibrium*. In this equilibrium, high type firms succeed in signaling their type to investors by purchasing money-burning signals and hence avoid under-investment. Low type firms cannot

afford to burn money, so they reveal their type through price and get financed. A two-speed economy is financed in which high type firms use money-burning signals, low type firms don't, and both offer different prices.

(ii) The second pure strategy sequential equilibrium is *a price separating and non money-burning equilibrium* which exists under two different sets of conditions. In the first set of conditions, the money-burning signal is too costly for high type firms to purchase it and investors thus do not consider the money-burning signal as reliable. Both firm types offer the same price. High type firms do not succeed in signaling their type and suffer under-investment. Conversely, in the second set of conditions, the money-burning signal is not costly enough to be informative of the firm value level, as both firm types can buy it. Once again, high type firms suffer under-investment, as both firm types offer the same price.

(iii) The third pure strategy sequential equilibrium is *a price pooling and non money-burning equilibrium*. Here, money-burning is too costly to be profitable, it is not done and both firm types offer the same price to investors. In this setting, high type firms are underpriced and low-type firms are over-priced.

(iv) The last pure strategy sequential equilibrium is *a price pooling and money-burning equilibrium*. In this equilibrium, the money-burning cost is kept low enough by the stated conditions so that it is more profitable for both firm types to pay for it rather than suffer poorer treatment based on investor beliefs about non money-burning deviators. High type firms are still underpriced and low-type firms are still over-priced.

4.3. Experimental Design

4.3.1. Model Parameters

The previous model will now be experimentally tested. Parameters are chosen so as to conduct a tough test of the ability of subjects to separate in equilibrium (which is further discussed in section 4.3.3). They are precisely chosen to set up three different situations of Private Equity negotiations that will be experimentally tested and compared: (i) "expensive" money-burning signals affordable by high type firms only; (ii) "cheap" money-burning signals affordable by both firm types; (iii) as a control treatment, model predictions are also tested in the absence of money-burning based on Giammarino and Lewis's (1988) model

predictions (presented in Appendix C.2). Figure 4.1 displays the game tree to be played in the experiment.

Parameters for the expensive setting, cheap setting and control setting without signal are presented in Table 4.1. Note that only the availability and price of signaling ($C_i = C_h = C_l$) change between the three settings.

4.3.2. Equilibrium Predictions

No Money-Burning Treatment

In this treatment, money-burning signal is not available. The *"no money-burning" setting* uses parameters consistent with an equilibrium in which all firms should offer the same price to investors. Precisely, Giammarino and Lewis's (1988) precise that high type firms have no other possible strategy and that low type firms should select with a probability of zero a strategy in which they reveal their low type.

Equilibrium Prediction 1*: Firms should all offer a share of 27% (up to 32%) in the absence of money-burning opportunities. Investors should accept those offers.*

Details of Giammarino and Lewis's (1988) model predictions can be found in Appendix C.2 and detailed predicted strategies with their probabilities and payoffs in Appendix C.3.

Expensive Money-Burning (Affordable by High Type Firms Only) Treatment

Expensive money-burning is now available. The "*expensive money-burning" setting* uses parameters consistent with two equilibria, one of them being dominant (following the intuitive criteria): (i) a dominated equilibrium in which different firm types offer different prices and only high type firms purchase money-burning signals; (ii) and a dominant equilibrium in which all firms offer the same price and none purchase money-burning signals.

Equilibrium Prediction 2*: Firms should all offer a share of 27% (up to 32%) and not buy expensive money-burning signal. Investors should accept those offers.*

Note that Prediction 2 is similar to the control treatment Prediction 1. Detailed predicted strategies with their probabilities and payoffs can be found in Appendix C.3.

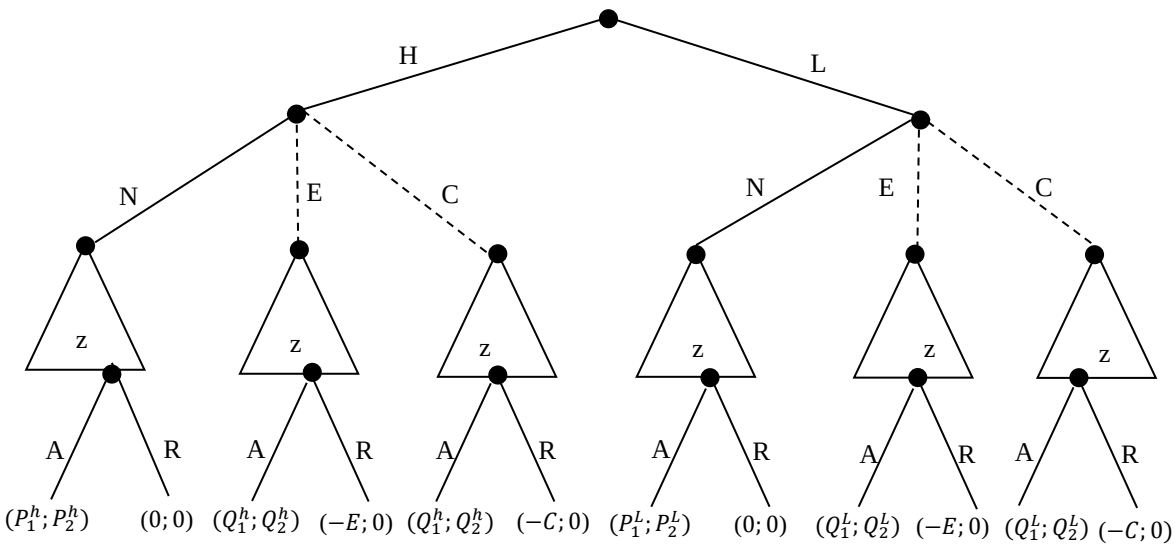

FIGURE 4.1 – Game tree

Nature decides whether firms are high type (H) or low type (L). Depending on treatments, firms can purchase an expensive money-burning signal (E), a cheap money-burning signal (C) or no money-burning signal (N). Also depending on treatments, the nature of the signal will be either a green signal or a standard advertisement. Then firms choose the price signal z, that is the share (0% to 100%) to be offered to the investor against equity provided. Investors receive offers (money-burning signal and price signal) and either accept (A) or reject (R) the offer. Payoffs are then received: (firm payoff; investor payoff). If the offer is rejected, the firm that bought the money-burning signal bears its cost alone (-E or –C). If the offer is accepted, the value created is shared between firms and investors. P_1^h and P_2^h (respectively P_1^l and P_2^l) are the firm and investor payoffs if the firm is high type (resp. low type) and bought no signal. Q_1^h and Q_2^h (resp. Q_1^l and Q_2^l) are the firm and investor payoffs if the firm is high-type (low type) and bought a signal.

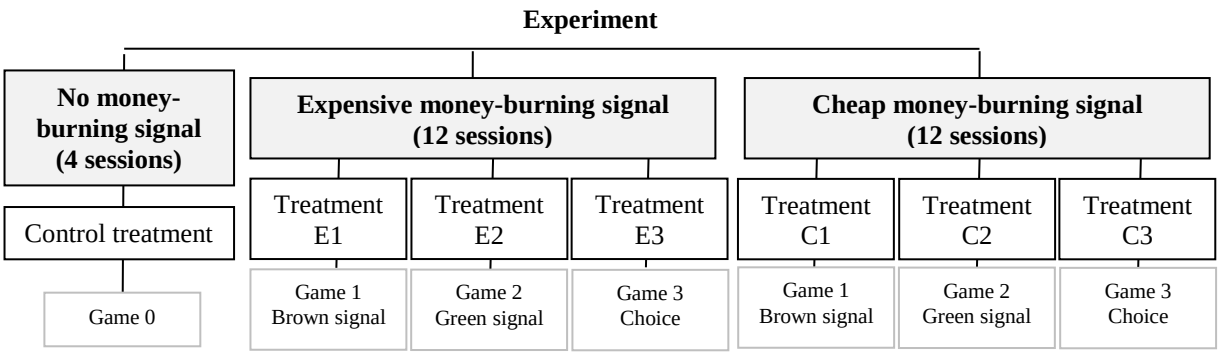

FIGURE 4.2 - Experimental design.

Each treatment was run four times and counted 10 to 11 participants.

TABLE 4.1 - Parameters for experimental design

Parameter	Expensive signaling setting		Cheap signaling setting		Control - No signal	
	High type firm	Low type firm	High type firm	Low type firm	High type firm	Low type firm
Equity needed: E	6	6	6	6	6	6
Value of assets in place: a_i	20	6	20	6	20	6
NPV of investment: b_i	9	2	9	2	9	2
Total non-signaling firm value given investment: W_i	36	15	36	15	36	15
Cost of money-burning signal C_i	***8***	***8***	***3***	***3***	***0***	***0***
Total money-burning firm value given investment: $W_i - C_i$	28	7	33	12	-	-
Probability of *i*	0.40	0.60	0.40	0.60	0.40	0.60
Max share offered by non- money-burning firm: $z_{i,\underline{s}}^{max}$ (%)	44	60	44	60	44	60
Max share offered by money-burning firm: $z_{i,\overline{s}}^{max}$ (%)	29	14	39	50	-	-
Share min for investor if non- money-burning firm type is known: $z_{i,\underline{s}}^{min}$(%)	19	47	19	47	19	47
Share min for investor if money-burning firm type is known: $z_{i,\overline{s}}^{min}$	25	100	21	58	-	-
Share of average non- money-burning firm: $\overline{z}_{\underline{s}}$. (%)	27	27	27	27	27	27
Share of average money-burning firm: $\overline{z}_{\overline{s}}$ (%)	45	45	34	34	-	-

Cheap Money-Burning (Affordable by Both Firm Types) Treatment

Cheap money-burning is now available. The "*cheap money-burning" setting* uses parameters consistent with three equilibria, one of them being dominant (following the intuitive criteria): (i) a dominated equilibrium in which all firms are at the same price and all purchase money-burning signals; (ii) a dominated equilibrium in which different firm types offer differ prices and none purchase money-burning signals; (iii) a dominant equilibrium in which all firms are at the same price and none purchase money-burning signals.

Prediction 3 is identical to prediction 2. Detailed predicted strategies with their probabilities and payoffs can be found in Appendix C.3.

4.3.3. Behavioral Conjecture: Green Versus Brown Signals

A pure signaling game theory model with its predictions was presented. In this setting, the signal in itself has no content. The underlying assumption is that all money-burning signals are perfect substitutes. To provide context, the experimental design introduces two types of money-burning signal labels: "green signal" and "brown signal".

The green signal indicates the firm performs well on the environmental level. In a real-life setting, the green signal could be energy efficient, cleaner production processes (as in the TXU example) or carbon emission offset. In the experiment, the green money-burning signal precisely is carbon emission offset, which is here analyzed as a costly private provision of public good. The green signal goes beyond sole wording: the provision of public good is actually real. Part of the signal cost is indeed transferred online, in front of participants, to a certified carbon-offset non-profit organization (Planetair).

The brown signal consists in standard advertisement (as in the seminal paper of Milgrom and Roberts, 1986). In a real-life setting, advertising is also paid for by firms to improve their reputation, independently of product quality. A recent example of (very) costly advertisement campaign decorrelated from product quality is Red Bull financing of Felix Baumgartner free-fall from the stratosphere. In brown signal treatments, a participant is randomly assigned to become a publicist ("group C" in the instructions). When firm managers ("Group A" in the

instructions) decide to purchase an advertisement, part of the signal cost is transferred to the publicist. The existence of the publicist ensures in the design that money goes "somewhere real".

Green and brow signals differ by framing and economic consequences but are similar in terms of monetary payoffs for participants. Equilibrium selection is conjectured to differ depending on the money-burning signal content. Indeed, parameters have been chosen for type separation (by purchasing money-burning signals) to always be a dominated equilibrium. As a provision of public good, the green signal might increase both firm managers and investors' utility beyond profits. In the context of portfolio selection, Holm and Rikhardsson (2008) and Consolandi et al. (2009) show for instance how environmental, social and governance information impacts investment-decision. If green signaling impacts firm managers and investors' preferences, it will then be used differently from a standard signal. Typically, green signal is conjectured to enhance the selection of separating strategies by purchasing green money burning signals. Conversely, brown signal should not enhance utility and the pooling strategy is expected.

The following conjecture is hence proposed.

Behavioral Conjecture: *Green signal should increase the selection of the price separating and money-burning equilibrium. Conversely, a pooling equilibrium should be reached in presence of the brown signal. As such green signal it is not a perfect substitute to brown signal.*

4.4. Experimental Procedure

The experimental design is based on the three previously described settings: the control treatment (no signal - Game 0); the expensive money-burning setting and the cheap money-burning setting. For each money-burning setting, the experience compares brown signaling (Game 1) to green signaling (Game 2) and also provides participants with a choice of money-burning signals (green or brown; Game 3). Henceforth, the design consists in a control treatment (no money-burning signal available) plus six money-burning signal treatments (see Figure 4.2).

In Game 1 (brown signaling), a participant is randomly assigned to become a publicist ("group C" in the instructions). When firm managers ("Group A" in the instructions) decide to purchase an advertisement, part of the signal cost is transferred to the publicist. In Game 2 (green signaling), firm managers can decide to purchase voluntary carbon offset. Part of the signal cost if then transferred online (in front of participants) to a certified carbon-offset non-profit organization. Signal descriptions to participants were kept as neutral as possible (see instructions in Appendix C.5; the working used is further indicated). Theoretical predictions are identical between Games 1 and 2. Finally, in Game 3 (signal choice), participants can choose between standard advertisement and carbon offset.

Each of the seven treatments was run four times. Each session counted 24 rounds and was played by 10 or 11 (when "publicists" were needed) participants who kept the same role and type for the whole session. 296 participants, recruited in Montreal universities and newspaper job ads, took part in the experiment. Participants had no specific knowledge requirement on Private Equity, corporate finance or environmental issues. Survey answers showed that subjects were rather homogenous in terms of demographics and investment knowledge (see Appendix C.4 for descriptive statistics on participants).

The experiment was run on networked computers, programmed and conducted with the software z-Tree (Fischbacher, 2007). Upon arriving for the session, participants received acceptance and instruction sheets detailing for all players rules and potential payoffs, which were read aloud. Examples were also provided. Participants were randomly assigned to be firm managers ("Group A" in the instructions) of high ("type 1") or low ("type 2") type, investors ("Group B") or publicists ("Group C") for the entire session. Rounds were independent and between rounds participants gained experience. The number of rounds to be played (24) was not announced. Throughout the session, communication between subjects was not allowed.

The sequence of play in a round was as follows. At the start of each round, firm managers were randomly and anonymously paired with investors. After observing her type and her opportunities, the firm manager chose the fraction of equity to offer and whether or not to purchase a signal. The paired investor then observed the offer made and either accepted or rejected the offer. Both partner players then learned each other payoffs.

At the end of the session, subjects got show up fee (10$CAN) plus their payoffs. Special care was brought to the payoff structure. Indeed, Cadsby et al. (1998) results appeared driven by the potential short-term gains that could be obtained by defecting high type firms. Those

results are rather similar to those of Brandts and Holt (1992, 1993), where it was the payoff structure on actions taken prior to convergence that seemed to determine equilibrium selection. Participants' payoffs were thus calculated as follows. Participants were first endowed 6$CAN, knowing that this money was at stake. At the end of the session, two rounds were randomly selected. Payoffs were calculated as the endowment added to the results for the two selected rounds. Investors got zero if they rejected an offer. If their offer was rejected, firm managers got either zero if they had bought no signal or minus the signal cost if they had bought a signal. If their offer was accepted, firm managers received their share of the value created by the investment, as the investors did. Participants were indeed paid on created value. As an example, let us consider an investor who accepted to invest 6$CAN against a 20% share in a firm. If the firm was worth 35$CAN, the investor received 20% * 35$CAN = 7$CAN. Her net payoff was thus 7 $CAN – 6$CAN = 1 $CAN. Publicists received 1$CAN for each advertisement bought, and 1$CAN was given to Planetair if participants had purchased carbon offset. The average participant payoff was about 20$CAN for 1H30.

4.5. RESULTS

This section presents results for each prediction. For the purpose of clarity when presenting results, firm offers are classified into four categories, namely "*non-credible*", *"separating*", "*pooling*" and "*no-risk*" offers.

"*Non credible*" offers are such that whatever the firm type, the investor's payoff is known by all to always be negative (no signal z < 18%; cheap signal z < 19%; expensive signal z < 23%). "*Separating*" offers are such that the investor's mathematical expected payoff is negative (no signal 17% < z < 27 %; cheap signal 18% < z < 31%; expensive signal 22% < z < 42%) and include high type firm separating offers. *"Pooling"* offers are such that the investor's expected payoff is positive (no signal 26% < z < 43%; cheap signal 30% < z < 55%; expensive signal z > 42%) and include pooling offers. *"No-risk"* offers are such that whatever the firm type, the investor's payoff is known by all to be positive (no signal 42% < z; cheap signal 55% < z; does not exist with expensive signal) and include low type separating offers.

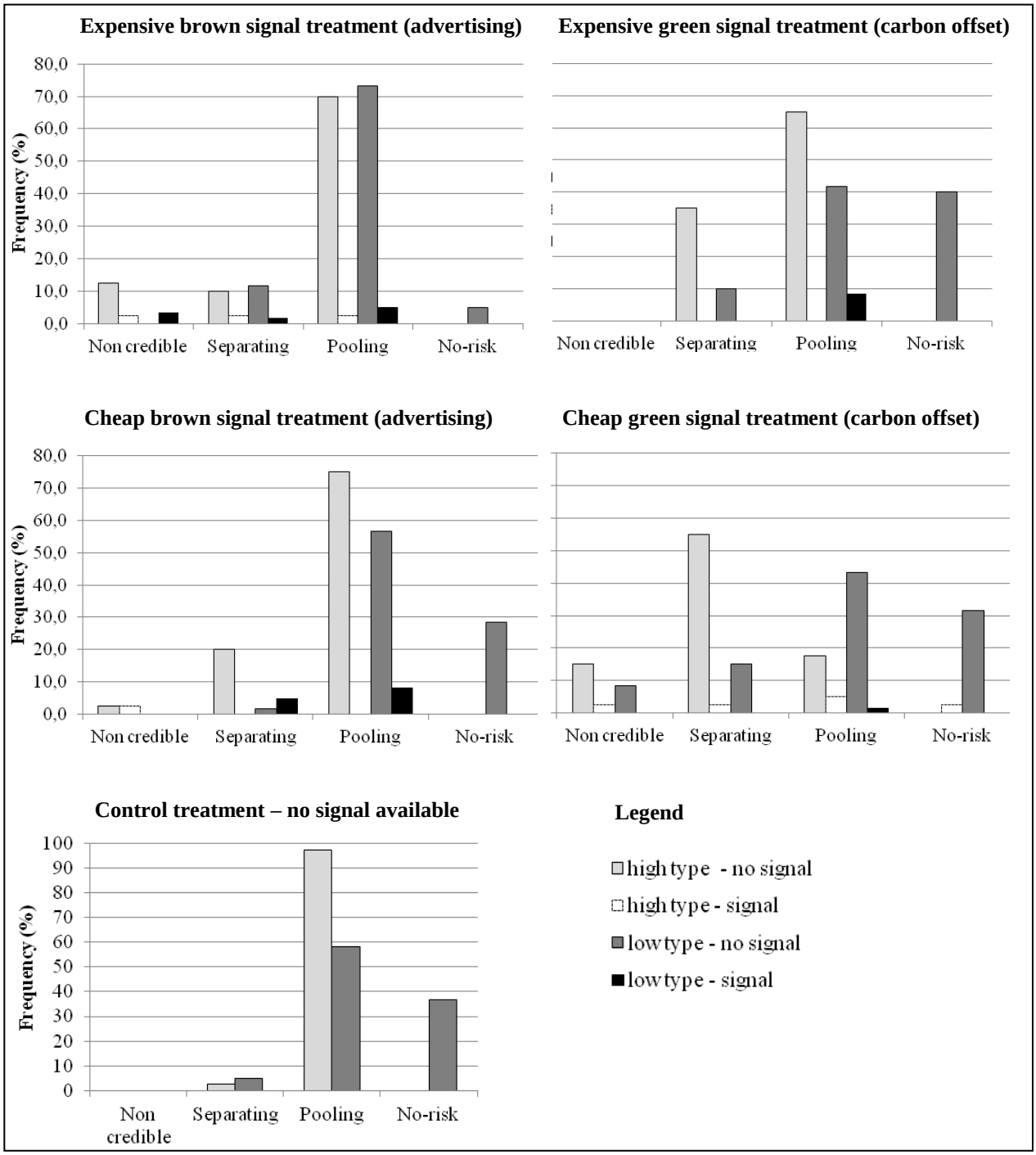

FIGURE 4.3– Firm offers

Money-burning and non money-burning offers made by high type and low type firms over the last five rounds of play in the expensive advertisement treatment (top left); the expensive carbon offset treatment (top right); the cheap advertisement treatment (middle left); the cheap carbon offset treatment (middle right); and the control treatment (bottom left).

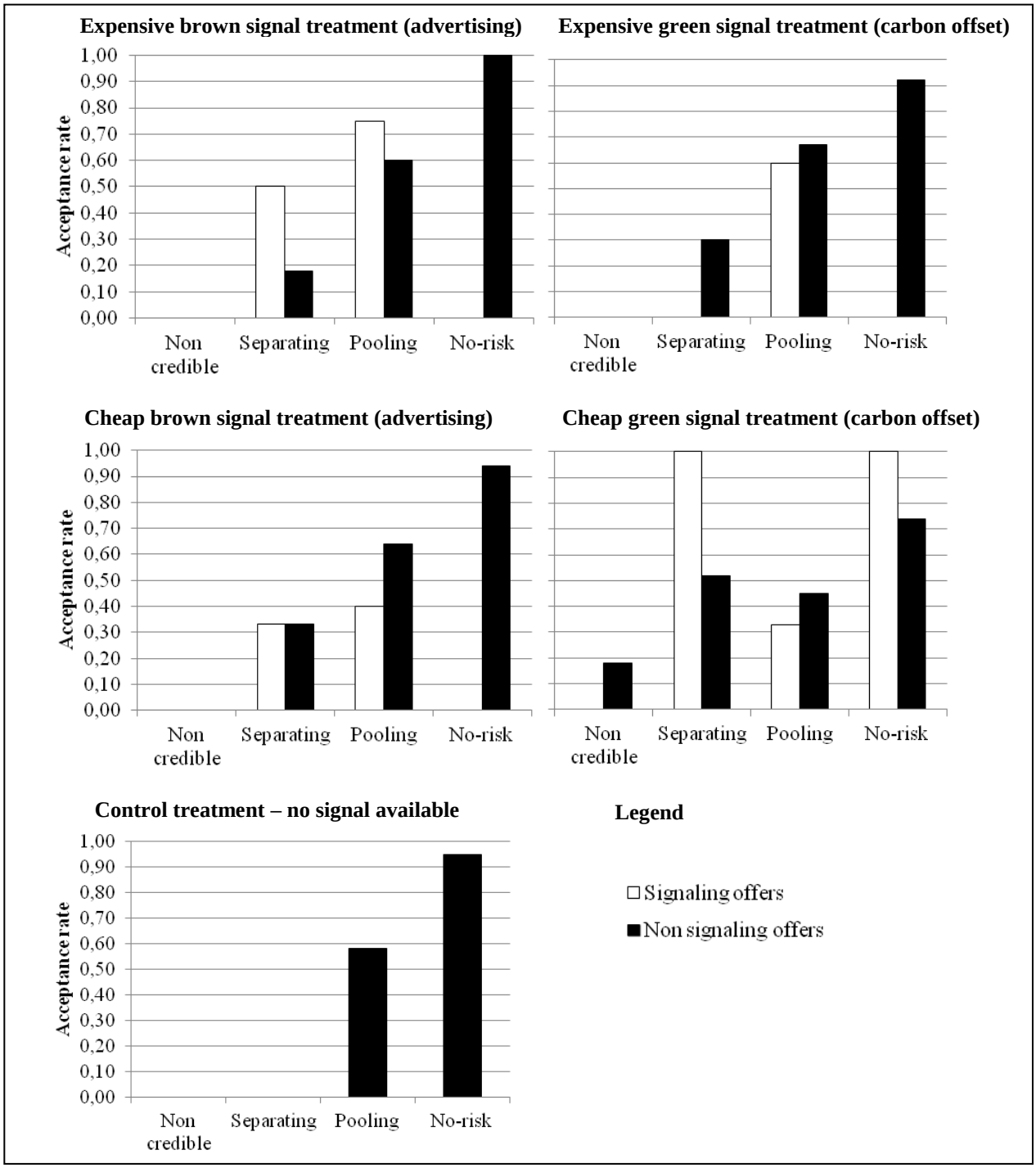

FIGURE 4.3 - Investors' answers

Investors' acceptance rate of money-burning and non money-buring offers over the last five rounds of play in the expensive advertisement treatment (top left); the expensive carbon offset treatment (top right); the cheap advertisement treatment (middle left); the cheap carbon offset treatment (middle right); and the control treatment (bottom left).

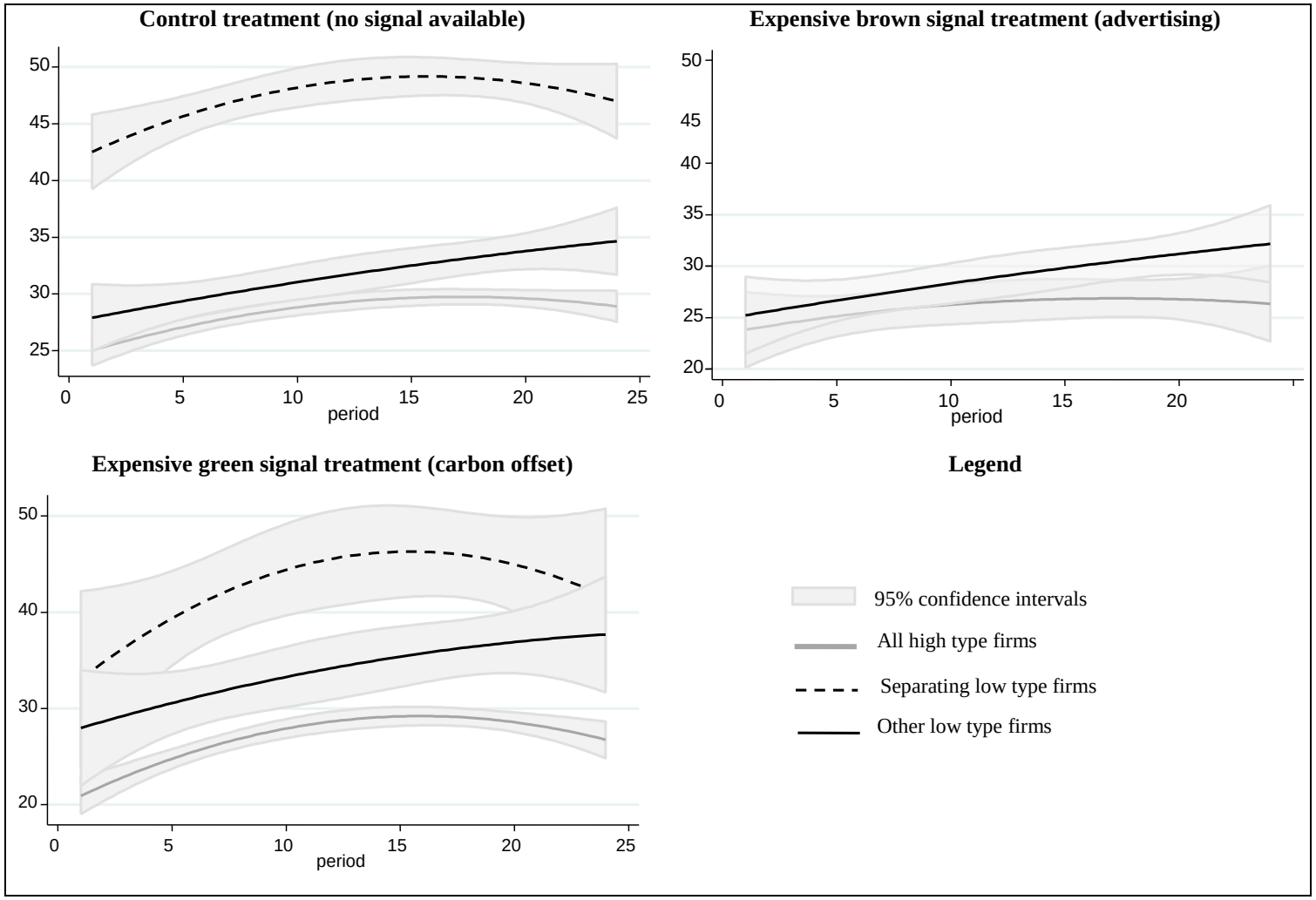

FIGURE 4.4 - Quadratic predictions of offers made

Quadratic predictions of shares offered (ordinates) by high type firms (grey lines) and low type firms (black lines) over periods of play (abscissa) in the control treatment (top left); the expensive advertisement treatment (top right); and the expensive carbon offset treatment (bottom left). Dotted lines highlight the average decision trajectory of low-type firms that constantly revealed their types in the last five rounds of play

TABLE 4.2 - Predictions versus aggregate results and earnings per player types and treatments

Treatment	Firm managers										Investors		
	High type					Low type							
	Mean share offered	Std Dev	Signal %	Actual earnings	Predicted earnings	Mean share offered	Std Dev	Signal %	Actual earnings	Predicted earnings	Acceptance (%)	Actual earnings	Predicted earnings
Control – no signal	28.5	3.7	no	2.8	4.15	36.9	10.4	no	1.5	3.7	64.4	0.94	1.2
1A - Expensive advertisement	26.1	9.3	0.11	1.5	3.8	29.0	11.9	0.12	1.0	3.5	53.9	0.35	1.2
1B - Expensive carbon offset	27.0	5.4	0.10	1.9	3.8	36.0	16.4	0.12	0.7	3.5	60.8	0.64	1.2
1C – Choice	24.8	8.3	0.16	1.6	3.8	33.5	17.7	0.21	0.0	3.5	57.2	0.37	1.2
2A – Cheap advertisement	26.5	6.3	0.11	2.0	3.8	33.7	11.4	0.15	1.3	3.5	55.8	0.38	1.2
2B - Cheap carbon offset	20.6	12.7	0.11	2.4	3.8	30.1	14.5	0.08	1.5	3.5	51.9	0.23	1.2
2C – Choice	27.5	5.0	0.14	2.5	3.8	28.6	16.5	0.24	0.7	3.5	54.4	0.74	1.2

Predictions are that all firms should select the pooling non signaling equilibrium with $\mathbf{z}^* \in [\mathbf{27}\%; \mathbf{32}\%]$ without signaling.

4.5.1. Results for Prediction 1: Pooling Equilibrium in the Absence of Money Burning Opportunities

Results confirm Prediction 1: a pooling equilibrium is reached when money-burning is not available. However, some deviations are observed from low-type firms. Typically, about a third of participants does not strategically select a pooling strategy but rather reveal (through prices) their low type (separating strategy). Control results constitute a benchmark for the other treatments and similar deviations as those observed will hence be expected in further treatments.

Table 4.2 presents predicted and actual offers, acceptance rates and earnings across treatments by player types. Figure 4.3 illustrates offer distribution by firm type over the previously defined categories in the five first and last rounds of play, as well as investors' answers. T-tests (with Satterthwaite's approximation formula when needed) are used to analyze differences between offers. Let us consider successively high type firms, low types firms and investors.

High type firms clearly converged to the predicted dominant pooling equilibrium ($z^* \in [27\%; 32\%]$ in Table 4.2; "pooling" offers in Figure 4.3). Differences between the first five and last five rounds of play highlight the existence of a learning effect (Figure 4.3).

Low-type firm offers were more scattered than high type's (e.g. standard variation of respectively 10.4% versus 3.7%, Table 4.2), which calls for a detailed analysis of the heterogeneity of strategies played. Indeed, whereas some low type firms converged to the predicted dominant pooling equilibrium ("pooling" offers; 2.79$/round, Figure 4.3), others converged to the dominated separating equilibrium ("no-risk offers"; 1.35$/round) in which they reveal their type. Figure 4.5 illustrates that most players kept to their separating or pooling strategy from the first rounds of play on (see also the proportions of participants that changed of offer category over the last 5 rounds in Table C.4.2, Appendix C.4). Hereby the different equilibrium selections correspond to different types of participants selecting different strategies.

Let us now turn to investors' answers. Investors also earned less than predicted (0.94$/round instead of 1.2$/round, Table 4.2). Figure 4.3 shows that investors acknowledged low type disclosure and accepted all "no-risk offers" (0.67$/round). However they only accepted 2/3 "pooling offers" (1.21$/round). Hence Investors' acceptance of non signaling offers increased

linearly with the share offered, not playing strategically but rather overweighting potential losses over potential gains.

4.5.2. Results for Prediction 2: Pooling Equilibrium in Presence of Expensive Money Burning Opportunities

Results only partially support Prediction 2: a pooling equilibrium is not always reached when expensive money burning is available. In line with the behavioral prediction, the equilibrium selected is not the same depending on the money-burning signal available. Prediction 2 is confirmed in presence of brown signaling but deviations are observed in presence of green signaling.

Figure 4.4 summarizes results over the last 5 rounds of play in expensive signal treatments. The reader can find in Appendix C.4 results in the 5 first rounds of play. Random effect probit models, cluster corrected by participants, are used to analyze money-burning behavior (Table 4.4). Descriptive statistics of variables used in the regressions can be found in Table C.4.3 in Appendix C.4.

Results differ depending on signal types. Indeed, in light of the control treatment results, the availability of expensive brown signal increased the selection of the dominant price pooling equilibrium whereas the availability of expensive green signal increased the selection of the dominated separating equilibrium in which firms reveal their type (Figures 4.4 and 4.5). The expensive choice signal treatment has similar results than the expensive green signal treatment (Figure 4.5).

Strikingly, purchases of money-burning signals nevertheless little occur whatever its type (green or brown) and was abandoned over the last rounds of play (Table 4.2, Figure 4.3, Figure 4.5). Probit results (Table 4.4) confirm that money-burning offers decline over time. Type separation in the green signaling setting occurs through prices and not through money-burning. When the green signal is available, some participants select a strategy that was theoretically always dominated (the price separating and non money-burning strategy).

Signal type effect on separation does not result from green signal salience as conjectured in the behavioral prediction. Indeed, when the choice between green or brown signal is given to participants, participants do not choose green over brown, or the reverse way (Table 4.2;

figure 4.3). The green signal effect on separation might thus be a consequence of the public good provision, which will be discussed later on.

Let us now consider successively high type firms, low types firms and investors.

High type firm managers converged to the predicted dominant pooling non signaling equilibrium ($z^* \in [27\%; 32\%]$, no signal; Table 4.2). They buy brown signal (22.5%) and even more green signal (32.5%) in the first 5 rounds but quit signaling as the game goes on. Despite reaching the predicted equilibrium, high type firm managers earned only about half of what was predicted.

Low type firm offers differ significantly from high type offers (Table 4.2). Unexpectedly, low type firms deviate and buy expensive signals at a certain loss with significant frequency (23% to 30% in the first 5 rounds), although the design ensured they cannot afford to do so (payoffs always negative). Finally, low type firms also earned less than predicted and did poorer than high type firms.

Based on those first elements of analysis, money-burning signals appear jammed by low type firms. Why does signal jamming occurs, and more specifically, why do low type firms purchase money-burning signals they can't afford? Based on the actual probability of investor acceptance conditional on the type of offer made, the actual firm expected profit per offer type is established. Results over the last five rounds of play are presented in Table 4.3. Signal jamming can result from either (i) signal salience for participants; (ii) a strategy anchored on social preferences; or (iii) a strategy anchored in prospect theory.

(i) *Money-burning signal salience* would mean that low type firms purchase money-burning signals because they have a strong preference for the signal itself and a high willingness to pay for it. Thus they would purchase signals in order to maximize their utility function. However, there is no significant difference in the use of brown (sacrificing profit for a participant) versus green (sacrificing profit for a more abstract public good) signals. It can be considered unlikely that both signals have the same salience for all participants. Moreover most participants only signal in the first rounds and stop. Henceforth, signal salience appears an unlikely hypothesis for signal jamming.

(ii) *Strategic signal jamming anchored in social preferences* would mean that low type firms purchase signals because they find unfair that high type firms earn more than them and they also believe the existence of a credible signal protects this inequality. Thus they would purchase signals in order to change investors' belief update in the signal credence. However,

high type firms succeeding in signaling their types do not earn more than low type firms revealing their type (Table 4.3). Therefore the social preference hypothesis is unlikely.

(*iii) Strategic signal jamming anchored in prospect theory* would mean that low type firms purchase money-burning signals because they understand there is more money to make by pooling than by revealing their type and because they believe the existence of a credible signal prevents them from succeeding in pooling. This belief would imply participants believe investors have a strong preference for signaling firms. If high type firms succeed in signaling, low types firms are indeed likely to have their pooling offers rejected by investors. Therefore prospect theory appears as a relevant explanation for signal jamming.

Let us now turn to investors' aggregated results. Investors also earned less than predicted in all treatments (Table 4.2). An econometric analysis takes into account the dynamics of the experimental results and grasps individual investor acceptance determinants (Table 4.5). Random effect probit models, cluster corrected by participants, are used (variable descriptive statistics are available in Table C.4.3, Appendix C.4). Acceptance increases at first with expensive signaling, hence when the signal is expensive enough to be credible (Table 4.5). However, a learning effect is observed, with investors learning over time to be more skeptical of offers made. Estimations of the interactions between shares offered and signals show that, at equivalent price, signaling offers are more rejected than non signaling ones. Henceforth investors are willing to accept expensive signaling offers in a rational way (one that would optimize their profits) but are not willing to sacrifice profits for signals in themselves, be them green or brown.

TABLE 4.3 - Actual firm expected profit (by category of offer made) over the last five rounds knowing the actual investors' acceptance probability

Signal type	Offer category	Control treatment		Expensive signal treatments						Cheap signal treatments					
				Brown		Green		Choice		Brown		Green		Choice	
		High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
No signal purchased	Non credible	no	no	0.00	0.00	no	no	0.00	0.00	0.00	0.00	1.63	1.44	0.00	0.00
	Separating	0.00	0.00	1.25	0.86	**2.09**	1.43	**1.46**	1.00	**2.29**	1.58	**3.61**	2.49	2.29	1.58
	Pooling	**3.22**	**2.45**	**3.33**	**2.53**	**3.72**	**2.83**	**3.39**	**2.57**	**3.55**	**2.70**	2.50	**1.90**	**4.27**	**3.25**
	No-risk	-0.05	**1.88**	-0.05	1.98	-0.05	**1.82**	-0.05	**1.84**	-0.05	**1.86**	-0.04	**1.47**	-0.05	**1.82**
Advertisement purchased	Non credible			-8.00	-8.00			-8.00	-8.00	-2.40	-2.40			-3.00	-3.00
	Separating			-3.61	-4.69			-3.61	-4.69	-0.06	-1.05			-3.00	-3.00
	Pooling			-5.46	-3.94			-4.61	-2.58	-0.97	-1.16			no	no
	No-risk			no	no			no	no	no	no			no	no
Carbon offset purchased	Non credible					no	no	-11.00	-6.65			-3.00	-3.00	no	no
	Separating					no	no	-8.00	-8.00			5.92	2.91	-3.00	-3.00
	Pooling					-5.97	-4.75	-7.32	-6.92			-1.32	-1.49	-1.32	-1.49
	No-risk					no	no	no	no			-5.60	-1.05	no	no

In table 4.3, « no »indicates that no such offer was made in the last five rounds of the treatment. Bold characters highlight selected strategies.

TABLE 4.4 - Random effect Probit model estimates of determinants of firm money-burning

	Advertisement (brown signal)						Carbon offset (green signal)					
Variable	High Type			Low Type			High Type			Low Type		
Offered shares (z)	0.02	*	(0.01)	0.01		(0.01)	0.05	***	(0.01)	0.01	**	(0.05)
Result at previous round	-0.03		(0.03)	-0.03		(0.03)	-0.04		(0.03)	0.01		(0.03)
Result at previous round * signal purchased	-0.09	*	(0.05)	-0.16	***	(0.04)	0.04		(0.04)	-0.18	***	(0.05)
Non credible offer	0.70	**	(0.35)	0.82	***	(0.26)	1.34	***	(0.33)	0.70	**	(0.29)
1st period dummy	0.30		(0.33)	0.55	**	(0.25)	-0.21		(0.35)	-0.14		(0.29)
Last 10 period dummy	0.66	*	(0.34)	0.26		(0.24)	0.17		(0.34)	0.15		(0.28)
Period	-0.10	***	(0.03)	-0.05	**	(0.02)	-0.07	***	(0.03)	-0.05	**	(0.02)
Gender	0.48		(0.46)	0.02		(0.23)	0.05		(0.33)	0.08		(0.32)
Age	0.06	**	(0.03)	0.02		(0.02)	0.01		(0.02)	0.02		(0.02)
Experienced player	-0.49		(0.52)	-0.15		(0.29)	-0.29		(0.38)	0.22		(0.47)
experienced investor	-0.12		(0.26)	-0.18		(0.11)	-0.26	*	(0.15)	-0.11		(0.16)
ρ	0.41	***		0.24	***		0.11	***		0.41	***	
Log Likelihood:	-178.5			-317.1			-166.6			-265.2		
Number of observations	786			1179			786			1179		
Number of firms	34			51			34			51		

Figures in brackets are standard deviations. * Statistically significant at 10%; ** Statistically significant at 5%; Statistically significant at 1%.

TABLE 4.5 - Random effect Probit model estimates of determinants of investors' decision

Variable	Expensive signal treatments			Cheap signal treatments		
Offered shares (z)	0.09	***	(0.01)	0.08	***	(0.01)
Carbon offset purchased	0.73	**	(0.34)	-0.29		(0.57)
z * Carbon offset purchased	-0.06	***	(0.01)	-0.01		(0.02)
Advertisement purchased	1.21	***	(0.32)	0.41		(0.34)
z * Advertisement purchased	-0.07	***	(0.01)	-0.04	***	(0.01)
Result at previous round	0.03		(0.02)	0.04	*	(0.02)
Result at previous round * Carbon offset purchased	-0.13		(0.08)	-0.10		(0.11)
Result at previous round * Advertisement purchased	0.03		(0.06)	-0.11		(0.08)
Non credible offer	-0.47	*	(0.27)	-0.60	**	(0.28)
1st period dummy	0.72	***	(0.22)	0.66	***	(0.23)
Last 10 period dummy	0.12		(0.16)	0.31	*	(0.16)
Period	-0.02	**	(0.01)	-0.03	***	(0.01)
Gender	-0.09		(0.15)	0.22		(0.19)
Age	-0.01		(0.01)	0.00		(0.01)
Experience at Cirano experiment	0.28		(0.19)	-0.39		(0.24)
Knowledge at investing	-0.12		(0.08)	-0.05		(0.09)
ρ	0.16	***	(0.04)	0.26	***	(0.05)
Log Likelihood:	-715.6			-725.8		
Number of observations	1440			1440		
Number of groups (investors)	60			60		

Figures in brackets are standard deviations. * Statistically significant at 10%; ** Statistically significant at 5%; Statistically significant at 1%.

4.5.3. Results for Prediction 3: Equilibrium in Presence of Cheap Money Burning Opportunities

Results only partially support Prediction 3: a pooling equilibrium is not always reached when cheap money-burning is available. In line with the behavioral prediction, the equilibrium selected is not the same depending on the money-burning signal available. Prediction 3 is confirmed in presence of brown signaling but deviations are observed in presence of green signaling.

Results of the cheap brown money-burning treatment and the cheap money-burning choice treatment are similar to the control treatment. Results of the cheap green signal treatment (2B) differ. The availability of the green signal once again increased type revelation and signaling declined over time (Table 4.4). Figure 4.3 summarizes results over the last 5 rounds of play in cheap signal treatments. The reader can find in Appendix C.4 results in the 5 first rounds of play.

As found with expensive money-burning, cheap money-burning effect on separation does not only result from green signal salience as participants do not choose green over brown in the choice treatment (Table 4.2; figure 4.3). The green signal effect on separation will be discussed in Section 4.6.

Let us consider successively high type firms, low types firms and investors.

High type firm managers converged to the predicted dominant pooling non signaling equilibrium in presence of the cheap brown money-burning signal ($z^* \in [27\%; 32\%]$ and no signal; Table 4.2 and Figure 4.5). However, in the presence of the cheap green signal treatment (2B), offers were significantly lower (Table 4.2). About half high type firms indeed converged to a dominated separating equilibrium in which they reveal their type ("separating offers" in Figure 4.5; see also Figure 4.3; earn 3.49 $CAN/round). The presence of the green signal increased their separation.

Contrary to theoretical predictions, low type firms little mimicked this strategy and instead spread between the predicted dominant pooling non signaling equilibrium ("good offers", 2.17$CAN/round) and the predicted dominated (non signaling) separating equilibrium in which they reveal their type ("no-risk offers, 0.96$CAN/round) as shown in Figure 4.3.

Let us now turn to investors' results. Table 4.5 shows that when signaling is cheap and thus not credible, acceptance rate is rationally not significantly impacted by signal purchase,

whatever its type. In details, in cheap brown signaling treatments, investors' acceptance of non signaling offers increased linearly with the share offered rather than strategically (Figure 4.4; Table 4.5). However, in cheap green signal treatments, investors answered rationally to firm managers' strategies (Figure 4.4): acknowledging the type separation that was unpredictably occurring, they accepted more (56%) "separating offers" than "pooling offers" (50%). Investors also earned less than predicted in all treatments. Moreover, probit estimations show that, for the same price, cheap advertising offers are more rejected than non advertising off; but that green offers are not more rejected than non-green offers (see the interactions between signal and offered shares). Consequently, investors have a willingness to pay for the cheap green signal than they do not have for standard signal.

4.6. Discussion

4.6.1. The Money Burning Signal Content Impacts Equilibrium Selection

This chapter first contributes to the wide literature that tests refinements and equilibrium selection (e.g. Brandts and Holt, 1992, 1993; Banks et al., 1994). The experimental test of Giammarino and Lewis (1988)' model of equity sales highlights deviations from the predicted equilibrium selection (Equilibrium Prediction 1, see Appendix C.2). High type firms converged to the pooling equilibrium predicted by Giammarino and Lewis (1988) to be a certain realization (probability equal to 1). However low type firms deviated by spreading between the pooling equilibrium predicted to occur with a probability of $f_l(z^*)$ (equal to 1 with parameters used) and a dominated separating equilibrium predicted to occur with a probability $1 - f_l(z^*)$ (equal to 0 with parameters used). Henceforth the prediction is realized when participants are faced with unique equilibrium but fails when players are confronted to mixed strategies.

The experimental results are hence in line with Cadsby et al. (1990)'s results. These authors test a sequential game theoretic model of corporate finance also based on Myers and Majluf (1984). Contrary to this paper's model and design, Cadsby et al. (1990) use an auction design. They find that where theoretical equilibrium was unique, theory predicted well; when theory permitted pooling, separation and semi separation equilibrium, the more efficient pooling equilibrium was observed. In this paper, pooling and separating strategies co-exist.

When money-burning is introduced, similar yet more complex deviations are observed. Extending Cadsby et al. (1990), Cadsby et al. (1998), introduce signaling (advertisement) in their model and experimental setting. They observe that equilibrium dominance often fails and that equilibrium selection appears related to the payoff structure. Morgan et al. (2006) note that in a large experimental literature studying matrix games with mixed strategy equilibria systematic departures from equilibrium predictions are commonly observed.

This paper's contribution is to show that the money-burning *content* matters in equilibrium selection. Specifically, it shows that the existence of a public good provision signal creates deviations from predicted strategies, namely type revelation. Environmental performance is thus not a perfect substitute for other types of money-burning signal.

4.6.2. Green Signals Increase Type Revelation Without Being Used

Surprisingly, type revelation does not occur through actual green signaling, but rather through prices when green signaling is available. Indeed, both green and brown signals were used and then abandoned over the first rounds of play. Data hence contradicts the proposed behavioral conjecture, but is shown to be consistent with a signal jamming strategy anchored in prospect theory. Results are also in line with Shleifer (2004)'s findings on competition and ethical conduct. The author shows that competition reduces entrepreneurs' willingness to pay for ethical conduct. When unethical behavior by competitors reduces their costs, it also reduces prices in the market, and as a result drives down prices. Participants in the experiment jammed the strategic potential of money-burning, as previously discussed, and therefore stopped providing public good as it was driving down their profits.

Hereby money-burning signals are discarded but type revelation still occurs through non-strategic price separation. This equilibrium was predicted to always be dominated, as low type firms could only make significantly less profits by selecting such strategy. However, this sub-optimal behavior is only observed in treatments with green signaling available. The behavioral conjecture is hence partially supported: green signals are not perfect substitutes for brown signals. This costly type revelation is analyzed as a consequence of the availability of the public good provision. Such behavior might be related to the "identity" or "self-image" concept (Akerlof and Kranton, 2005; Brekke et al., 2003; Bénabou and Tirole, 2006). Following Brekke et al. (2003)' model, participants are likely to want to think of themselves

as socially responsible ('What kind of a person am I?'). However, their individuals' perceived social responsibility varies with external conditions and potential profit ('What kind of situation is this?'), which lead them to make trade-offs between the wish to be socially responsible and the desire for remuneration ('What should a person such as I ideally do in a situation such as this?'). Hence participants first determine their morally ideal effort, and then maximize utility by trading the benefits of maintaining a self-image as a socially responsible person against the costs. This trade-off between pay-off and identity appears as a likely explanation for the type revelation observed. Indeed, firm managers in the experiment are likely to have quit green signaling to cut costs. However, revealing their type appears as an "honest" strategy in which one does not try to lie about her type, hence protecting one's self-image.

Conversely, when advertising is available and public good participation is not mentioned, participants play strategically under the impetus of pure extrinsic motivation, without taking into consideration damage to their self-image. Knowing that they *could* contribute to a public good led firm managers to reveal their true type, hence reducing market information asymmetry.

4.7. Conclusion

Chapter 4 aimed at exploring whether environmental performance, and more generally corporate public good provision, could perfectly substitute to other types of money-burning signals to reduce information asymmetry in Private Equity negotiations. It investigated whether the existence of a money-burring signal that contributed to a public good allowed for the possibility for firms to signal their type to investors. To do so, a signaling game of Private Equity negotiations was built and tested in the laboratory. The experimental design enabled to provide content to the money-burning signal, making it an actual contribution to a real public good.

In the laboratory, environmental performance was not achieved, as money burning signals were not purchased. Environmental performance did not appear particularly more salient than advertisement as a money-burning signal, and none were used to signal quality. However, in the green signal setting (that is when firms *could potentially* pay to become environmentally performant) firm type separation occurs in a sub-optimal way, firms revealing their type

through prices. This type revelation is costly, but appears preferred to a pooling strategy that would require (on top of not being environmentally performant) to hide one's true type. Equilibrium selection thus differs depending on the money-burning signal content. Environmental performance cannot thus perfectly substitute to other types of money-burning signals to reduce information asymmetry.

Private provision of public good seemed to increase transparency trough prices on the experimental Private Equity market. Such a result triggers the suggestion that involving environmental and social performance in deals might crowd-in actors' intrinsic motivation to act in line with their moral values. Improving performance on environmental, social and governance issues might thus create virtuous circles on transparency and standard business and investment activities.

Finally, public good contribution quickly fades away in the setting used in this chapter, whatever its cost. Whereas the growing interest of investors for environmental and social performance of their portfolio might be a promising improvement of standard practices, results in the laboratory simplified environment call attention to the actual public good provision and impact on society as a whole. A natural extension of this work, that would also enable to test for result robustness to other settings, would be to use other types of money-burning signals, including other types of public-good provisions. In particular, the question of the most relevant type of public good provision signaling in equity market might provide interesting insights of corporate finance and socially responsible investment literatures.

CHAPTER 5

THE PRICE OF UNSUSTAINABILITY: AN EXPERIMENT WITH PROFESSIONAL PRIVATE EQUITY INVESTORS

Do sustainable and unsustainable practices impact the access to equity financing?

Abstract

This last chapter sheds light on the impact sustainable and unsustainable corporate practices have on equity financing. We present a unique framed field experiment in which professional Private Equity investors compete in closed auctions to acquire fictive firms. We hence observe that corporate non-financial performance impacts firm valuation and investment decision and we quantify to which extent. Main result is an asymmetric effect, entrepreneurs having more to lose from unsustainable practices than to gain from sustainable ones. Our findings are discussed in terms of practical implications for both investors and firm managers.

Résumé

Ce dernier chapitre met en lumière l'impact que les pratiques durables et non durables des entreprises peuvent avoir sur leur financement en capitaux-propres. Nous présentons une expérience de terrain unique où des investisseurs en capital sont mis en compétition pour acquérir des entreprises fictives dans un contexte d'enchères fermées. Nous observons ainsi que la performance extra-financière des entreprises impacte les valorisations et décisions des investisseurs et nous quantifions dans quelle mesure. Le principal résultat est un effet asymétrique de la durabilité, les entrepreneurs ayant plus à perdre des pratiques non durables qu'à gagner des durables. Nos résultats sont discutés en termes d'implications pratiques pour les investisseurs et les manageurs d'entreprises.

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5.1. INTRODUCTION

The academic community has acknowledged that the past half-century wide gains in global economic development and human wealth creation has been achieved at the cost of environmental degradation, jeopardizing the sustainability of our economic systems (the Millennium Ecosystem Assessment, 2005; Dean and McMullen, 2007). In search for green growth foundations, an expanding body of literature investigates the role sustainable entrepreneurship can play (Cohen and Winn, 2007; Dean and McMullen, 2007; Zahra et al., 2009). Hall et al. (2010) review this academic field and underline research paths left open, such as the conditions under which entrepreneurs can pursue sustainable ventures, or the limits to entrepreneurs' potential for creating sustainable economies. This chapter contributes to this literature by shedding light on the impact both sustainable and unsustainable corporate practices have on Private Equity financing. We indeed ask whether investors support sustainable entrepreneurs by preferentially providing them with the equity needed to ensure their growth.

Most research focused on developing the 'business cases' for sustainable development (Parrish, 2010), that is motivating and legitimating firms' sustainable orientations by potential profit making. Indeed, the impact of corporate social performance on economic performance has been largely studied in the business and economic literature (e.g. Margolis and Walsh, 2003; Orlitzky et al., 2003; Crifo and Ponssard, 2010). In the most extensive literature meta-analysis up-to-date, Margolis et al. (2009) conclude on the existence of a small, positive and significant relationship between firm financial and social performance. However, drivers and causality of this relationship are ambiguous and not well understood (Horváthová, 2010; Surroca et al., 2010). This chapter argues that the equity market reaction to corporate sustainable orientations is likely to be profit-oriented. Therefore, understanding how corporate social performance is perceived by investors in terms of value creation is not trivial for academics and remains core for entrepreneurs, including for sustainability entrepreneurs as defined by Parrish (2010)[17].

[17] Parrish (2010) opposes conventional entrepreneurs to sustainability entrepreneurs. The former « *view enterprises as a means of profiting from the exploitation of resources, with the underlying logic of using resources for one's own advantage to generate maximum financial returns in the shortest time possible* ».The latter « *view enterprises as a means of perpetuating resources, with the underlying logic of using human and natural resources in a way that enhances and maintains the quality of their functioning for the longest time possible* ».

Hereby we take the standpoint of focusing specifically on how sustainable (or socially responsible) and unsustainable (or socially irresponsible) practices can respectively create and destroy firm value, that is create or destroy profits for the firm shareholders. More specifically, we aim at providing entrepreneurs with a quantified measure of whether their efforts to manage the "*triple bottom line, that is balancing economic health, social equity and environmental resilience*" (Kuckertz and Wagner, 2009) is rewarded by investors in terms of firm value and investment attractiveness. The literature highlights that entrepreneur's engagement in sustainable practices may be profit-motivated, morally motivated or ethically grounded (Bryant, 2009; Harris et al., 2009). Here, whatever their original motivations, we explore how entrepreneurs may have a strong rationale for wanting to know whether engaging their firm on a sustainable path will create or destroy its market value and whether it will ease or not their access to equity.

Firm value aggregates a large quantity of information on the company's past, current and future cash flows and assets, both tangible and intangible. Many factors, often not directly available to researchers[18], interweave in real life to build firm value, making it difficult to isolate the sole contribution of extra-financial performance in standard empirical analysis. A first research path consists in analyzing listed firms, whose values publicly result from stock market consensus. In this line, the socially responsible investment literature (see Renneboog et al., 2008 for a review) provides interesting insights using event studies (such as Takeda and Tomozawa, 2008) and empirical comparisons of socially responsible to conventional portfolio performance (Van de Velde et al., 2005; Galema et al., 2008).

However, the backbone of our economies consists in non-listed firms[19], for which no public price is available. The novelty of our approach is to provide an original analysis based on experimental economics, allowing us to quantify the contribution of sustainable practices to the value of non-listed firms. The experimental setting we rely on enables us to simplify the investing environment and control the information that grounds firm-value to focus on sustainability impact. The robustness of our methodology is grounded in the firm valuation expertise of the participants in our experiment.

[18] Examples of such factors include expected cash flows, management quality and intangible assets.

[19] Unlisted firms have been shown to differ from public corporations, for instance in terms of capital structure (Romano et al., 2001) and shareholders protection (Loderer and Waelchli, 2010). They also undergo different legislation on extra-financial performance disclosure than public corporations. They encompass the large body of small-and-medium size enterprises (SMEs), which are the largest GDP contributor and employer in Europe (Ecorys, 2011), and differ in their CSR from public corporations (Jenkins, 2004; Lepoutre and Heene; 2006).

Indeed, our experiment involves professional Private Equity investors (including both venture capital and buyouts specialists). Our motivation to recruit these specific investors was threefold. First, their business is to value and invest in unlisted firms, in particular small and medium size enterprises. On a theoretical level, they have been identified as highly efficient at maximizing shareholders' value by reducing information asymmetry (Jensen, 1986, 1989), monitoring the companies they select (Holmstrom and Tirole, 1997) and evaluating them better than a standard financial institution would (Ueda, 2004). Second, several authors pointed out that they already include in their valuation and investment decision non-financial criteria identified as core for business in the long run, such as the quality of management (Muzyka et al., 1996) or governance (Kaplan and Strömberg, 2009; Wright et al., 2009), in particular for family firms (Dawson, 2009). Third, many entrepreneurs turn to Private Equity investors to get access to capital. Analyzing whether sustainable and unsustainable practices matter for those key investors in terms of firm valuation and investment decision is therefore a core issue in itself for entrepreneurs.

Hence we present a framed field experiment with Private Equity investors and infer from their expertise explicit measures of over and underperformance in terms of sustainable practices. We formalize sustainable practices as CSR and decompose it into its three main pillars: Environment, Social and Governance (ESG) factors. Along each *factor*, we consider that the firm can implement either sustainable or unsustainable practices (*sign*, either positive or negative for society). Finally, we distinguish policies that are core for the business and mobilize resources (*hard*) from policies which are peripheral (*soft*), following a dichotomy suggested by Hannan and Freeman (1984) and Nicholls-Nixon et al. (2000). Our experimental design thus enables a focus on these three dimensions of corporate practices: *factor* (ESG), *sign* (positive, i.e. sustainable, or negative, i.e. unsustainable) and *quality* (soft or hard).

Thirty three investors were involved in first-price sealed-bid auctions with embarrassment cost, a mechanism we formalize to demonstrate that it enables price revelation. Investors competed to acquire fictive firms based on case studies carefully built to ensure realism and credential context. Investors were provided with accounting and financial information, together with non-financial information as the experiment progressed. We intentionally manipulated the non-financial details in order to obtain investors' valuation revision for each *factor*, *sign* and *quality* independently.

Our results on 330 observations highlight that non-financial performance matters for Private Equity financing. We control for investor heterogeneity and observe that firm valuations and

investment decisions are both impacted by the *factor* (ESG), *sign* (sustainable or unsustainable) and *quality* (hard or soft) of corporate practices, and we quantify to which extent. Main finding is the existence of an asymmetrical effect of non-financial performance, entrepreneurs having more to lose from unsustainable practices than to gain from sustainable ones.

When investors' heterogeneity is controlled for, our results unveil that unsustainable policies (cumulating soft and hard practices) decrease firm valuation by respectively 11%, 10% and 15% for environmental, social, and governance issues. Sustainable environmental and social policies only increase firm valuation by 5%, governance having no significant impact. Whether the corporate practice is core (hard) or peripheral (soft) for the business essentially matters in the case of unsustainable practices. We also observe that unsustainable practices decrease investment likelihood by about 30%. The decrease only occurs for hard environmental and social issues, whereas all governance issues (both soft and hard) matter for investors, highlighting the specificity of this CSR dimension. We conclude that unsustainable corporate policies might both prevent equity financing and increase its cost, sustainability thus consisting in a defensive strategy to protect firm value and equity access.

The remainder of this chapter is organized as follows. Section 5.2 details the experimental design, procedures used and the incentive mechanism of the first-price auction with embarrassment cost. Results are presented in Section 5.3 and their practical implications for investors and entrepreneurs are discussed in Section 5.4. Section 5.5 concludes by suggesting potential research extensions.

5.2. Experimental Design and Procedures

We first present our experiment design in subsection 5.2.1 before detailing procedures in subsection 5.2.2. The experiment was built and conducted in partnership with professional associations[20] in order to ensure realism, credent context and participants' involvement. It is designed to quantitatively measure investors' pricing of corporate sustainability based on

[20] The Sustainable Club of the French Private Equity Association provided financial, technical and logistic support to build the case studies, recruit participants and run the experimental sessions. We affirm that our research was conducted in full independence and that our professional partners neither interfered in our study nor in our results.

first-price sealed-bid auctions with embarrassment cost. We discuss the choice of this auction mechanism and prove that it is incentive compatible in subsection 5.2.3.

5.2.1. DESIGN

The design encompasses four treatments based on three fictive case studies carefully built with professional Private Equity investors. Each treatment uses two case studies and evaluates a different set of extra-financial performance in terms of *factor*, *sign*, and *quality*.

Factor deals with the focus of the policy, which can target any of the multiple actions encompassed in CSR, from waste reduction to proactive human resources management. Following business and academic practices in use[21], we categorize corporate policies within the three pillars of CSR: Environment (E), Social (S) and Governance (G). *Sign* can be positive (+) or negative (-), meaning that the firm respectively over-performs (sustainable practices) or underperforms (unsustainable practices) its industry non-financial performance standards on a given factor. Finally, the corporate practice can either be core for the firm business ("hard practice") or peripheral ("soft practice"), defined by the bearing on firm resource mobilization (Hannan and Freeman, 1984; Nicholls-Nixon et al., 2000). We qualify this property as the corporate practice *quality* and refer to it as "hard" (++ or --) or "soft" (+ or -).

Each of the three case studies corresponds to a fictive firm that needs Private Equity financing. Various industries, firm sizes and financial performances (investment attractiveness) are used across cases. Table 5.1 summarizes the characteristics of the case studies, which are detailed in Appendix D.1. Each case study uses two different *factors* with different *signs*. For each *factor* and *sign* (for instance: sustainable environmental policy), we always evaluate the effects on investors' decisions of successively a soft practice (e.g. energy saving at the holding building level) and a hard practice (e.g. change in the production process to reduce toxic waste). We thus measure the effects of a soft practice, a hard practice, and the total cumulative impact of both, which we assimilate to the effect of a global policy.

[21] For business and market practices in use, the reader can refer to the United Nations Principles for Responsible Investing (http://www.unpri.org/), US SIF (http://ussif.org/) and EUROSIF (http://www.eurosif.org/); for academic literature reviews on CSR and SRI to Crifo and Ponssard (2010), Reinhardt et al. (2008), Renneboog et al. (2008).

Treatments combine case studies in order to independently test investor decisions when confronted to various extra-financial performance levels. Treatments 1, 2 and 3 test all combinations of *factors* and *signs*. Treatment 4 ensures that the sequence of information (learning first about the firm's sustainable practices and then about its unsustainable ones; or the reverse way) does not impact investors' decisions. Figure 5.1 displays the experiment design and details the information evaluated by participants in each treatment.

5.2.2. PROCEDURES

Participants were recruited by professional association emailing and directly registered online. We run one session per treatment (hence four sessions) with 6 to 11 participants. Treatments 1 to 3 were conducted in the French Private Equity Association office; treatment 4 was conducted via an internet website for participants who could not attend the previous sessions. The 33 participants were all professional Private Equity investors (their profile is detailed in section 5.3.1).

In each session, the sequence of events was as follows. First, participants signed an agreement form that ensured anonymity and confidentiality. They were explained the rules of the experiment (available in Appendix D.3). They were given the first case study, similar in its format and content to a real business deal offer. Data provided encompassed business description, history, key market indicators, accounting data, business-plan with expected future cash-flows, comparable transactions and multiples, and a firm price benchmark based on different weighted average cost of capital. After analyzing this information, investors wrote down their firm valuation and whether they wanted to invest or not in it.

Information step	**Treatment 1** (11 participants)	**Treatment 2** (7 participants)	**Treatment 3** (9 participants)	**Treatment 4** (6 participants)
Step 1	**Firm A**	**Firm C**	**Firm B**	**Firm A**
Step 2	S +	G +	E +	E -
Step 3	S ++	G ++	E ++	E --
Step 4	E -	S -	G -	S +
Step 5	E --	S --	G --	S ++
Step 6	**Firm B**	**Firm A**	**Firm C**	**Firm B**
Step 7	E +	S +	G +	G -
Step 8	E ++	S ++	G ++	G --
Step 9	G -	E -	S -	E +
Step 10	G --	E --	S --	E ++

FIGURE 5.1 - Experiment design

Four treatments were tested. Two case studies were done by treatment, using information on Environmental (E), Social (S) or Governance (G). Information is either positive (+) or negative (-), and either soft (+ and -) or hard (++ and --). Each participant underwent the 10 steps of information of a single treatment.

TABLE 5.1 - Characteristics of the three case studies used in the experiment

Case Study	Sector	Number of Employees	Factor	Sign	Quality	Policy
Firm A	Catering	1600	Social	+	soft	Employee training & career development
					hard	Working conditions & remuneration
			Environment	-	soft	Environmental footprint monitoring
					hard	Environmental performance of supply chain
Firm B	Packaging	227	Environment	+	soft	Environmental footprint monitoring
					hard	Eco-design
			Governance	-	soft	Organization of authority delegation
					hard	Organization of board of directors
Firm C	Electronic Components	2608	Governance	+	soft	Organization of authority delegation
					hard	Organization of board of directors
			Social	-	soft	Employee training & remuneration
					hard	Working conditions & remuneration

Once all investors in the session had done so, new extra-financial information was progressively given to them, as would occur in an auditing process. They sequentially received four new pieces of extra-financial information of different *sign*, *quality* and *factors* (see Figure 5.1, steps 1 to 5). For each new piece of information, participants could either revise their firm valuation and investment decision or not. Altogether, each investor thus valued five times the first case study. Our interest lays in the change of decisions between the first valuation (our baseline) and the four decisions that follow. Investors could also write comments on their decisions, providing us with qualitative data.

Once the first case study was completed, the second case study was given to investors and the same rules applied (Figure 5.1, steps 6 to 10). We thus gathered 330 observations (330 firm valuations and 330 investment decisions) as well as detailed qualitative data. Once the second case study was completed, participants fulfilled a short questionnaire eliciting their socio-economic characteristics, understanding, strategy, ESG training, beliefs on ESG factors as well as intrinsic preferences such as risk aversion (full questionnaire is available in Appendix D.4). On average, sessions lasted about 90 minutes.

5.2.3. Incentives Mechanism

The experimental design is based on first-price sealed-bid auctions with embarrassment cost. We here discuss the efficiency of this mechanism at revealing investors' true firm valuation. In a first-price sealed-bid auction, each investor independently submits a single bid without seeing others' bids. The firm is sold to the bidder who makes the highest bid (the winner), who pays her bid. First-price sealed-bid auctions with a limited amount of bidders ("controlled sales") are a widespread bidding process among Private Equity investors (Boone et al., 2009, Fidrmuc et al., 2012). Deal values usually stay private information and research on the topic thus often resorts to survey data (Hsu, 2004). First-price sealed-bid auctions have been well documented both theoretically (Klemperer, 2004, p.12) and experimentally (for a survey see Kagel, 1995). Two downsides of our experimental auction need offsetting: obviously, there is no actual firm to acquire in our experiment; and conversely, participants would not be asked to spend large amounts of cash. The auction game is therefore built to psychologically trigger participants' price revelation.

First, to ensure saliency, we use two incentives: a monetary incentive, as the winner can earn a prize equivalent to 120€ (which consisted in three bottles of Champagne of a French luxury brand); and a reputational incentive, as the auction winner is announced publicly. Second, to offset the absence of monetary cost for the auction winner, we rely on the embarrassment of winning with too high a bid that was identified by Klemperer (2002). Beyond cash flow waste (which does not occur in our setting), winning with too high a bid causes embarrassment cost as it suggests incompetence. We spur further this embarrassment cost in a threefold way: (i) our case studies provide investors with a common price range for the firm valuation (depending on their choice of Weighted Average Cost of Capital; see Appendix D.1), which they can use as a benchmark; (ii) the winner's firm valuation is made public, so that all participants know if the winning bid is too high; and (iii), we introduce a penalty in the first-price sealed bid auction. Indeed, if the winner's bid is too high, we openly state that she made a "bad deal" and she loses her prize. A winning bid is defined as "too high" if it exceeds 10 percent of the market consensus, calculated as the median of all valuations[22].

Drawing on Klemperer (2004, p. 68), we formalize the first-price sealed-bid auction with embarrassment cost and demonstrate that this mechanism enables the revelation of investors' true firm valuation. We consider n risk-neutral investors[23] whose firm valuations v_i are independently drawn from the uniform distribution on [0,1], with distribution function denoted by $F(v)$ and density function denoted by $f(v)$. With a uniform distribution on $[\underline{v}; \overline{v}]$ we have $F(v) = (v - \underline{v})/(\overline{v} - \underline{v}), \quad f(v) = 1/(\overline{v} - \underline{v})$.

Investor i's utility u_i from winning the auction with bid b_i equals:

$$u_i = v_i - b_i - k\left(b_i - m(b_j)\right) \tag{1}$$

where v_i denotes her true firm valuation, $m(b_j)$ the median of all j bids, and the term proportional to parameter k reflects the embarrassment of winning with too high a bid, that is

[22] The choice of the median is based on perceptions within the sector as well as the 10 percent interval that corresponds to the estimated bargaining on the real market.

[23] Klemperer (2004, p.19) notes that in first-price auction, risk-aversion make bidders bid more aggressively. Risk aversion in first-price auction has received major attention by the experimental community: for instance, see Neugebauer and Perote (2008) for a recent contribution showing the limits of over-bidding. In our experiment, participants appear fairly risk-neutral (see section 3.1 and Appendix D.2).

disutility for a winner to lose the monetary prize and to be known to make a bad deal. A non-winner's utility is zero[24].

We are going to determine the players' expected payments and the equilibrium bidding strategies. Let denote by $b(\tilde{v})$ the bidding strategy that player *i* is supposed to follow in the equilibrium of the game induced by the incentives mechanism ($\tilde{v}$ denotes the corresponding type of player *i*). We denote by EU_i bidder *i*'s expected utility from behaving as type $\tilde{v}$ given her opponents. The expected payment of a bidder of type $\tilde{v}$ is defined as the probability of winning the auction in the equilibrium ($p_i(\tilde{v})$), times the expectation of u_i conditional on the remaining *(n-1)* values being below $\tilde{v}$: $EU_i = p_i(\tilde{v}) \times E\left(u_i \middle| v_j < \tilde{v}, \forall j \neq i\right)$.

In any mechanism which always gives the object to the highest-value bidder in equilibrium, the probability of winning the auction is simply $p_i(\tilde{v})=(F(\tilde{v}))^{n-1}$, with *F(.)* the distribution function, since a bidder's probability of winning is the probability that all the other *(n-1)* bidders have lower values than she does. With a uniform distribution on [0,1], we have $F(\tilde{v})=\tilde{v}$, therefore $p_i(\tilde{v})=\tilde{v}^{n-1}$. EU_i then writes:

$$EU_i = \tilde{v}^{n-1}\left(v_i - b(\tilde{v}) - k\left(b(\tilde{v}) - E\left[m(b_j)\middle| v_j < \tilde{v}, \forall j \neq i\right]\right)\right) \tag{2}$$

Bidder *i*'s optimal bidding choice of $\tilde{v}$ satisfies $\partial EU_i / \partial \tilde{v} = 0$ that is:

$$\begin{aligned}&(n-1)\tilde{v}^{n-2}\left(v_i - b(\tilde{v}) - k\left(b(\tilde{v}) - E\left[m(b_j)\middle| v_j < \tilde{v}, \forall j \neq i\right]\right)\right)\\ &+\tilde{v}^{n-1}\left(-b'(\tilde{v}) - k\left(b'(\tilde{v}) - \partial/\partial\tilde{v} E\left[m(b_j)\middle| v_j < \tilde{v}, \forall j \neq i\right]\right)\right) = 0\end{aligned} \tag{3}$$

To simplify our computations and obtain analytical results, we assume following Klemperer (2004, p.215) that there is a linear equilibrium so that: $b(v)=\beta \times v$. We are searching for the equilibrium bidding strategy *b(v)*, which in a linear equilibrium amounts to determining the equilibrium value of β. Equilibrium bidding strategies are symmetric Nash equilibrium in which a bidder with value *v* chooses the bid *b(v)*. Consider that player *i* with value *v* deviates and chooses the bid $\tilde{b}$, and let $\tilde{v}$ be the type of bidder she would just tie with, that is: $b(\tilde{v}) = \tilde{b}$. Mimicking $\tilde{v}$ would beat all the other *(n-1)* bidders with probability $(F(\tilde{v}))^{n-1}$ and yield expected surplus to player *i* $EU(v,\tilde{v}) \times (F(\tilde{v}))^{n-1}$. Choosing the best bid to make is thus

[24] In the basic analysis of optimal auctions, revenue equivalence and marginal revenues apply (see Klemperer, 2004). In a framework in which the object always goes to the buyer with the highest value and bidders with lowest values expect zero surplus, any mechanism that allocates a unit among the bidders yields the same expected revenue.

equivalent to choosing the best $\tilde{v}$ to mimic which is computed as the first-order condition $\partial EU_i/\partial\tilde{v} = 0$. In turn, for the bidding function *b(v)* to be an equilibrium, *i*'s best response to all other biddings according to this function must be to do likewise, that is, her optimal choice of $\tilde{b}$ is *b(v)* and of $\tilde{v}$ is *v*. We thus have $\tilde{v} = v_i$ in our (symmetric Nash) equilibrium.

Conditional on v_i being the highest value, the other *n-1* values are uniformly distributed on [0, v_i] so, using the property of the uniform distribution, the expected value of the median of these (which is what *i* would expect to pay conditional on winning) is $v_i/2$:

$$E\left[m(b_j)\,|v_j < v_i\,, \forall\, j \neq i\right] = v_i/2 \tag{4}$$

Using $b(v) = \beta\times v$ and $\tilde{v} = v_i$ and substituting for equation (4) into equation (3), we get:

$$(n-1)v_i^{n-2}\left(v_i - \beta v_i - k\left(\beta v_i - \frac{v_i}{2}\right)\right) + v_i^{n-1}\left(-\beta - k\left(\beta - \frac{1}{2}\right)\right) = 0 \tag{5}$$

That is we obtain the following equilibrium bidding strategy $b(v_i) = \beta\times v_i$ with:

$$\beta = \left(\frac{n-1}{n} + \frac{k}{2}\right)/(1+k) \tag{6}$$

And bidder *i*'s unconditional expected utility is given by:

$$EU_i = v_i^{n-1}\left[v_i - \beta v_i - k[\beta v_i - v_i/2]\right] = v_i^n/n \tag{7}$$

The result of this simple first-price auction with embarrassment cost shows that EU_i is independent of *k*. Since the highest type wins, the lowest type makes zero surplus. For all *k*, the other conditions for revenue equivalence are satisfied and the bidders are equally well off.

What matters for the experiment is that when the embarrassment cost (k) increases, the equilibrium bidding strategy ($b(v_i)$) converges toward the median valuation ($v_i/2$). In other words, the risk of winning the auction with too high a bid depresses investors' firm valuations towards the market consensus. Assuming the reputational and monetary incentives we implemented are salient, the embarrassment cost is very high in the experimental auction. Therefore our first-price sealed-bid auction design enables the revelation of investors' real firm valuation.

5.3. RESULTS

We first present participants' main characteristics in section 5.3.1, then results on the impact of corporate extra-financial performance on investors' firm valuation in section 5.3.2, before analyzing the impact on investment decisions in section 5.3.3. Table 5.2 summarizes descriptive statistics on experimental results. Full descriptive statistics, detailed by treatment and firm, can be found in Appendix D.5 (Table D.5.1).

5.3.1. PARTICIPANTS' PROFILE

Following our questionnaire's answers, participants in our experiment are professional and experienced Private Equity investors (39 years old in average). They work in different segments of Private Equity (venture and seed capital 33%, growth capital 24% and leveraged buyouts 52%[25]) and at different posts (chairman 21%, partner 21%, investment director 12%, investment manager 40% and specialists of socially responsible investments 6%). 73% are men and 48% have received some kind of training on the management of ESG issues. Results of a simple lottery (see question 10 in Appendix D.4) allows us to estimate participants' risk aversion. Compared to usual experimental participants (Holt and Laury, 2002), they appear fairly risk-neutral and less risk-averse than usual experimental participants (see figure D.2.3. in Appendix D.2). Detailed participant descriptive statistics can be found in Appendix D.2. In the following analysis, we control for investor heterogeneity using these variables.

5.3.2. RESULTS ON FIRM VALUATION

A first element worth noting is the consistency of firm valuation between sessions, which supports the expertise of our participants, the efficiency of the auction mechanism and the robustness of our results. Between sessions, Firm A base mean valuation was 151.8 M€ with a 35.2M€ standard error (that is 23%); 37.8M€ with a 6.9 M€ standard error (18%) for firm B; and 514.8M€ with a 114.3M€ standard error for firm C (23%) (see Table 5.2). 70% of the winners received their prize for firm A and 50% for firm B and C, meaning most winning

[25] Some participants worked in two segments, explaining why total exceeds 100%

valuations were within 10% of the median valuation. Also supporting results consistency, we can note that most valuations (respectively 67%, 100% and 63% valuations for firms A, B and C) were within the firm valuation range we had provided in the case studies (see Appendix D.1).

For the remainder of the analysis, we focus on the relative change in investors' firm valuation between information steps (in %) rather than the absolute firm valuation (in M€). The heterogeneity of investors' valuations in Step 1, that is based on sole financial data, is therefore controlled for in the analysis. Table 5.3 presents the mean of the relative change in investors' firm valuation depending on *factor*, *sign* and *quality*. Statistical significance of the observed changes is assessed by the p-values yielded by the non-parametric Wilcoxon signed-rank test, which compares the mean of the relative valuation change to zero. Figure 5.2 summarizes these data.

Descriptive statistics (Table 5.2) and the results of the Wilcoxon signed-rank tests on the mean changes in firm valuation (Table 5.3) indicate that sustainable and unsustainable practices all impact firm valuation whatever their *factor*, *sign* and *quality*.[26] Unsustainable environmental, social and governance policies (cumulating soft and hard practices) appear to significantly decrease investors' firm valuation by respectively 11.6%, 10.5% and 15.3% (all p-values <0.01); whereas sustainable ones only increase it by 5.0%, 5.5% and 2.0% (all p-values < 0.05) (Table 3). Most of the unsustainable policy effect appears driven by hard (that is core for the business) practices.

[26] Only the impact of positive hard governance practice is not significant at the level of 10%.

TABLE 5.2 - Descriptive statistics on experimental results [a]

Firm	Corporate practice			Valuation (M€)					Investment decision (%)	
	factor	Sign & quality	Obs.	Mean [b]		Median.	Min.	Max.	Mean [b]	
A	*Base*		*24*	*151.8*	*(35.2)*	*160.0*	*81*	*242*	*0.75*	*(0.44)*
	Social	+	24	151.1	(35.2)	160.0	81	220	0.75	(0.44)
		++	24	152.2	(35.6)	162.5	81	220	0.71	(0.46)
	Env.	-	24	150.0	(34.7)	160.0	81	220	0.75	(0.44)
		- -	24	137.5	(27.4)	137.5	81	180	0.46	(0.51)
B	*Base*		*26*	*37.8*	*(6.8)*	*38.2*	*20*	*50*	*0.65*	*(0.49)*
	Env.	+	26	36.6	(8.3)	37.9	15	50	0.69	(0.47)
		++	26	37.9	(9.4)	39.3	15	58	0.81	(0.40)
	Gov.	-	26	37.3	(8.0)	37.5	20	56	0.61	(0.50)
		- -	26	33.8	(8.9)	33.0	15	50	0.46	(0.51)
C	*Base*		*16*	*514.8*	*(114.3)*	*500.0*	*280*	*747*	*0.94*	*(0.25)*
	Gov.	+	16	522.8	(119.3)	505.0	280	747	0.94	(0.25
		++	16	526.7	(124.7)	506.5	280	750	1.00	(0.00)
	Social	-	16	508.2	(114.7)	497.5	280	740	0.88	(0.34)
		- -	16	467.5	(117.3)	450.0	275	700	0.50	(0.52)

[a] Provided by firm case study (A, B or C) and by corporate practice factor (Environment, Social or Governance), sign and quality ("+" sustainable soft practice; "++" sustainable hard practice; "-" unsustainable soft practice; "-- " unsustainable hard practice). *Base* (italic figures) is the first investment round, in which investors' decisions are taken based on sole financial data.
[b] Figures in brackets are standard errors.

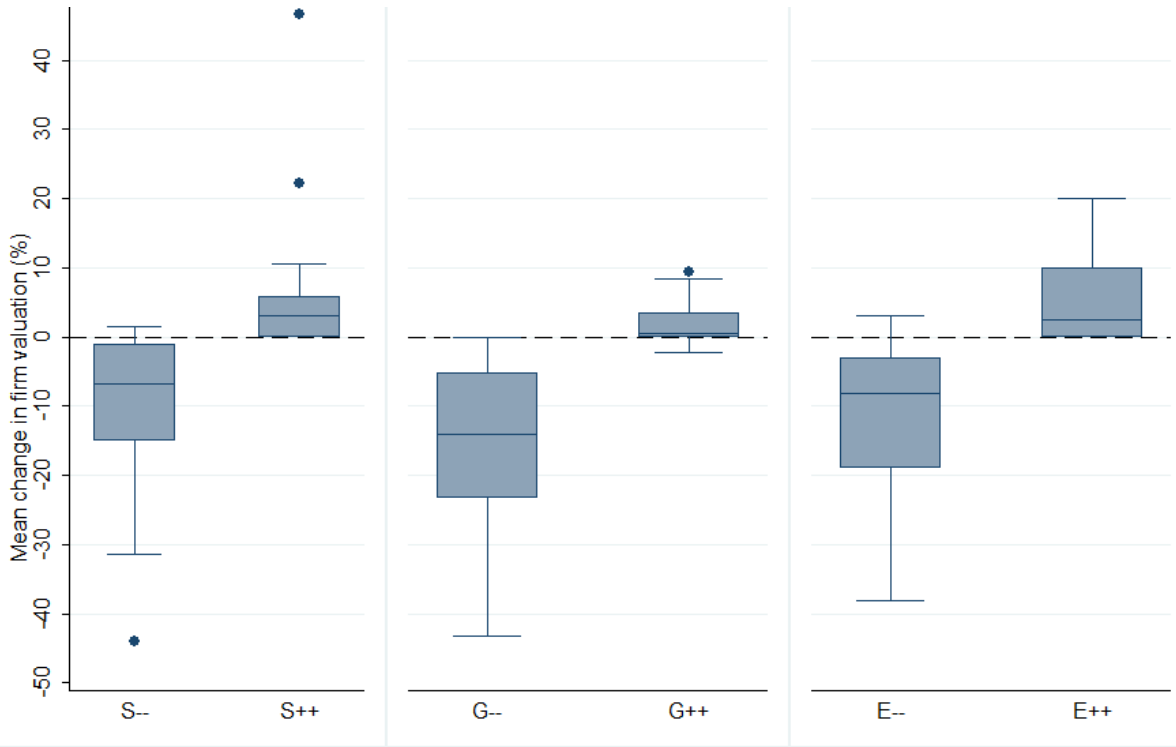

FIGURE 5.2 - Impact on firm valuation

Mean impact (%) of corporate sustainable (Positive hard "++") and unsustainable (Negative hard "- -") practices on investors' firm valuation depending on the policy factor: Social (left), Governance (middle) and Environment (right)

TABLE 5.3 - Experimental effects of corporate policies on the mean changes in firm valuation and investment decision[a]

Factor	Sign[b]	Quality	# obs.	Mean change in firm valuation (%) [c]		Mean change in investment decision (%) [c]	
Environment	*Negative*		*24*	*-11.57*	***	*-29.17*	***
		Soft -	24	-3.36	*	0.00	
		Hard --	24	-8.08	***	-29.17	***
	Positive		*26*	*4.95*	***	*11.54*	*
		Soft +	26	1.69	**	0.00	
		Hard ++	26	3.20	***	11.54	*
Social	*Negative*		*16*	*-10.47*	**	*-50.00*	***
		Soft -	16	-2.98	**	-12.50	
		Hard --	16	-7.95	**	-37.50	**
	Positive		*24*	*5.49*	***	*-4.17*	
		Soft +	24	3.95	**	-4.17	
		Hard ++	24	1.48	**	0.00	
Governance	*Negative*		*26*	*-15.26*	***	*-30.77*	**
		Soft -	26	-5.80	***	-15.39	
		Hard --	26	-10.07	***	-15.39	
	Positive		*16*	*2.03*	**	*6.03*	
		Soft +	16	1.43	**	0.00	
		Hard ++	16	0.60		6.03	

[a] Mean relative change in respectively firm valuation and investment decision when investors learn about corporate extra-financial performance, depending on the corporate practice factor (Environment, Social or Governance), sign (Negative, i.e. unsustainable; or Positive, i.e. sustainable) and quality (hard or soft practice).
[b] The mean change in firm valuation and investment decision calculated by Sign (italic) represents the cumulative effect of both the soft and hard practices, that is the effect of a global sustainable or unsustainable policy.
[c] Statistical significance is given by Wilcoxon signed-rank test (H0: Mean of change = 0): *** $p<0.001$; ** $p<0.005$ * $p<0.010$

However, heterogeneity in investors' socio-economic characteristics, experience and preferences may affect their decisions and bias those results. To control for this heterogeneity and for the repetition of valuations for each investor, we use panel regression models and econometrically analyze the effects of sustainable corporate policy (Table 5.4) and unsustainable corporate policy (Table 5.5) on firm valuation change depending on *factor* and *quality*.

In both tables, models 1 and 2 are GLS models with random effects in which investors' age, gender, specialty (venture capital; buyouts; expansion capital; socially responsible investments), and training on ESG issues management are controlled for. We also control for the order in which the case studies were given as well as whether the session was run on the internet or not. Models 1' and 2' are panel regression models with fixed effects, hence directly controlling for investors' heterogeneity, and are used as robustness check. Models 1 and 1' explain the firm valuation change between rounds 1 – 3, 3 – 5, 6 – 8 and 8 – 10 and test the effects of corporate policy *factor* (ESG). They thus provide estimates of the cumulative effect of hard and soft practices on a given factor. Models 2 and 2' explain the firm valuation change between each round and estimate the crossed effects of *factor* and *quality*. They thus distinguish the effects of soft and hard practices for any given factor. As a robustness check, table D.5.2. in Appendix D.5 provides other estimations using crossed effects of *sign*, *factor* and *quality*.

Let us first focus on the effects of sustainable practices on firm valuation change (Table 5.4). Sustainable environmental and social policies (cumulating soft and hard practices) led to a significant increase in firm value of respectively 4.7% and 5.4% in Model 1; 4.6% and 5.9% in Model 1' (all p-values<0.01). Positive Governance has no significant impact in our data. We now distinguish core from peripheral practices (Models 2 and 2', Table 5.4). Once sustainable policies are separated into soft and hard practices, the effects that remain significant are the effect of hard environmental practice (3.2% and 3.1% in Model 2 and 2', p-value<0.01) and the effect of soft positive social practice (3.8% in Model 2 and 4.1% in Model 2', p-value<0.01). In all random-effect models, investors' intrinsic characteristics do not have significant effect on firm valuation change.

Let us now focus on the effects of unsustainable practices on firm valuation change (Table 5.5). Unsustainable environment, social and governance policies (cumulating soft and hard practices) respectively decrease firm value by -11.2%, -10.6% and -15.1% in Model 1; and -11.7%, -10.7% and -14.6% in Model 1' (Table 5.5; all p-values<0.01). When we separate the

effects of soft and hard practices (Models 2 and 2'), we find that both significantly reduce firm value, but hard practices have a significant larger impact (tests of equality between coefficients for each *factor*: p-value<0.05). Soft unsustainable practices decrease firm value by -3.5% (p-value<0.05), -3.1% (p-value<0.10), and -5.7% (p-value<0.01) for respectively environment, social and governance issues in Model 2 (-3.8%, -3.1% and -5.3% in Model 2'), whereas hard unsustainable practices respectively lead to a -8.2%, -8.0% and -9.9% decrease in Model 2 (all p-values<0.01; decrease of -8.5%, -8.1% and -9.6% in Model 2').

Three investors' intrinsic characteristics appear to impact their change in firm valuation when they learn about unsustainable practices: gender, Private Equity segment and specialization in socially responsible investments. Change in firm valuation is less important for women than for men (+3.6%, model 1, p-value<0.05). A close look at data reveals that they do not increase their firm valuation when they learn about unsustainable practices, but rather have a smaller reaction than men. Growth expansion investors penalize more strongly firm value than investors specialized in venture capital or buyouts (-3.5%, model 1, p-value<0.10). Finally, the two socially responsible investments specialists of our sample also have a stronger reaction (-11.4%, model 1 p-value<0.01).

To summarize, results show that unsustainable corporate policies significantly decrease firm value whereas sustainable ones significantly increase it (except for governance), yet with a lesser magnitude.

TABLE 5.4 - Effects of corporate sustainable policies on the change in firm valuation [a]

	Model 1 [b]			Model 1' [d]			Model 2 [c]			Model 2' [d]		
Env.	4.74	***	(1.21)	4.59	***	(1.26)						
Soc.	5.38	***	(1.25)	5.85	***	(1.31)						
Gov.	2.48		(1.48)	2.01		(1.57)						
Env x soft							1.66	*	(0.98)	1.57		(1.01)
Env x hard							3.18	***	(0.98)	3.08	***	(1.01)
Soc x soft							3.73	***	(1.02)	4.05	***	(1.05)
Soc x hard							1.30		(1.01)	1.61		(1.05)
Gov x soft							1.79		(1.19)	1.47		(1.24)
Gov x hard							0.97		(1.19)	0.65		(1.24)
Case study order	0.53		(0.92)	0.56		(0.95)	-0.45		(0.62)	0.20		(0.63)
Internet session	0.42		(1.35)				0.35		(0.90)			
Investor age	0.02		(0.05)				0.01		(0.03)			
Investor gender	-0.76		(1.09)				-0.47		(0.72)			
Venture capital	0.31		(1.78)				0.20		(1.18)			
Buyout	0.54		(1.53)				0.35		(1.01)			
Expansion capital	-0.24		(1.47)				-0.17		(0.98)			
SRI	5.40		(2.67)				3.69		(1.77)			
ESG training	-0.47		(0.95)				-0.30		(0.63)			
Obs.	132			132			198			198		
Nb. investors	33			33			33			33		
Wald chi2	39.11	***					31.99	***				
F-test				6.88	***					3.00	***	
R^2 (within)	0.22			0.22			0.12			0.12		

[a] We only test here the effects of policies of Positive Sign. Model 1 and 1' use the change in firm valuation (%) between rounds 1, 3 and 5. Model 2 and 2' use all rounds. Sustainable corporate policy effects are decomposed into factor (Env., Social or Gov.) and quality (soft or hard). Figures in brackets are standard errors. * p-value< 10%; ** p-value< 5%; *** p-value< 1%.

[b] Model 1 is a GLS model with random effects. Global effects (soft and hard practices cumulated) are estimated.

[c] Model 2 is a GLS model with random effects. Effects of hard and soft practices are distinguished.

[d] Model 1' and 2' are panel regression models with fixed effects.

TABLE 5.5 - Effects of corporate unsustainable policies on the change in firm valuation[a]

	Model 1 [b]			Model 1' [d]			Model 2 [c]			Model 2' [d]		
Env.	-11.20	***	(1.80)	-11.65	***	(1.83)						
Soc.	-10.56	***	(2.11)	-10.66	***	(2.17)						
Gov.	-15.09	***	(1.72)	-14.61	***	(1.75)						
Env x soft							-3.47	**	(1.48)	-3.79	**	(1.49)
Env x hard							-8.19	***	(1.48)	-8.51	***	(1.49)
Soc x soft							-3.06	*	(1.73)	-3.11	*	(1.77)
Soc x hard							-8.04	***	(1.73)	-8.08	***	(1.77)
Gov x soft							-5.64	***	(1.43)	-5.32	***	(1.44)
Gov x hard							-9.91	***	(1.43)	-9.59	***	(1.44)
Case study order	0.13		(1.32)	0.00		(1.31)	0.09		(0.90)	-0.03		(0.90)
Internet session	-2.17		(1.94)				-1.47		(1.39)			
Investor age	0.13	*	(0.07)				0.09	*	(0.05)			
Investor gender	3.56	**	(1.56)				2.47	**	(1.12)			
Venture capital	-2.95		(2.56)				-2.26		(1.83)			
Buyout	-2.25		(2.19)				-1.73		(1.57)			
Expansion capital	-3.49	*	(2.12)				-2.56	*	(1.51)			
SRI	-11.36	***	(3.83)				-8.74	***	(2.74)			
ESG training	0.26		(1.36)				0.26		(0.97)			
Obs.	132			132			198			198		
Nb. investors	33			33			33			33		
Wald chi2	128.81	***					101.25	***				
F-test				24,95	***					10.21	***	
R^2 (within)	0.51			0.51			0.31			0.31		

[a] We only test here the effects of policies of Negative Sign. Model 1 and 1' use the change in firm valuation (%) between rounds 1, 3 and 5. Model 2 and 2' use all rounds. Unsustainable corporate policy effects are decomposed into factor (Env., Social or Gov.) and quality (soft or hard). Figures in brackets are standard errors.
* p-value< 10%; ** p-value< 5%; *** p-value< 1%.
[b] Model 1 is a GLS model with random effects. Global effects (soft and hard practices cumulated) are estimated.
[c] Model 2 is a GLS model with random effects. Effects of hard and soft practices are distinguished.
[d] Model 1' and 2' are panel regression models with fixed effects.

5.3.3. Results on Investors' Investment Decisions

Let us now focus on the impact of corporate policies on investment decisions. Table 5.2 presents the mean change in investment decision depending on corporate practice *factor*, *sign* and *quality*, that is the share of investors (in %) who revise their previous decision and either stop or start investing in the firm when they learn about its sustainability performance. As for mean change in firm valuation, statistical significance of the observed changes is assessed by the p-values yielded by the non-parametric Wilcoxon signed-rank test.

In our experiment, unsustainable policies (cumulating both soft and hard practices) reduce the investment likelihood by respectively -29.2%, -50.0% and -30.8% for environment, social and governance issues (p-values<0.01, Table 5.2). Most of the effects seem driven by hard practices, governance put apart. For all factors, soft practices do not stand out as sufficient to influence the decision to invest. Sustainable policies do not appear to significantly increase the investment decision, except for environment (+10.4%, p-value<0.10; Table 5.2).

As for firm valuation, the decision to invest or not in a firm depends on investors' heterogeneity in terms of preferences and style. To explain investment decision while controlling for this heterogeneity, we use random-effect logistic model (Model 3) in Table 5.6 (a fixed-effect model 3' is tested as a robustness test and presented in table D.5.3. in Appendix D.5). Controls in Model 3 are similar to those used to explain the relative change in firm valuation in Tables 5.4 and 5.5. As estimates cannot be directly interpreted, predictive margins are calculated. They provide the predicted probabilities of deciding to invest knowing the *factor* and *quality* of the corporate practice, assuming the random effect is zero (i.e. for an average investor).

Results confirm that only unsustainable practices significantly change the investment decision. They also confirm that only hard unsustainable practices matter in this regard for environmental and social issues (both p-values <0.01). Governance stands out, both soft (p-value<0.10) and hard (p-value<0.01) unsustainable practices reducing the investment decision (p-value<0.01). Predictive margins also highlight that, among the ESG factors, governance has the largest impact on the investment decision in terms of magnitude.

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TABLE 5.6 - Effects of corporate sustainability policies on investment decision [a]

	Sustainable practices					Unsustainable practices				
	Model 1 [b]			Predictive Margins		Model 1 [b]			Predictive Margins	
Env x soft	-0.76		(0.87)	0.74	***	0.37		(0.75)	0.86	***
Env x hard	0.86		(0.95)	0.87	***	-1.84	***	(0.66)	0.50	***
Soc x soft	-0.27		(0.83)	0.79	***	0.77		(1.02)	0.90	***
Soc x hard	-0.26		(0.83)	0.79	***	-2.26	***	(0.81)	0.41	***
Gov x soft	2.06		(1.35)	0.94	***	-1.25	*	(1.67)	0.61	***
Gov x hard [d]	21.85		(15270)	1.00	***	-2.27	***	(0.69)	0.41	***
Case study order	-0.12		(0.59)			0.44	*	(0.43)		
Internet session	-4.49	**	(1.28)			-1.52		(1.17)		
Investor age	-0.11		(0.09)			0.00		(0.04)		
Investor gender	0.66		(1.74)			-1.07		(0.94)		
Venture capital	-2.70		(2.48)			-1.16		(1.48)		
Buyout	-4.92	**	(2.37)			-2.37	*	(1.30)		
Expansion capital	-2.46		(1.94)			-1.14		(1.25)		
SRI	-5.27		(3.42)			-2.53		(2.21)		
ESG training	2.55		(1.54)			0.30		(0.80)		
Obs.	198					198				
Nb. investors	33					33				
Wald chi2	11.77					23.17	*			
log_likelihood	-61.53					-96.89				

[a] Effects of sustainable (Sign = positive) and unsustainable (Sign = negative) corporate policies on the investment decision (0 = don't' invest; 1 = invest) depending on their factor (Env., Social or Gov.) and quality (soft or hard). * p-value< 10%; ** p-value< 5%; *** p-value< 1%.

[b] Model 3 is a random effects logistic regression.

[c] Predictive margins are the predicted probability of deciding to invest knowing the sign, factor, and quality, assuming the random effect is zero (i.e. that it is an average investor).

[d] All observations = 1 when Factor = Governance, Sign = Positive and Quality = Hard.

5.4. Discussion

Experimental findings show that corporate sustainability impacts Private Equity investors' firm valuation and investment decision. However, sustainable and unsustainable policies asymmetrically affect Private Equity financing, entrepreneurs having more to lose from the latter than to gain from the former. We also observe that investors care for the content of the corporate sustainability policy: environmental, social and governance issues do not equally matter, Governance appearing specific. The *quality* of the corporate practice (whether it is core (hard) or peripheral (soft) for the firm) also matters.

Our results are consistent with earlier studies (on listed firms) showing that companies with better ESG performance tend to face significant lower capital constraints. El Ghoul et al. (2011) show for instance that investment in responsible employee relations and environmental policies contributes substantially to reducing firms' cost of equity, whereas participation in "sin" industries (tobacco and nuclear power) increases firms' cost of equity.

We discuss in this section the consequences of our results for investors and entrepreneurs, taking into account qualitative data. Indeed, many participants (20 out of 33) wrote down the justifications of their valuations and investment decisions, shedding light on their understanding and use of the ESG criteria in Private Equity.

5.4.1. Sustainability and Private Equity investors

As could be expected from such participants, most investors integrated the extra-financial information in standard financial tools. For instance, they estimated the cost of upgrading poor environmental management systems and impacted that cost in the firm business plan and future cash flows. Cost estimations were often approximated, investors indicating they would require additional auditing to confirm their valuation. Poor extra-financial performance thus enabled them to lower the firm price during the acquisition stage. However, numerous comments indicated that they expected to be able to generate profits by improving this poor extra-financial performance. Conversely, sustainable practices already implemented were not expected to create additional value. As put by a participant, they were "*considered intrinsic to quality management and expected by the board*".

Investors' qualitative comments also pointed out that our estimation of unsustainability impact on investment decisions (about -30%) is likely biased upward by our experimental design. Indeed, most investors would not actually have rejected the investment (as they did in the experiment, as they had no alternative), but would have rather asked for complementary audits and dues diligences in a real investment. Whereas the high rejection rates we observed might be overestimated, unsustainable practices appear likely to increase Private Equity investors' demands in terms of dues diligences and eventually shareholders' pact.

Our results also highlight that the content of the corporate sustainability policy matters for investors, both in terms of *quality* and *factor*. The importance of the environment and social practice *quality* (soft or hard) appears in line with the pointed-out financial and quantitative approach of extra-financial performance by Private Equity investors. Indeed, hard practices in our experiment were designed to be core to the firm business, bearing on resource mobilization, hence having stronger accounting impact. Among the ESG factors, governance stands out as having strong effects on firm valuation and investment decision when negative (for both soft and hard practice), and none when positive. Governance is indeed a specific issue in the Private Equity industry. As significant shareholders, Private Equity investors are usually deeply involved in the firm governance, when they do not have complete control of the board. Kaplan and Strömberg (2009) also identify governance engineering as a major strength of the industry. Whereas good governance might not be paid for during the acquisition stage because it is expected, a firm poorly governed might be a risk well understood and to which investors strongly react.

For the Private Equity industry, the ability to properly evaluate the extra-financial performance of a target firm could thus constitute a negotiation tool in acquisition stages to lower its cost, thus increasing the investment profitability. Also, it could enable Private Equity investors to create value in the companies they already hold in portfolio. However, succeeding in doing so requires a specific human capital on corporate social responsibility management, which the industry might likely still be in lack of.

5.4.2. Sustainability and Entrepreneurs

Let us now consider consequences for entrepreneurs. Our results imply that unsustainable practices are likely to prevent access to Private Equity financing, particularly when they

represent sufficient a risk to threaten the core business. For instance, food-safety issues due to poor environmental management in our catering case-study (firm A) decreased investment decisions by about 30%. As previously discussed, in real investments, this rejection rate is likely to be overestimated. However, poor management of environmental and social issues would likely increase investors' demands in terms of audits and dues diligences, which are costly.

Core business issues put apart, unsustainable firms are likely to get financed as much as sustainable ones. However, low extra-financial performance appears to be used to lower the firm valuation, meaning it increases the cost of equity capital for entrepreneurs and destroys their shareholders' value. Improving environmental, social and governance practices could thus allow entrepreneurs to protect their firm price and access to Private Equity capital. Environmental and social performance might even be paid for by investors when it strengthens the firm attractiveness.

Let us finally note that the quantification approach used by investors implies the need for entrepreneurs to implement indicators to assess and monitor environmental, social and governance performance. Indeed, considering Private Equity investors' growing concern for extra-financial performance (Crifo and Forget, 2012), it appears likely that such quantified information will be increasingly required. To be paid for, sustainability will hence likely need to be accurately and quantitatively demonstrated.

5.5. Conclusion

This paper tackled the core question of the impact of corporate sustainable and unsustainable practices on Private Equity financing. We find that entrepreneurs who engage their company on a sustainable path might not be more attractive for Private Equity investors than the others. However, we provide evidence that entrepreneurs who do not manage environmental, social and governance issues are likely to suffer limited access to Private Equity, with a higher cost of capital, hence penalizing their shareholders by destroying firm value. Indeed, when investors' heterogeneity is controlled for, our results unveil that unsustainable policies decrease firm price by respectively 11%, 10% and 15% for environmental, social, and governance issues.

Several research paths are opened by our results and we here shed light on three of them. A first path arises from our experiment focus on deal pricing, discarding issues about control rights. As several experiment participants highlighted, unsustainable practices might lead to reinforced dues diligences rather than price change. The issue of the impact of corporate sustainability on control rights in Private Equity financing negotiations is left open to investigate and is likely to be of broad interest for entrepreneurs.

Another research avenue is triggered by the asymmetry we highlighted in the pricing of sustainable and unsustainable policies. Indeed, it remains unclear whether investors strategically overweighed unsustainability to lower firm price in acquisition stages, or whether they actually overvalued extra-financial risks (potential losses) over opportunities (potential gains). Whereas the former could be explained by negotiation strategy and empirically tested by observing exist stages, the latter would rather relate to behavioral finance concepts, such as prospect theory (Kahneman and Tversky, 1979).

Finally, a research path is drawn by our focus on the Greening Goliaths rather than the Emerging Davids identified by Hockerts and Wustenhagen (2010), that is firms engaging in incremental environmental or social process innovation (such as through corporate social responsibility initiatives) rather than new sustainable entrepreneurships. Investigating how Emerging Davids would be evaluated by venture and seed capitalist compared to Greening Goliaths appears as a promising research extension to the sustainable entrepreneurship literature.

From a wider perspective, equity financing remains a core limit of entrepreneurs who wish to pursue sustainable ventures. Venture capital likely has a key role to play in such entrepreneurships, yet its extent is a question left open. Research is still needed to analyze how to raise the equity needed and what are the best organizational structures to finance green growth and support Emerging Davids.

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CONCLUSION

MAIN FINDINGS

The five chapters of this dissertation used different methodologies to tackle from various angles the question of the compatibility of CSR in the Private Equity industry. Doing so, contributions were made to different fields of the literature. This section summarizes them in a transversal approach and discusses in which extent Private Equity funds can indeed foster sustainable development through CSR.

Contributions to the CSR literature were made in Chapters 1, 2 and 5. Chapter 1 anchored this concept in economics and provided a unified framework of its drivers based on market imperfections. It thus highlighted, among other research paths to explore, the need to account for the multidimensional nature of CSR as different policies have diverging effects on firm performance. Chapter 2 introduced in the CSR literature model averaging that enabled to estimate simultaneously the effects of five types of corporate policies as well as their relative importance for firm performance. The chosen variant of this methodology has the potential to be practically used in many empirical fields hampered by multidimensional issues lacking theoretical consensus. Results have implications for academics and practitioners, as they reconcile competing theories on the effects of CSR and show that CSR dimensions are not equivalent to do well and do good. Chapter 5 completed these findings by pointing out that over and under performance on CSR levels do not have symmetrical effects on firm value, the latter being stronger.

Using the CSR and Private Equity framework, Chapter 4 contributed to signaling theory by showing that a money-burning signal that provides public good is not a perfect substitute to standard money-burning signals. Indeed, it generates deviations from predicted equilibrium in the laboratory. Whereas a wide literature on equilibrium selection and refinements exists in signaling games, the novelty of this work is to observe deviations from equilibrium due to the social consequences of the signal and related to intrinsic motivations. The experimental design also contributed to this literature by proposing an original way of giving content to signals in the laboratory as the signals used actually provided real public good (online donations to carbon offset).

The socially responsible investment field is enriched by Chapter 3, 4 and 5. Indeed, its spread in the Private Equity investment class is shown and characterized in Chapter 3. Its specificity lies in investor engagement, which is stronger than usual on public financial markets, Private Equity investors being significant shareholders in the companies they finance and often involved in their governance. Socially responsible investments in this asset class are also pointed out as strategic rather than philanthropic, which supports the on-going mainstreaming process of these investment practices.

This dissertation finally contributes to corporate finance in several ways. Theoretically, it provides in Chapter 4 a model of bilateral Private Equity negotiations with signaling which highlights how information asymmetry can be reduced. It also demonstrates in Chapters 3 and 5 that firm valuation and equity financing models ought not only to be based on financial information, but also on extra-financial information, as investors already consider it. Empirically, it thus unveiled that omitting CSR performance might bias estimations results of econometrics research on Private Equity funds strategy and performance.

To sum up and put conclusions together to answer this dissertation research question, CSR appears compatible with the Private Equity industry to some extent. Indeed, Private Equity investors are involved in their portfolio companies in such a way that they can actively foster CSR if they decide to, and if they have the needed expertise. They can improve their bottom line by strategically fostering some CSR dimensions – yet not all. Consequently, regulators can rely on them to promote some forms of public goods, on specific circumstances. Implications for Private Equity investors and public policies are detailed in the following sections.

IMPLICATIONS FOR PRIVATE EQUITY INVESTORS

The findings of this dissertation have several implications for the Private Equity industry. First and foremost, CSR already is a strategy undertaken by many conventional funds to improve business and operational management (Chapters 1 and 3). Indeed, depending on whether CSR issues are well managed or conversely ignored, value can be created or lost (Chapter 5). In other words, the extra-financial performance impacts the cost of capital. Yet a good management of CSR issues is far from trivial to implement (Chapter 2). Findings lead to

a few suggestions for Private Equity funds managers who wish to engage in CSR and limits of this engagement[27].

Once the management of a given Private Equity firm has decided to engage in CSR, several steps need to be undertaken for it to be successful, meaning to create shared value between funds investors, the Private Equity firm, its portfolio companies and society. Implementing a CSR policy requires processes akin to those developed to implement any transversal business strategy. Indeed, CSR precisely *is* a business strategy that can interfere with the firm usual activities and should therefore be thought and built with the other corporate functions on a mid to long term horizon. The choice of CSR policy level hence depends on resource allocation and action perimeter (for instance the Private Equity firm, or its portfolio, or only new companies in the portfolio). Two levels are to be identified: CSR at the Private Equity firm level and CSR at the portfolio level.

At both levels, the first step to develop a CSR strategy could consist in mapping corporate extra-financial impacts along the firm value creation chain. This inventory would lead to a list of all CSR issues and opportunities that can be analyzed, hierarchized and dealt with. Among the wide range of potential CSR policies (Chapter 1), those that best fit the business model and have the greater potential to yield both extra-financial and financial outcomes could be selected (Chapter 2). At the Private Equity firm level, developing a CSR policy might be an efficient and practical way of learning by doing what would be (or will be) required from portfolio companies. At the portfolio company level, CSR can be fostered by investor engagement, for instance by visiting portfolio companies' productive sites, bringing CSR issues to their boards, evaluating CSR performance, or requiring CSR reporting (Chapter 3). Table C.1 suggests what could be a proactive CSR policy in a Private Equity firm.

[27] The section is adapted from the chapter "L'intégration des Enjeux ESG dans le Capital Investissement", V.D. Forget and F. Massut, forthcoming in the collective book *Tout Savoir sur le Capital Investissement*, G. Mougenot (Ed.), City & Work, Paris, 2013.

TABLE C.1 – Examples of ESG practices for Private Equity funds managers

	Environment	Social	Governance
Daily management at the Private Equity firm level	• ESG Chart (engagement level, perimeter, UN PRI signature, dedicated means, etc.) • Implementation of identification processes of ESG risks and opportunities at the management firm level and at the portfolio level • Dedicated organization to ESG strategy implementation • ESG strategy communication to internal and external stakeholders (employees, institutional investors, portfolio companies, Private Equity professional associations, UN PRI, etc.) • Staff training on ESG issues management (and/or external expertise) • Quarterly or yearly evaluations of ESG strategy implementation (dedicated means, progresses, results) communicated to institutional investors • Third-party audits of sustainable development reports		
	• Evaluation of direct (headquarters, transports) and indirect (portfolio companies, suppliers) environmental impacts • Impact reduction, Eco gestures • Carbon footprint assessment • Recycling	• Fight against discrimination • Employee participation • Compensation transparency • Yearly employee performance appraisals • ESG factor integration in appraisals and manager variable premiums	• Transparency towards institutional investors : reports, investment memos, consultative committees, strategic committees • Annual General Meeting
Acquisition Stages	• Exclusion of specific geographical areas and sectors • ESG issue integration in due diligences to evaluate related risks and opportunities • ESG part in investment memos • ESG issue integration in shareholders' agreements		
	• Exclusion of operations using protected species (CITES), etc. • Evaluation of environmental operational risks	• Exclusion of operations that don't respect international conventions (Humans Rights, ILO, etc.) • Evaluation of social operational risks	• ESG expertise of target company management
Holding Stages	• Shareholder engagement to help portfolio companies to improve ESG performance (reduce risks / exploit opportunities) • Dialogs with portfolio company management on ESG issues • Surveillance and respect of sectorial ESG guidelines • Implementation of quantitative and qualitative ESG indicators to develop scoreboards, ESG reporting and performance evaluations • Visits to portfolio company plants • Sharing good practices between portfolio companies and help to acquire internal expertise		
	• Evaluation of direct and indirect environmental impacts	• Dialog with stakeholders • Working conditions improvement	• Specialized Committees • Stakeholders involvement
Exit Stages	• Quantitative valuation of value created by ESG performance (vendor due diligences) • Sharing capital gains from sales with employees • ESG results communication.		

Translated from "L'intégration des Enjeux ESG dans le Capital Investissement", co-written with François Massut and forthcoming in the collective book *Tout Savoir sur le Capital Investissement*, G. Mougenot (Ed.), City & Work, Paris, 2013.

However, the integration of CSR issues in the Private Equity industry encounters several limits. First, the implementation of CSR strategy goes as far as managers' conviction goes and thus depends on their willingness to involve extra-financial issues in their activities (Chapter 1). CSR also goes as far as the conviction of middle managers and teams, whose awareness can be promoted by dialogue, training or compensation. Yet managers and employees willing to go beyond wording and actively integrate CSR issues face its complexity and technicality (Chapter 2). For CSR not to be felt as an additional and pointless constraint, employee participation, training and human capital development are needed. Expertise on CSR, which likely still lacks in Private Equity funds (Chapter 3) can either be developed internally or externalized (consulting), but can hardly be bypassed for CSR not to drift to greenwashing (Chapter 1).

Expertise also requires resource allocation. The diffusion of CSR practices will thus likely depends upon Limited Partners (Chapter 3) who expect profitability from Private Equity firms. Their future requests and sustainability commitments might play a core role in the responsible investment movement in Private Equity. For instance, part of the management fees could be dedicated to CSR expertise gains both at the Private Equity firm and portfolio levels. Similarly, part of the variable compensation of Private Equity funds managers could take into account extra-financial objectives on both qualitative and quantitative indicators.

IMPLICATIONS FOR PUBLIC POLICIES

This dissertation demonstrated that Private Equity funds have both interest and means to be socially responsible investors and have the potential to actively promote sustainable practices in the firm they own. This section discusses public good contribution and its limits, CSR regulation, Private Equity regulation, and implications for public administrations.

The research presented shows that Private Equity funds have the potentiality to foster some aspects of sustainability through CSR, but only as far as CSR makes business sense. All Chapters contribute to the idea that CSR will not be implemented at the expense of profitability or competitiveness to provide public good for the sake of it. Hereby we can expect that some dimensions of CSR will be more fostered than others, as they will be more profitable on the short run. For instance, good business behaviors with customers and

suppliers might be more easily improved than implication in local communities or high environmental levels (Chapter 2). The optimal CSR level might also differ between business and society: Chapter 5 illustrated that whereas unsustainable practices penalized equity financing, sustainable ones were not proportionally priced. The extra-financial performance mostly impacts the cost of capital by lowering it when unsustainable practices are discovered. A core issue for public policies targeting CSR might thus be to evaluate its social consequences and actual public good contributions (Chapters 1 and 4) in order to well balance voluntary programs and binding environmental and social regulations.

Whereas CSR will only cover part of the ground to sustainable development, it stands out as an efficient tool to be promoted by regulations. At a time of state budgetary restraints and economic crisis, it seems consistent to advocate private contributions to public good and self-regulations that business is willing to achieve while protecting its competitiveness. Since different CSR policies have various effects on profitability (Chapters 2 and 5), this dissertation's findings suggest that soft law relying on corporate strategy might be the most efficient framework for CSR regulation, as is currently the case. However, regulations might be relevant to ensure CSR does not drift to greenwashing by strengthening transparency and promoting third-party certified norms and labels (such as EMAS regulation). Proofs of means and result reporting requirements could be required to ensure that CSR claims are not empty or mislead consumers, along deceptive advertising regulations.

Transparency has also been the focus of Private Equity regulation. National, European and International negotiations started in 2009 to strengthen regulation and supervision of alternative funds managers, among which Private Equity funds managers. These negotiations yielded the Dodd–Frank Wall Street Reform and Consumer Protection Act (July 21, 2010) in the United States and its Volcker Rule, which prohibits banks from acquiring or retaining any equity, partnership, or other ownership interest in a hedge fund or Private Equity fund and also from sponsoring them. The European Parliament voted in 2011 the Directive on Alternative Investment Funds Managers (AIFM), which should be applied by Member States by 2013 and consists in a comprehensive framework for the supervision and prudential oversight of different asset classes, including Private Equity. In Europe, the stated objectives are to introduce safeguards to increase the transparency of this type of investments and to

address potential risks to portfolio companies, acknowledging their crucial role in restructuring and financing companies[28].

Transparency on their environmental and social impacts is also increasingly required from Private Equity managers. In the United Kingdom, the CRC Energy Efficiency Scheme holds since 2008 Private Equity companies liable for the carbon emissions of the companies over which they have management and financial control. In France, the Grenelle II 224 decree (n° 2012-132, 30 January 2012) and 225 decree (n° 2012-557, 24 April 2012) requires that assets managers disclose how they integrate environmental, social and governance issues in their investment policies and assess the extra-financial impacts of their portfolio companies over 500 employees (starting from 2013). These regulations will have important local impacts but their scope will be limited by their national anchorage, notwithstanding potential market distortions. Extensions of extra-financial transparency laws at the European level appear essential to foster CSR and socially responsible investments.

Important regulations have thus been decided between the beginning and the end of my research with crucial impacts on CSR spread and growth financing. Findings of this dissertation mostly go along them. These regulations are just being implemented, or will be implemented in the on-going year, and need not to be complemented before their effectiveness can be assessed. They will clearly have important impacts on the Private Equity industry, its move towards socially responsible investment and the equity financing of enterprises. Evaluations of these regulations and of their impacts in the upcoming years will tell us whether an adequate balance between competitiveness, social inclusion and environmental protection has been found considering the current market turmoil.

Finally, implications for public administrations can also be drawn. This research essentially focused on the social responsibility of enterprises and their financers. Yet CSR and socially responsible investments also have a role to play in public administrations – so to say, charity begins at home. Public administrations are indeed important employers (it is the first employer in France) and their direct activities, such as public procurement, have large impacts on business and society. Sustainable development would clearly benefit from the engagement of public administration to foster responsible practices among its human resource and supply chain. Moreover, States are also major investors through their sovereign wealth funds, where

[28] See theEuropean website : http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/10/572&format=HTML&aged=0&language=EN&guiLanguage=en

socially responsible investments would fully be relevant. In this regard, the French Caisse des Dépôts et Consignations plays a crucial role on the French market as the first institutional investor. This financial institution currently promotes socially responsible practices in its direct investments and funds of funds activities, with a strong impact on the French market. The continuation of such efforts and its spread at the European and international level are still left as open question marks and should be promoted.

LIMITS AND FURTHER RESEARCH PATHS

Each chapter of this dissertation detailed its limits and potential extensions. This final section takes a step back to summarize what could not be tackled in this research and what was left open to explore for academics to understand interactions between sustainable development, CSR and Private Equity.

A first limit of this dissertation has been raised as early as Chapter 1. To understand if Private Equity investors can foster sustainable development, a missing milestone in this research is the actual social and environmental impacts of CSR. In other words, what are the consequences for society as a whole of Private Equity investor engagement? In a broader perspective, research is currently needed on the social side of CSR. To do so, the current CSR research toolbox needs to be expanded, driving for instance on methodological lessons from development economics, public policy evaluation or ecology as suggested in Chapter 1. In a different perspective, evaluating and comparing the social and environmental externalities of conventional versus responsible investments and of different types of responsible investments would be a challenging path for further research.

A similar research could be developed at the firm level. Indeed, the question of the actual impact of Private Equity investor engagement on firm social and financial performance is new, both for practitioners and academics. Much could be learned by following the financial and extra-financial performance of enterprises as investor engage in them to promote competitiveness and sustainability. In this regards, Private Equity responsible investments is particularly difficult to tackle as they essentially focus on SMEs, for which little environmental and social data is available. A project was set up in the first year of this Ph.D. (in partnership with a French extra-financial rating agency and an asset management firm) to

evaluate and match the CSR and economic performances of European SMEs. Lacking funding, this project was finally abandoned. A different way to answer questions left open would be to work with assets managers engaging in CSR and evaluate results at the portfolio company results.

On a more theoretical level, issues of moral hazard might arise once Private Equity investors acquired a firm based on its CSR strategy. While this exploratory research sheds light on responsible investing in Private Equity, it did not provide it with a proper framework that would enable dealing with these issues. More generally, a theory of CSR in Private Equity could for instance arise from principal-agent theory (commonly used in Private Equity models in corporate finance) and could trigger questions related to multitasking (firm managers trying to do well and do good).

Consequences of CSR engagement for Private Equity funds themselves will also be interesting to follow up in the future. The use of CSR by Private Equity firms as a mean of differentiation (Chapter 3) and value protection (Chapter 5) was supported. Empirical tests could be developed, particularly regarding advertising and media. Do Private Equity firms actually suffer financial penalty when they poorly manage the extra-financial performance of their portfolio? Do media campaigns targeting environmental or social performance affect Private Equity deals, exits and performance?

Another limit of this Ph.D. dissertation arises from its national anchorage in the French Private Equity market. However, socially responsible investment behaviors are likely to depend on factors such as legal conditions, culture and regulatory pressure, which differ between institutional contexts. A promising research path would thus be to extend this research to other markets, such as the United States or the United Kingdom markets, and test whether drivers, maturation, prioritization and implementation differ beyond French borders. On a more international level, CSR in Private Equity backed-up companies raises issues that go beyond borders. For instance, SMEs are increasingly embedded within global supply chains. Is CSR a good or a bad news for such companies? Are Private Equity investors better suited than other investors to grasp such investment opportunities? Lastly, what will globalization of Private Equity (through deal syndications for instance) imply for their interest for CSR?

Finally, as noted in Chapter 5, the role of innovation in sustainable development has not been discussed in this dissertation. However, innovation financing is the focus of seed capital and venture capital, two segments of the Private Equity industry. The research presented mostly

tackled the integration of CSR issues in existing firms on conventional markets. However, the largest share of sustainable development solutions are likely still to be invented, developed and spread through markets – and to do so, entrepreneurs need equity financing. The potential of venture capital as a tool for green growth could thus constitute a last extension of this dissertation.

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A. APPENDIX TO CHAPTER 2

Corporate Social Responsibility Data

Vigeo ratings on five CSR dimensions are used in this paper: environmental policy rating (Environment), corporate governance (Governance), human resources management (human resources), involvement in local communities (Community involvement) and business behaviors towards customers and suppliers (Customers & suppliers).
Vigeo identifies CSR issues by sector and, for each CSR dimensions, specific criteria are selected and weighted according to: CSR type and impact on sector stakeholders; stakeholders' impact exposure; and finally sector risks if the impact is not correctly managed.
Vigeo then rates firm performance on CSR dimensions in terms of leadership, implementation and results. A final score is calculated by firm for each dimension on a 0 (minimum) to 100 (maximum) scale.
For firms to be comparable across sectors, firm scores are benchmarked against their sector average score. The resulting rating is provided on a five-level scale: 'worst-in-class' (5%), 'below sector average' (25%), 'in the sector average' (40%), 'proactive' (25%) and 'best-in-class' (5%). For the purpose of this paper, whose methodology requires sufficient observations per category, those ratings are quantified into a three-level scale: worst (bellow sector average; 30%); average (40%); best (above sector average).
As Vigeo systematically rates the DJ Stoxx 600 firms (largest listed European firms), there is no bias selection in data. Academic work based on Vigeo's data is still scarce (Cavaco and Crifo 2010) and promising, notably because it allows researchers to study the European market whereas most previous studies focused on the United States market.

Financial Data

Financial performance and control variables data come from the Bureau Von Dijk's Orbis global database, which is sourced from many different providers. All financial measures are given in 2005 United States dollars and observations with unconsolidated accounting data and more than one subsidiary were not kept. Control for outliers is done by winsorizing at the 2% and 98 % levels ROA and ROCE.
In full sample (not restricted to R&D intensity data availability), firms belong to 17 different countries and 14 industrial sectors (see Table A1).
Pearson correlation coefficients can be found in Table A2.

TABLE A.1.- DESCRIPTIVE STATISTICS PER COUNTRY GROUP AND INDUSTRY (FULL SAMPLE)

Variable	ROA			ROCE			Global CSR rating		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Austria	12	8.21	2.97	12	14.16	3.82	12	2.49	0.56
Belgium	42	8.82	6.26	44	18.01	13.49	44	2.66	0.55
Denmark	25	10.14	7.62	25	15.68	9.59	25	2.82	0.91
Finland	42	10.67	7.44	42	19.09	12.95	42	3.29	0.66
France	430	6.64	6.52	416	12.87	9.51	416	3.11	0.62
Germany	189	6.80	6.77	191	13.25	10.13	191	3.14	0.61
Greece	9	10.01	7.16	9	14.05	9.14	9	2.11	0.62
Ireland	27	6.90	5.84	27	12.25	7.33	27	2.48	0.76
Italy	68	8.38	6.51	65	16.46	12.55	65	2.66	0.62
Luxembourg	11	5.64	8.35	11	9.71	11.67	11	3.13	0.75
Netherlands	126	6.16	5.85	126	11.91	10.95	126	3.14	0.57
Norway	17	12.65	9.93	18	20.43	14.27	18	3.06	0.45
Portugal	20	6.21	2.26	20	12.50	4.22	20	2.63	0.46
Spain	96	7.17	6.40	94	13.97	15.74	94	2.72	0.62
Sweden	52	8.61	7.41	55	16.86	12.58	55	2.92	0.61
Switzerland	70	9.91	6.07	71	16.08	8.84	71	2.80	0.72
UK	341	9.46	7.16	340	17.07	12.58	340	3.24	0.63
Car Industry	82	4.64	4.04	83	10.86	8.45	83	3.09	0.64
Trade	129	8.34	7.16	129	17.48	13.07	129	3.06	0.61
Consumer goods	287	10.94	6.91	285	18.99	10.96	285	3.04	0.68
Building	67	6.26	4.62	65	14.65	8.10	65	2.97	0.72
Energy	163	7.95	6.11	161	14.23	10.10	161	3.08	0.63
Equipment	84	7.62	5.99	83	15.86	13.52	83	3.04	0.67
Finance	58	7.53	6.00	58	12.47	7.92	58	3.09	0.66
Hotel industry	54	4.75	4.59	54	10.22	6.46	54	3.05	0.61
Agri-food	91	9.01	4.53	91	16.92	7.58	91	3.03	0.66
Intermediate	196	7.76	6.01	196	13.03	8.29	196	3.05	0.68
ITC	148	7.35	10.24	143	13.74	16.31	143	2.99	0.67
Media	43	7.79	7.26	39	14.47	10.08	39	2.91	0.66
Telecom	76	5.09	7.57	80	9.31	17.39	80	3.02	0.64
Transport	99	5.98	4.33	99	12.21	6.86	99	3.07	0.72

TABLE A.2.- PEARSON CORRELATION COEFFICIENTS

	CSR	Human Resources	Governance	Customers & Suppliers	Community Involvement	Environment	ROA	ROCE	Risk.	Financial leverage	R&D intensity	Size
Global CSR	1.00											
Human Resources	0.76	1.00										
Governance	0.56	0.24	1.00									
Customers & Suppliers	0.76	0.49	0.32	1.00								
Community Involvement	0.73	0.45	0.24	0.44	1.00							
Environment	0.76	0.52	0.25	0.50	0.48	1.00						
ROA	0.01	0.01	0.03	0.04	-0.01	-0.01	1.00					
ROCE	-0.01	-0.00	0.05	-0.00	-0.01	-0.05	0.45	1.00				
Risk.	-0.06	-0.03	-0.07	-0.02	-0.08	-0.02	0.37	-0.01	1.00			
Financial leverage	0.00	-0.01	0.02	-0.01	0.02	-0.01	-0.27	-0.11	-0.55	1.00		
R&D intensity	-0.01	0.06	-0.09	0.01	0.02	0.01	0.03	-0.04	0.31	-0.09	1.00	
Size	0.34	0.23	0.16	0.21	0.33	0.28	-0.09	-0.02	-0.33	0.03	-0.22	1.00

B. APPENDIX TO CHAPTER 3

Survey wording

« ESG Practices of Private Equity Investors – Survey 2011 » (Novethic)

ESG Policy at the Management Firm Level

1) Have you formalized a policy or a chart stating how you take into account Environmental, Social and Governance (ESG) criteria in your portfolio and/or your investments?

Yes; Please detail since when / No, but we plan to do so this year (directly go to question 5) / No (directly go to question 5)

2) If you answered yes to question 1, to whom do you communicate it?

Our co-workers / Our investors / Our portfolio companies / Publicly communicated

3) Are you a signatory of the French Private Equity Association Chart?

Yes / No; why?

4) Are you a signatory of the United Nations Principles for Responsible Investments (PRI)?

Yes; Please detail since when / No, but we plan to do so this year / No.

5) Are your co-workers trained in ESG issues management in their daily business?

Yes; Please detail how / No.

6) Your ESG policy is run by :

A co-worker dedicated to this policy / A co-worker non dedicated to this policy / Investment directors / An external third-party / Other, please detail.

7) Within your management firm, which policies have you launched in terms of sustainable development?

ESG evaluation at the management firm level

Environment: Management firm carbon footprint evaluation / Videoconferences / Energy savings thanks to eco-gestures

Social: employee training / annual job appraisal / employee profit-sharing

Governance: Ethics Chart or Deontology Code

Other: please detail

Implementation in portfolio companies

8) Do you exclude from your investments:

Specific industries: Weapons / Alcohol / Tobacco / Pornography / Hazard games / GMOs / Nuclear Energy / Other, please detail

Specific policies considered reprehensible: Child labor / Forced labor / Other, please specify

9) Which means do you use to evaluate ESG practices in companies (before investment; over the investment phase; while the company is hold in your portfolio)?

Dialogue between the management firm and the portfolio company / ESG survey sent to the company / Management firm internal ESG audit grid / Acquisition dues diligences / Specific acquisition dues diligences / Audit by an external third-party / Other, please detail.

10) In this context, are environmental issues (water and energy consumptions, carbon assessment, waste management, etc.) evaluated:

	Always	Sometimes *	Never	No, but we plan to do so this year*
When you acquire a company				
When you hold a company in portfolio				
When you sell a company				

**Please detail how many companies were evaluated in 2010.*

1) In this context, are social issues (training, skill management, diversity, non discrimination, etc.) evaluated:

	Always	Sometimes *	Never	No, but we plan to do so this year*
When you acquire a company				
When you hold a company in portfolio				
When you sell a company				

**Please detail how many companies were evaluated in 2010.*

1) In this context, are governance issues (allocation and delegation of authority, board formation, board independence, fight against corruption, etc.) evaluated:

	Always	Sometimes *	Never	No, but we plan to do so this year*
When you acquire a company				
When you hold a company in portfolio				
When you sell a company				

**Please detail how many companies were evaluated in 2010.*

2) How do you support your portfolio companies to implement their sustainable development policy?

Regular dialogue between the management firm and a dedicated contact in the portfolio company / Link establishment with a specialized consultant / Support of the ESG reporting / Follow-up, but the portfolio company has full autonomy to implement the policy / Other, please detail.

3) How do you ensure ESG criteria are taken into account in the companies in which you invest?

Chart compliance request / ESG reporting request / ESG issues on the agenda of the company's supervisory board / Visit of plants / ESG clause in the shareholders pact / Other; please detail.

4) Have you ever measured the impact of the ESG issue management on your portfolio?

Yes; please detail / No.

5) The ESG evaluation of a company already led you to :

Decrease a target company valuation / Reject an investment / The company ESG evaluation had no impact on our management / Other; please detail.

Relationships with investors

6) Have you implemented a regular ESG reporting of your portfolio?

Yes, it is public / Yes, it is communicated to our investors / No / No, but we plan to do so this year.

7) Do your Limited Partners ask you how you manage ESG issues?

Yes, often / Yes, sometimes / No, never.

8) If you answered yes to question 7, how have your Limited Partners formalized their request (survey, side letters, shareholders pact, etc.)?

Motivations

9) For which reasons do you take into account ESG issues in your investments?

To improve risk management (social litigations, environmental liability, etc.) / To answer our investors' demand / To ease fund raising / To improve deal flow / To reduce the management firm reputational risk / to improve the value of portfolio companies / other, please detail.

APPENDIX - TABLE B.1. - Correlation Matrix (1/3)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
1-Firm Age	1,00																									
2-Workforce	0,15	1,00																								
3-Funds	0,02	0,45	1,00																							
4-Companies	0,16	0,39	0,70	1,00																						
5-Assets managed	0,14	0,39	0,26	0,32	1,00																					
6-Listed	0,21	0,04	-0,08	-0,06	0,08	1,00																				
7-PE firm	0,00	0,03	-0,01	-0,08	-0,03	-0,03	1,00																			
8-Partners	-0,14	-0,13	-0,01	-0,23	0,08	-0,10	-0,38	1,00																		
9-Bank	0,06	0,10	0,12	0,30	-0,08	-0,08	-0,23	-0,43	1,00																	
10-Insurance	0,04	0,12	0,10	0,27	0,18	-0,03	-0,09	-0,18	-0,06	1,00																
11-Industry	0,01	-0,06	-0,07	-0,04	-0,06	-0,06	-0,12	-0,22	-0,08	-0,04	1,00															
12-French state	-0,01	0,01	-0,07	0,06	-0,09	-0,04	-0,15	-0,37	-0,03	-0,02	-0,03	1,00														
13-Other	0,07	-0,04	-0,10	-0,07	-0,02	0,06	-0,09	-0,16	-0,08	-0,01	-0,04	-0,00	1,00													
14-LP Industry	-0,05	-0,08	-0,09	-0,04	-0,13	-0,08	-0,05	-0,12	-0,10	-0,07	0,51	0,16	-0,08	1,00												
15-LP Captive	0,00	0,03	0,10	0,17	-0,00	0,06	0,13	-0,32	0,48	0,14	-0,14	-0,22	-0,04	-0,19	1,00											
16-LP Sovereign	-0,07	0,02	-0,02	0,11	-0,12	-0,06	-0,08	-0,19	-0,01	0,02	-0,08	0,55	-0,02	0,29	-0,17	1,00										
17-LP Individuals	-0,04	0,20	0,50	0,26	0,13	0,05	-0,01	0,11	0,01	-0,05	-0,05	-0,19	0,06	-0,11	-0,01	-0,04	1,00									
18-LP Institutional	-0,03	0,02	0,01	-0,09	0,03	-0,02	-0,03	0,30	-0,24	-0,07	-0,13	-0,01	-0,04	-0,01	-0,27	0,11	0,01	1,00								
19-LP Pension funds	0,08	0,22	0,03	0,02	0,30	0,08	0,10	0,20	-0,19	0,04	-0,13	-0,14	-0,04	-0,05	-0,20	-0,04	-0,03	0,17	1,00							
20-LP Family offices	0,03	-0,02	-0,07	-0,10	-0,10	0,05	-0,10	0,19	-0,18	-0,02	-0,07	0,00	0,07	0,13	-0,25	0,20	-0,04	0,13	0,10	1,00						
21-VC	-0,02	0,05	0,26	0,16	-0,09	-0,05	0,01	-0,14	-0,01	-0,10	0,06	0,28	0,04	0,20	-0,09	0,35	0,23	-0,06	-0,14	-0,02	1,00					
22-Transmission	0,17	0,13	-0,01	0,07	0,15	0,08	-0,05	0,02	0,01	0,05	0,01	-0,06	0,03	-0,04	-0,08	-0,12	0,00	0,11	0,19	0,01	-0,24	1,00				
23-Growth	0,04	0,08	0,13	0,17	-0,11	-0,05	-0,01	-0,09	0,19	-0,03	-0,02	-0,03	-0,01	0,05	0,05	0,11	0,16	-0,06	-0,11	-0,08	-0,01	0,28	1,00			
24-Mezzanine	0,02	0,22	0,02	0,10	0,12	0,04	0,06	-0,08	-0,05	0,14	0,09	-0,05	0,00	-0,02	0,12	-0,08	-0,08	-0,02	-0,06	0,03	-0,16	-0,01	-0,03	1,00		
25-Distressed Capital	-0,04	0,15	-0,08	-0,12	0,02	-0,02	0,07	0,10	-0,09	-0,05	-0,08	-0,06	-0,03	-0,09	-0,06	-0,04	-0,07	0,06	0,08	-0,04	-0,12	0,11	-0,01	-0,04	1,00	
26-Funds of funds	-0,10	0,25	0,27	0,16	0,01	-0,05	0,14	-0,08	0,04	0,15	-0,09	-0,06	-0,08	-0,13	0,11	-0,14	0,01	-0,09	0,08	-0,08	-0,09	-0,15	-0,14	0,07	0,01	1,00

APPENDIX – TABLE B.1. (continues) - Correlation Matrix (2/3)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
27-Minority	0,05	0,05	0,16	0,24	-0,26	-0,06	0,05	-0,25	0,21	0,12	-0,03	0,15	-0,07	0,09	0,10	0,33	0,15	-0,14	-0,14	-0,01	0,36	-0,28	0,33	0,07	-0,26	0,12
28-Regional	0,06	-0,08	-0,10	0,09	-0,13	-0,07	-0,09	-0,35	0,24	0,01	0,03	0,44	-0,02	0,18	-0,01	0,35	-0,02	-0,01	-0,25	-0,04	0,18	0,10	0,18	-0,09	-0,08	-0,13
29-European	-0,03	0,15	0,17	-0,01	0,22	0,11	0,04	0,23	-0,18	0,03	-0,03	-0,23	-0,03	-0,11	-0,06	-0,23	-0,05	0,04	0,31	0,02	-0,10	-0,11	-0,16	0,08	0,02	0,23
30-International	0,01	0,23	0,16	0,12	0,22	0,21	0,03	0,03	-0,04	0,08	-0,01	-0,12	-0,07	-0,03	0,03	-0,09	0,01	0,09	0,18	-0,05	0,09	-0,06	0,05	0,08	0,05	0,21
31-Sector	-0,08	-0,08	0,03	-0,14	-0,04	-0,07	0,06	0,07	-0,13	-0,07	0,11	0,01	-0,06	0,12	-0,07	0,03	-0,03	0,10	0,04	-0,03	0,24	-0,29	-0,08	-0,07	-0,06	-0,03
32-Gender	-0,08	0,00	0,02	0,09	0,11	0,09	-0,10	-0,08	-0,04	0.09	0,14	0,12	0,02	0,04	0,01	0,12	-0,03	-0,05	-0,04	-0,05	0,04	-0,02	-0,05	0,06	-0,07	0,04
33-Founder	-0,20	-0,02	-0,06	-0,13	-0,10	-0,10	-0,12	0,52	-0,33	-0,03	-0,08	-0,27	-0,02	-0,05	-0,22	-0,08	0,12	0,20	0,07	0,08	-0,04	-0,06	-0,03	0,01	0,10	-0,07
34-Engineer	0,03	-0,02	0,03	0.09	0,11	-0,03	-0,04	-0,01	0,02	0,05	-0,08	0,14	0,00	-0,08	0,04	0,12	0,00	-0,04	0,07	-0,03	-0,00	-0,08	-0,02	0,01	-0,04	-0,03
35-Business school	-0,06	-0,10	0,03	-0,02	-0,13	0,09	-0,01	0,01	0,02	-0,03	0,18	-0,17	-0,08	0,12	0,13	-0,02	0,15	-0,11	-0.08	0,15	-0,02	-0,07	0,05	0,05	-0,11	0,03
36-mgt International	-0,09	0,12	-0,01	-0,10	0,04	0,04	0,09	0,07	-0,10	-0,09	0,03	-0,13	-0,05	-0,08	-0,09	-0,13	-0,12	0,13	0,11	-0,13	-0,09	0,10	-0,05	0,02	0,15	-0,02
37- mgt Other	0,03	-0,06	-0,03	0,01	-0,01	-0,07	-0,04	-0,02	0,08	-0,04	-0,06	0,07	0,06	0,07	-0,10	0,03	0,02	0,08	-0,08	0,04	0,11	-0,10	-0,04	-0,12	-0,07	-0,04
38-UNPRI	0,06	0,15	0,19	0,14	0,20	-0,01	0,04	0,07	-0,08	0,01	-0,03	-0,05	-0,07	-0,04	0,06	-0,06	0,07	0,06	0,17	-0,08	-0,06	0,03	-0,04	-0,00	-0,10	0,08
39-AFIC Chart	-0,04	-0,06	0,13	0,05	0,02	0,05	-0,00	0,24	-0,06	0,04	-0,03	-0,36	-0,02	-0,10	0,18	-0,22	0,16	-0,01	0,04	-0,04	-0,12	-0,01	0,03	0,03	0,01	0,02
40-Green or Social fund	-0,07	-0,03	0,05	-0,03	-0,06	-0,06	-0,04	-0,05	-0,05	0,01	0,12	0,05	0,13	0,07	0,05	0,07	0.05	-0,07	-0,11	-0,11	0,17	-0,18	0,13	-0,10	-0,00	-0,02
41-Communication	0,01	0,20	0,16	0,07	0,27	0,06	-0,06	0,07	-0,12	0,09	-0,01	-0,06	0,14	0.00	0,05	-0,06	0,12	0,00	0,13	-0,15	0,02	-0,01	0,02	-0,06	-0,11	0,03
42-Interest	0,04	0,11	0,18	0,12	0,11	-0,02	-0,01	-0,02	-0,07	0,02	0,06	0,04	0,09	0,06	0,04	0,03	0,02	0,07	0,07	0,01	-0,01	0,10	0,01	0,04	-0,01	-0,02

APPENDIX - TABLE B.1. (continues) - Correlation Matrix (3/3)

	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)
27-Minority	1,00															
28-Regional	0,26	1,00														
29-European	-0,20	-0,47	1,00													
30-International	0,07	-0,23	0,37	1,00												
31-Sector	-0,03	-0,18	0,18	0,07	1,00											
32-Gender	0,06	-0,02	0,03	0,01	-0,09	1,00										
33-Founder	-0,05	-0,24	0,08	-0,01	0,13	0,01	1,00									
34-Engineer	-0,03	-0,14	0,06	-0,00	0,15	-0,10	-0,12	1,00								
35-Business school	0,05	-0,07	0,04	-0,05	-0,00	0,09	-0,07	-0,24	1,00							
36-mgt International	-0,18	-0,10	0,12	0,15	-0,00	0,06	0,10	-0,13	-0,21	1,00						
37- mgt Other	0,12	0,15	-0,10	0,07	0,05	-0,02	-0,04	-0,13	-0,28	-0,31	1,00					
38-UNPRI	-0,02	-0,11	0,14	-0,02	0,03	0,04	0,01	0,04	-0,10	-0,00	0,02	1,00				
39-AFIC Chart	-0,15	-0,30	0,22	0,15	-0,01	-0,08	0,13	0,01	0,13	-0,00	-0,07	0,15	1,00			
40-Green or Social fund	0,07	0,02	-0,02	0,09	0,34	0,02	-0,01	0,05	-0,01	0,01	0,17	0,03	0,04	1,00		
41-Communication	-0,11	-0,14	0,17	0,16	0,13	0,02	0,07	0,13	-0,13	0,03	0,07	0,37	0,13	0,42	1,00	
42-Interest	-0,10	-0,03	0,04	-0,06	0,02	-0,02	-0,04	0,02	0,04	-0,17	0,05	0,40	0,11	0,15	0,30	1,00

This table presents the Pearson's correlation coefficients between variables of the public data database. Correlations significant at the 5% level or lower are underlined.

TABLE B.2. - Appendix
Survey sample representativeness

		Survey Respondents			Survey Non Respondents			Comparison of tests
Variable name	Definition	Obs.	Mean	Median	Obs.	Mean	Median	
Main characteristics								
Firm Age	Years elapsed since firm foundation	74	13.9	11.0	227	12.9	11.0	1.0
Workforce	Number of employees	68	18.6	10.5	218	11.5	6.0	7.1**
Funds	Number of funds managed by the firm	74	7.7	2.5	228	4.1	2.0	3.7***
Companies	Number of companies hold in portfolio	68	55.7	17.5	220	34.8	16.0	20.9**
Assets managed	Millions of Euros of assets managed	72	1422	318	223	700	100	722**
Ownership: Percentage of firms shares...								
Listed	... listed on a Stock market (in %)./	73	1.1	0.0	227	1.6	0.0	-0.0
PE firm	... owned by another Private Equity firm (in %).	70	15.5	0.0	204	16.1	0.0	-0.0
Partners	... owned by the firm Partners (in %).	70	40.7	22.5	201	42.3	0.0	-0.0
Bank	... owned by a Bank (in %).	70	13.9	0.0	201	18.8	0.0	-0.1
Insurance company	... owned by an insurance company (in %)	70	3.8	0.0	201	3.2	0.0	0.0
Industry	... owned by an industrial corporation (in %).	70	7.3	0.0	201	4.7	0.0	0.0
French state	... owned directly or indirectly by the French State (in %).	71	13.4	0.0	203	10.8	0.0	0.0
Other	... owned by other shareholders (in %).	70	5.5	0.0	201	2.7	0.0	0.0
Limited Partners: Dummy variable equal to 1 if....., 0 otherwise								
LP Industry	....the firm manages funds provided by an industrial corporation	69	0.23	0.00	199	0.18	0.00	0.06
LP Captive	... the firm is captive and essentially manages funds provided by a single bank or insurance	69	0.35	0.00	199	0.31	0.00	0.04
LP Sovereign	...the firm manages funds provided by a Sovereign Wealth Funds	71	0.41	0.00	200	0.38	0.00	0.03
LP Individuals	... the firm manages funds provided by individuals	71	0.23	0.00	199	0.21	0.00	0.01
LP Institutional	... the firm manages institutional funds (except pension funds)	70	0.87	1.00	194	0.76	1.00	0.11**
LP Pension funds	... the firm manages funds provided by pension funds	70	0.31	0.00	194	0.25	0.00	0.07
LP Family offices	... the firm manages funds provided by family offices	69	0.38	0.00	194	0.37	0.00	0.01

TABLE B.2. – Appendix continued

		Survey Respondents			Survey Non Respondents			Comparison of tests
Variable name	Definition	Obs.	Mean	Median	Obs.	Mean	Median	
Activity : Dummy variable equal to 1 if...., 0 otherwise								
Venture Capital	… funds are invested in venture capital	74	0.42	0.00	226	0.42	0.00	-0.01
Transmission	…funds are invested in transmission capital	74	0.69	1.00	226	0.57	1.00	0.12**
Growth	…funds are invested in growth capital	74	0.61	1.00	226	0.59	1.00	0.02
Mezzanine	…funds are invested in mezzanine	74	0.09	0.00	226	0.07	0.00	0.03
Distressed Capital	…funds are invested in distressed capital	74	0.08	0.00	226	0.09	0.00	-0.00
Funds of funds	…funds are invested in funds of funds	74	0.09	0.00	226	0.11	0.00	-0.02
Investment scope: Dummy variable equal to 1 if...., 0 otherwise								
Minority	.... the firm invests as a minority shareholder	65	0.71	1.00	174	0.80	1.00	-0.10*
French district scope	... the firm invests only in a specific French district	74	0.15	0.00	234	0.18	0.00	-0.03
European scope	... the firm invests in other European countries than France	74	0.61	1.00	234	0.57	1.00	0.04
International scope	... the firm invests in other countries than European countries	74	0.16	0.00	234	0.22	0.00	-0.06
Sector	... the firm manages at least one fund specialized in a sector	72	0.38	0.00	227	0.36	0.00	0.02
Management: Dummy variable equal to 1 if the Chairman ..., 0 otherwise								
Gender	... is a woman	74	0.04	0.00	225	0.05	0.00	-0.00
Founder	... founded the firm	73	0.40	0.00	217	0.44	0.00	-0.04
Engineer	... has a French “Grandes Ecoles” Engineer background	71	0.30	0.00	185	0.28	0.00	0.02
Business school	...has a French Business School background	71	0.51	1.00	183	0.46	0.00	0.05
International	... has an international background	71	0.11	0.00	183	0.27	0.00	-0.16***
Other	... has a different French background	71	0.49	0.00	183	0.44	0.00	0.05
Public Responsible Investment Practices: Dummy variable equal to 1 if the firm.... , 0 otherwise								
UNPRI	... is a UNPRI signatory	74	0.30	0.00	234	0.03	0.00	0.27***
AFIC Chart	... is signatory of the French Private Equity Association Ethics Chart	74	0.77	1.00	234	0.65	1.00	0.12**
Green or Social fund	... manages at least one fund with a social or environmental target	72	0.21	0.00	227	0.09	0.00	0.12***
Communication	...has a website referring to responsible investing practices	74	0.38	0.00	223	0.11	0.00	0.27***

This table compares the main characteristics of survey respondents and survey non respondents based on the public data we gathered (see Table 1). We test for survey sample representativeness of the French Private Equity industry by using t-tests for normally distributed variables and tests of proportion for dummy variables: respondents significantly differ from non respondents at the *** 1% level; ** 5% level; * 10% level.

C. APPENDIX TO CHAPTER 4

APPENDIX C.1.: PROOFS OF EQUILIBRIUM CHARACTERIZATION PROPOSITIONS

We here use the setting described in the main text.

To characterize equilibria, six critical values of z are useful to define. For the purpose of simplicity, we will use the notation $z_{i,\underline{s}}$ instead of $(z_i\ \underline{s},)$ and $z_{i,\overline{s}}$ instead of $(z_i\ ,\overline{s})$.

$z_{i,\underline{s}}^{min} = E/W_i$ is the value at which the purchase of securities is a zero NPV transaction for the investor if her beliefs are $\pi\left(i\middle|z_i, \underline{s}\right) = 1$. In other words, it is the smallest $\boldsymbol{z}$ that the investor will accept of a firm that does not signal under these beliefs.

$z_{i,\overline{s}}^{min} = E/(W_i - C_i)$ is the value at which the purchase of securities is a zero NPV transaction for the investor if her beliefs are $\pi(i|z_i, \overline{s}) = 1$. In other words, it is the smallest $\boldsymbol{z}$ that the investor will accept of a firm that signals under these beliefs.

$z_{i,\underline{s}}^{max} = (E + b_i)/W_i$ is the value of z that leaves the value of existing equity unchanged if the manager does not signal. In other words, it is the largest fraction that the manager who does not signal is willing to give up in order to secure financing.

$z_{i,\overline{s}}^{max} = (E + b_i\ - C_i)/(W_i - C_i)$ is the value of z that leaves the value of existing equity unchanged if the manager signals. In other words, it is the largest fraction that the manager who invests in a signal is willing to give up in order to secure financing.

$\overline{z}_{\underline{s}} = E/(p.W_h + (1-p)W_l)$ is the value of z at which the transaction has a zero NPV for the investor, based on the prior belief that the firm that does not signal is type h with probability p and is type l with probability $1 - p$. Note that these beliefs prevail if the action taken by the firm are uninformative, so that the investor's revised and prior beliefs are identical.

$\overline{z}_{\overline{s}} = E/(p.(W_h - C_h) + (1-p)(W_l - C_l))$ is the value of z at which the transaction has a zero NPV for the investor, based on the prior belief that the signaling firm is type h with probability p and is type l with probability $1 - p$. Note that these beliefs prevail if the actions taken by the firm are uninformative, so that the investor's revised and prior beliefs are identical.

Noe that we always have $z_{i,\underline{s}}^{max} > z_{i,\underline{s}}^{min}$, whereas for $\overline{s}$ the inequality depends of the relative values of C_i and b_i. We also always have $z_{i,\overline{s}}^{min} > z_{i,\underline{s}}^{min}$ and $z_{i,\overline{s}}^{max} < z_{i,\underline{s}}^{max}$. This means that since the signal is costly and thus decreases in our model the final firm value, would investors perfectly know the firm type, they would ask for a larger share of the firm to compensate for the value destroyed by the money-burning signal. Without information asymmetry, or if signaling can't impact investors beliefs, firm managers who signal reduce their gain. From the previous inequalities we also infer $z_{h,\underline{s}}^{min} < \overline{z}_{\underline{s}} < z_{l,\underline{s}}^{min} < z_{l,\overline{s}}^{min}$. The relative positions of the other critical values depend on parameter values.

The notion of sequential equilibrium of Kreps and Wilson (1982) is here used to solve the signaling game. Equilibria selected are contingent to the set of parameters used. Without loss of generality we

can make the following assumption, which allows us to restrict attention to a subset of the possible values of ***z*** when characterizing the equilibria:

Assumption 1*: Only offers* $z \in \left[z_{h,\underline{s}}^{min} ;\ z_{l,\overline{s}}^{min} \right]$ *are presented in equilibrium.*

Indeed, we always have: $z_{h,\underline{s}}^{min} < z_{l,\underline{s}}^{min} < z_{l,\overline{s}}^{min}$. Offers of $z > z_{l,\overline{s}}^{min}$ should be accepted by the investor since they provide her with an NPV of at least zero, regardless of the firm's type. However, such offers will reduce the value of the original shares without changing the probability of acceptance and therefore should not be made. On the other hand, offers $z < z_{h,\underline{s}}^{min}$ represent a negative NPV transaction for the investor regardless of the type of firm making the offer and hence should not be accepted. Given that these offers should not be accepted under any beliefs, managers should prefer offers of $z_{h,\underline{s}}^{min}$.

As in most signaling games, more than one Bayes-Nash equilibrium is found in our model, hence the theoretical prediction is ambiguous. To refine predictions, following Cadsby et al. (1998), we here choose the intuitive criterion of Cho and Kreps (1987). It requires that out-of-equilibrium beliefs reflect some though about which types are likely to make a particular out-of-equilibrium response. More precisely, it requires that the investor, after observing an unexpected deviation from equilibrium play, should assign probability zero to all those firm manager types that, by deviating so, cannot improve their respective payoff, provided the investor makes some utility-maximizing choice of response.

Assumption 2: *Players will not select an action that is dominated (following the intuitive criterion) and beliefs will reflect this.*

This game is consistent with four types of pure strategy sequential equilibria: (i) a price separating and signaling equilibrium; (ii) a price separating and non signaling equilibrium which exists under two different sets of conditions; (iii) a price pooling and non signaling equilibrium; (iv) a price pooling and signaling equilibrium. In a separating equilibrium, different firms present different offers. Here equilibria (i) and (ii) are separating equilibria; equilibria (iii) and (iv) are pooling equilibria. Equilibra characterization is given by the following propositions.

- **price separating and signaling equilibrium**

Proposition 1: *A price separating and signaling equilibrium in which*

1. *a type l firm offers* $z_{l,\underline{s}}^{min}$ *with probability 1;*
2. *a type h firm offers* $z_{h,\overline{s}}^{min}$ *with probability 1;*
3. *the investor accepts* $z_{l,\underline{s}}^{min}$ *and* $z_{h,\overline{s}}^{min}$ *with probability 1 and rejects all other offers;*

exists if and only if (i) $z_{h,\overline{s}}^{min} > z_{l,\overline{s}}^{max}$ *and (ii)* $z_{h,\underline{s}}^{max} < z_{l,\underline{s}}^{min}$ *and (iii)* $b_h > C_h$.

However,(iv) $C_h < z_{\underline{s}}^{*}(1-p)(W_h - W_l)$ *is also needed for this equilibrium to be dominant.*

In a separating equilibrium, different firms present different offers. In this equilibrium, investors believe that a firm that does not signal is type ***l*** with probability 1.

Condition (i) guarantees that a ***l*** – type firm cannot benefit from defecting by signaling. Indeed, offers $z < z_{l,\underline{s}}^{min}$ will be rejected in equilibrium by the investor as she will always get a negative expected payoff. Presenting such an offer has thus an expected payoff of zero for the *l*-type firm. Yet offers $z \geq z_{l,\underline{s}}^{min}$ will be accepted by the investor as they necessarily provide a positive or null NPV whatever the firm type. As $z_{l,\underline{s}}^{min} < z_{l,\overline{s}}^{min}$, presenting $z_{l,\overline{s}}^{min}$ reduces the expected payoff of the firm *l* without increasing the probability of acceptance by the investor. On the other hand, the firm *l* cannot profit from mimicking a h-type behavior as $z_{h,\overline{s}}^{min} > z_{l,\overline{s}}^{max}$, implying that presenting the offer $z_{h,\overline{s}}^{min}$ would lead to a negative payoff for the firm. Moreover, offers $z_{h,\underline{s}}^{min}$ would be rejected by the investor as she believes that a firm without signal is type *l*. Hence offers $z_{h,\overline{s}}^{min}$ or $z_{h,\underline{s}}^{min}$ are not presented. Since $z_{l,\underline{s}}^{min} < z_{l,\underline{s}}^{max}$, presenting the offer $z_{l,\underline{s}}^{min}$ is thus optimal in that it generates a positive and maximized expected payoff for the firm *l*.

Condition (ii) ensures that a type ***h*** firm will have no incentive to select type ***l***'s equilibrium strategy. Indeed, offering more than $z_{h,\underline{s}}^{max}$ generates a negative payoff if accepted and a payoff of zero is rejected. Hence, such an action is dominated by any offer that is less than or equal to $z_{h,\underline{s}}^{max}$ since this will generate a payoff of at least zero. As $z_{h,\underline{s}}^{max} < z_{l,\underline{s}}^{min}$, a *h*-type firm can thus not play a *l*-type firm strategy by offering $z_{l,\underline{s}}^{min}$. Taken together, the first two conditions thus imply that neither type can benefit from selecting the other's strategy. Moreover, offers $z_{h,\underline{s}}^{max}$ will be rejected by the investor as they put probability 1 of being *l*-type on non-signaling firms.

Condition (iii) guarantees a positive payoff of signaling for ***h***-type firms as $z_{h,\overline{s}}^{min} < z_{h,\overline{s}}^{max}$. However, condition (iv) is needed for this equilibrium to be dominant. Indeed, condition (iv) guarantees that a type ***h*** firm cannot benefit by defecting through abstention from signaling. Hence offers $z_{h,\overline{s}}^{min}$ are optimal for ***h***-type firms. If condition (iv) is not satisfied, then this equilibrium is dominated by the price pooling and non signaling equilibrium.
Finally, consider the investor's response to the offer made. Acceptance of $z_{l,\underline{s}}^{min}$ dominates reject since it yields an expected payoff of at least zero if the firm is *l* and positive if the firm is *h*, whereas rejection provides a payoff of zero regardless of the type. $z_{l,\overline{s}}^{min}$ and $z_{h,\underline{s}}^{min}$ offers are rejected as off-equilibrium path offers. Acceptance of $z_{h,\overline{s}}^{min}$ dominates rejection as it yields a positive expected payoff if accepted and zero if rejected.

In this equilibrium, high type firms signal their type to investors and hence succeed in avoiding under-investment. Low type firms cannot afford to purchase a money-burning signal, so they reveal their type and get financed. A two-speed economy is financed in which high type firms signal and low type firms don't.

- **price separating and signaling equilibrium**

This equilibrium exists under two sets of conditions (Propositions 2a and 2b).

Proposition 2a: *A price separating and non signaling equilibrium in which*

1. *a type **l** firm offers $z_{l,\underline{s}}^{min}$ with probability 1;*
2. *a type **h** firm offers $z_{h,\underline{s}}^{min}$ with probability 1;*

3. the investor accepts the offer $z_{l,\underline{s}}^{min}$ with probability 1 and rejects all other offers;

exists if $z_{h,\underline{s}}^{max} < z_{l,\underline{s}}^{min}$ and $z_{h,\bar{s}}^{min} > z_{l,\bar{s}}^{max}$ and $b_h < C_h$.

In this equilibrium, investors believe that a firm without signal is type ***l*** with probability ***1- p*** and type ***h*** with probability ***p***. The first condition ensures that a type ***h*** firm will have no incentive to select type ***l***'s equilibrium strategy. The second condition guarantees that a ***l*** – type firm cannot benefit from defecting by mimicking *h* price and signaling. Taken together, those conditions thus imply that neither type can benefit from selecting the other's strategy. The third condition necessarily implies $z_{h,\bar{s}}^{min} > z_{h,\bar{s}}^{max}$, meaning that a type ***h*** firm will have no incentive to defect by signaling as it will get a negative payoff if the offer is accepted and a payoff of zero if the offer is rejected. The investor will accept the offer $z_{l,\underline{s}}^{min}$ with probability 1 as she will get a positive payoff if the firm is ***h***-type and payoff of zero if the firm is ***l***-type. Offers $z_{h,\underline{s}}^{min}$ will be always rejected as the investor will get a negative payoff if the firm is ***l***-type and a null if the firm is ***h***-type. The signal is too costly for firms to invest in it. In this equilibrium, under-investment occurs as ***h***-type firm cannot successfully signal their type.

In this equilibrium, the signal is too costly for high type firms to profitably invest in it and investors thus do not consider it as a reliable quality signal. High type firms do not succeed in signaling their type and suffer under-investment.

Proposition 2b: *A price separating and brown signaling equilibrium in which*

*1. a type **l** firm offers $z_{l,\underline{s}}^{min}$ with probability 1;*

*2. a type **h** firm offers $z_{h,\underline{s}}^{min}$ with probability 1;*

3. the investor accepts the offer $z_{l,\underline{s}}^{min}$ with probability 1 and rejects all other offers;

exists if and only if $z_{h,\underline{s}}^{max} < z_{l,\underline{s}}^{min}$ and $z_{h,\bar{s}}^{min} < z_{l,\bar{s}}^{max}$

Conversely, in this equilibrium, the signal is not costly enough to be informative of the firm value level.

Investors here believe that a signaling firm is type ***h*** with probability ***p*** and type ***l*** with probability ***1 – p.*** The first condition ensures that a type ***h*** firm will have no incentive to select type ***l***'s equilibrium strategy by offering $z_{l,\underline{s}}^{min}$, and will not profit either from offering $z_{l,\bar{s}}^{min}$. The second condition implies that offers $z_{h,\bar{s}}^{min}$ and $z_{h,\underline{s}}^{min}$ can be proposed by both firm types and will be rejected by investor as she gets a negative expected payoff. Offers $z_{l,\bar{s}}^{min}$ will be rejected as an out-of-equilibrium offer. In this equilibrium, the signal is not costly enough to be informative of the firm value level, and ***h***-type firm suffers under-investment.

We can note that the stated conditions imply that the price separating non signaling equilibrium cannot co-exist with the price separating signaling equilibrium.

- **price pooling and non signaling equilibrium**

Proposition 3: *A price pooling and non signaling equilibrium in which*

*1. a type **l** firm offers $z_{\underline{s}}^*$ with probability 1;*

*2. a type **h** firm offers $z_{\underline{s}}^*$ with probability 1;*

3. the investor accepts the offer $z_{\underline{s}}^*$ with probability 1 and rejects all other offers;

Exists if and only if $z_{h,\underline{s}}^{max} > \overline{z}_{\underline{s}}$

However, $C_h > z_{\underline{s}}^*(1-p)(W_h - W_l)$ is also needed for this equilibrium to be dominant.

In this equilibrium, investors believe that a firm without signal may be type ***h*** with probability ***p*** and type ***l*** with probability ***1 – p***. Consider a value of $z_{\underline{s}}^*$ satisfying $\overline{z}_{\underline{s}} \leq z_{\underline{s}}^* \leq min\left\{z_{l,\underline{s}}^{min},\ z_{h,\underline{s}}^{max}\right\}$. A ***l***-type firm always benefits from offering $z_{\underline{s}}^*$ as $z_{\underline{s}}^* < z_{l,\underline{s}}^{min}$. The investor will accept the offer $z_{\underline{s}}^*$ as she gets a null expected payoff. A ***h***-type firm can benefit from offering $z_{\underline{s}}^*$ as $z_{\underline{s}}^* < z_{h,\underline{s}}^{max}$, but offers $z_{h,\underline{s}}^{min}$ will be rejected by the investor under any beliefs as she gets zero if the firm is ***h***-type but a negative payoff if the firm is ***l***-type. Both firm types will thus propose $z_{\underline{s}}^*$, which will tend to equal $\overline{z}_{\underline{s}}$ at the equilibrium. No restriction on the cost of signaling is needed to ensure the existence of this equilibrium. Nevertheless, if $C_h < z_{\underline{s}}^*(1-p)(W_h - W_l)$ then this equilibrium is dominated by the price separating and signaling equilibrium.
In this equilibrium, money-burning signal is too costly to be profitable and both firm types offer the same price to investors. In this setting, high type firms are under-priced, low-type firms are over-priced.

- **price pooling and signaling equilibrium**

Proposition 4: *A price pooling and signaling equilibrium in which*

*1. a type **l** firm offers $z_{\overline{s}}^*$ with probability 1;*

*2. a type **h** firm offers $z_{\overline{s}}^*$ with probability 1;*

3. the investor accepts the offer $z_{\overline{s}}^*$ with probability 1 and rejects all other offers;

Exists if and only if $W_l - C_l < W_h - C_h$ and $z_{l,\overline{s}}^{max} > \overline{z}_{\overline{s}}$ and $z_{h,\overline{s}}^{max} > \overline{z}_{\overline{s}}$

In this equilibrium, investors believe that a signaling firm may be type ***h*** with probability *p* and type ***l*** with probability *1 – p*, whereas a firm that does not signal is believed to be type ***l.*** The first condition ensures that l-type firms have no incentive to offer a signaling separating offer rather than a pooling signaling offer since it implies $z_{\overline{s}}^* < z_{l,\overline{s}}^{min}$. Consider then a value of $z_{\overline{s}}^*$ satisfying $\overline{z}_{\overline{s}} \leq z_{\overline{s}}^* \leq min\left\{z_{l,\overline{s}}^{min},\ z_{h,\overline{s}}^{max}\right\}$. The second condition guarantees that l-type firm has no incentive to deviate by not signaling. The third condition has the same consequence for h-type firms. Since both firms can purchase money-burning signals, offers $z_{h,\overline{s}}^{min}$ will be rejected by the investor as they have a negative expected payoff if accepted, and are worth zero if rejected. The offer $z_{\overline{s}}^*$ is thus optimal for both firm types. In this equilibrium, the cost of the money-burning signal is kept low enough by the stated conditions so that it is more profitable for both firm types to signal and pay that cost rather than to suffer poorer treatment based on investor beliefs about non-signaling deviators.
High type firms are still under-priced and low-type firms are still over-priced.

APPENDIX C.2.: GIAMMARINO AND LEWIS (1988)'S ASSUMPTIONS AND PROPOSITIONS

Giammarino and Lewis (1988) formulate the following assumption and propositions that we test in this paper:

Assumption 1*: Only offers* $z \in \left[z_h^{min} ;\ z_l^{min} \right]$ *are presented in equilibrium.*

Proposition 1: *A separating and signaling equilibrium in which*

1. *a type l firm offers* z_l^{min} *with probability 1;*
2. *a type h firm offers* z_h^{min} *with probability 1;*
3. *the investor accepts* z_l^{min} *with probability 1 and rejects all other offers;*

   exists if and only if $z_h^{max} < z_l^{min}$

Proposition 2: *A pooling equilibrium in which*

1. *both firm types offer* z^* *with probability 1 ;*
2. *the investor accepts the offer* z^* *with probability 1 and rejects all other offers;*

Exists if and only if $z_h^{max} > \bar{z}$

Proposition 3: *A semipooling equilibrium of the following type exists if and only if* $z_h^{max} > z_l^{max}$

1. *Type l offers* z^* *with probability* $f_l(z^*) = 1$. *Type h offers* z^* *with probability* $f_h(z^*) = \frac{(1-p)\varphi}{(1-\varphi)p}$ *and offers* $\hat{z}$ *with probability* $1 - f_h(z^*)$, *where* $\varphi = \frac{E+\tau-z^*W_l}{z^*(W_h-W_l)}$
2. $\alpha(z^*) = ((1-\ \hat{z}\ )W_h - a_h)/((1-z^*)W_h - a_h)$

   $\alpha(\hat{z}) = 1 = \alpha\left(z_l^{min}\right)$

   $\alpha(z) = 0\ \ \forall\, z \neq z^*, \hat{z}, z_l^{min}$
3. $\bar{z} < z^*\ <\ \hat{z} \leq z_l^{min}$

Proposition 4: *A semipooling equilibrium of the following type exists if and only if* $z_h^{max} < z_l^{max}$

1. *Type h firm offers* z^* *with probability* $f_h(z^*) = 1$. *Type l offers* z^* *with probability* $f_l(z^*) = \frac{(1-\theta)p}{(1-p)\theta}$ *and offers* z_l^{min} *with probability* $1 - f_l(z^*)$, *where* $\theta = \frac{E+\tau-z^*W_l}{z^*(W_h-W_l)}$
2. $\alpha(z^*)$=$((1-z_l^{min})\ W_l - a_l)/((1-z_l^{min})W_l - a_l)$

   $\alpha\left(z_l^{min}\right) = 1$

   $\alpha(z) = 0\ \ \forall\, z \neq z^*, z_l^{min}$
3. $z_h^{min}\ < z^*\ <\ z_l^{min}$

APPENDIX C.3.: DETAILS AND PROOFS OF EXPERIMENTAL PREDICTIONS

Strategies predicted in the "no signal" setting, "expensive signaling" setting, and the "cheap signaling" setting are respectively presented in Table A1, Table A2 and Table A3. Predictions for the "no signal" setting based on Giammarino and Lewis's (1988) model lead to the following hypothesis.

Hypothesis A*: *In the absence of signaling opportunity, only pooling offers should be made and accepted, with $z^* \in [27\%; 32\%]$. (Predictions of Giammarino and Lewis, 1988)

TABLE C.3.1.

Predicted strategies in the No signaling setting

Offer type:	Separating offers		Pooling offers
	z_l^{min}	z_h^{min}	z^*
Share offered (%) (with no risk premium)	43	18	27
Share offered (%) (with 1$ risk premium)	50	20	32
Payoff of high-type firm if offer accepted	-2.5	8.0	3.8
Payoff of high-type firm if offer rejected	0.0	0.0	0.0
Payoff of low-type firm if offer accepted	1.0	5.2	3.5
Payoff of low-type firm if offer rejected	0.0	0.0	0.0
Probability of offer by high-type firm: $f_h(.)$	0.0	1.0	1.0
Probability of offer by low-type firm: $f_l(.)$	1.0	1.0	1.0
Expected payoff of investor:	1.0	-1.5	1.2
Probability of acceptance by investor: α(.)	1.0	0.0	1.0

Notes: Predicted offers (following Giammarino and Lewis (1988)'s model) are given with and without a 1$CAN risk premium experimentally given to investors for the purpose of the incitation design. Payoffs are here displayed as they were to participants, which were paid according to the net value created by the investment.

In the "expensive signaling setting", let us consider the high-type firm strategy. Offers $z_{h,\underline{s}}^{min} = 20\%$ would yield the highest payoff (8$CAN), but are easily mimicked by low-type firms, so that the expected payoff of the investor is negative (-1.5$CAN). Anticipating the reject, firms will not offer $z_{h,\underline{s}}^{min}$. High-type type firms have no incentive to deviate by offering $z_{l,\overline{s}}^{min} = 100\%$ or $z_{l,\underline{s}}^{min} = 50\%$ as they get negative payoffs. So is it with $z_{\overline{s}}^* = 42\%$. Offering $z_{h,\overline{s}}^{min} = 25\%$ would be accepted and would yield 0.3$CAN. However, this strategy is dominated for high-type firms by $z_{\underline{s}}^* = 32\%$ which yields 3.8$CAN. Investors still accept this offer as in average they break even. Let us now consider the low-type firm strategy. We similarly show that the low type firm should also propose the price pooling and brown signaling offer $z_{\underline{s}}^* = 32\%$ ($z_{\underline{s}}^* = 27\%$ without the 1$CAN risk premium).

TABLE C.3.2.

Predicted strategies in the Expensive signaling setting

Strategy - Offer type:	Separating offers				Pooling offers	
	Signal		No signal		Signal	No signal
	$z_{l,\bar{s}}^{min}$	$z_{h,\bar{s}}^{min}$	$z_{l,\underline{s}}^{min}$	$z_{h,\underline{s}}^{min}$	$z_{\bar{s}}^{*}$	$z_{\underline{s}}^{*}$
Share offered without 1$ risk premium	100	23	43	18	42	27
Share offered with 1$ risk premium	100	25	50	20	49	32
Payoff of high-type firm if offer accepted	-20.0	0.3	-2.5	8.0	-6.2	3.8
Payoff of high-type firm if offer rejected	-8.0	-8.0	0.0	0.0	-8.0	0.0
Payoff of low-type firm if offer accepted	0.0	-1.5	1.0	5.2	-2.9	3.5
Payoff of low-type firm if offer rejected	-8.0	-8.0	0.0	0.0	-8.0	0.0
Probability of offer by high-type firm: $f_h(.)$	0.0	1.0	0.0	1.0	0.0	1.0
Probability of offer by low-type firm: $f_l(.)$	0.0	0.0	1.0	1.0	0.0	1.0
Expected payoff of investor:	0.0	0.8	1.0	-1.5	0.0	1.2
Probability of acceptance by investor: α(.)	0.0	1.0	1.0	0.0	0.0	1.0

Notes: Predicted offers are given with and without a 1$CAN risk premium experimentally given to investors for the purpose of the incitation design. Payoffs are here displayed as they were to participants, which were paid according to the net value created by the investment.

In the "cheap signaling" setting, we show with a similar analysis that both firm types are also predicted to select the price pooling and brown signaling offer $z_{\underline{s}}^{*} = 32\%$ ($z_{\underline{s}}^{*} = 27\%$ without the 1$CAN risk premium).

TABLE C.3.3.

Predicted strategies in the Cheap signaling setting

Strategy - Offer type:	Separating offers				Pooling offers	
	Signal		No signal		Signal	No signal
	$z_{l,\bar{s}}^{min}$	$z_{h,\bar{s}}^{min}$	$z_{l,\underline{s}}^{min}$	$z_{h,\underline{s}}^{min}$	$z_{\bar{s}}^{*}$	$z_{\underline{s}}^{*}$
Share offered without 1$ risk premium	55	19	43	18	31	27
Share offered with 1$ risk premium	64	22	50	20	37	32
Payoff of high-type firm if offer accepted	-8.5	5.0	-2.5	8	0.2	3.8
Payoff of high-type firm if offer rejected	-3.0	-3.0	0.0	0.0	-3.0	0.0
Payoff of low-type firm if offer accepted	-2.0	2.6	1.0	5.2	0.9	3.5
Payoff of low-type firm if offer rejected	-3.0	-3.0	0.0	0.0	-3.0	0.0
Probability of offer by high-type firm: $f_h(.)$	0.0	1.0	0.0	1.0	1.0	1.0
Probability of offer by low-type firm: $f_l(.)$	0.0	1.0	1.0	1.0	1.0	1.0
Expected payoff of investor:	0.0	-1.7	1.0	-1.5	1.2	1.2
Probability of acceptance by investor: α(.)	0.0	0.0	1.0	0.0	1.0	1.0

Notes: Predicted offers are given with and without a 1$CAN risk premium experimentally given to investors for the purpose of the incitation design. Payoffs are here displayed as they were to participants, which were paid according to the net value created by the investment.

Hypothesis B: *In both the expensive and cheap signaling settings, a price pooling and brown signaling equilibrium should be selected in which both firm types offer* $z_{\underline{s}}^{*} \in [27\%; 32\%]$. *Investors should accept those offers and reject all others.*

APPENDIX C.4.: DETAILED EXPERIMENTAL STATISTICS AND COMPLEMENTARY FIGURES

TABLE C.4.1.

Descriptive statistics of participants' profile per treatment

Treatment	Nb. Subjects	Age				Gender (%)		Lab Experiment		Investment experience			
		Mean	Std. Dv.	Min	Max	M	W	Mean	Std. Dv.	Mean	Std. Dv.	Min	Max
Control	40	28.4	8.3	18	55	52	48	0.80	0.40	2.58	0.79	1	4
E1	44	28.0	6.7	21	58	43	57	0.89	0.32	2.48	0.91	1	4
E2	40	28.4	8.5	18	60	60	40	0.85	0.36	2.55	1.00	1	5
E3	44	26.8	5.8	18	45	59	41	0.84	0.37	2.27	0.91	1	4
C1	44	27.1	6.4	18	46	50	50	0.80	0.40	2.55	1.14	1	4
C2	40	28.5	8.4	18	58	52	48	0.85	0.36	2.40	1.14	1	5
C3	44	28.4	7.9	18	60	52	48	0.75	0.43	2.32	1.06	1	5

TABLE C.4.2.

Proportion of participants that changed of offer category over the last 5 rounds

Firm type	Treatment						
	E1	E2	E3	C1	C2	C3	control
Low type firm	50%	42%	42%	25%	42%	58%	42%
High type firm	38%	50%	50%	50%	38%	50%	13%

TABLE C.4.3.
Descriptive statistics on Probit control variables

Variable name	Observations	Mean	Standard deviation	Minimum	Maximum
investment decision	2880	0.56	0.50	0.00	1.00
Offered shares z	2880	29.26	13.31	0.00	100.00
Carbon offset purchased	2880	0.07	0.25	0.00	1.00
Advertisement purchased	2880	0.08	0.27	0.00	1.00
Result at previous round (investor)	2880	0.42	2.15	-6.00	26.00
Result at previous round (firm)	2880	1.24	3.20	-20.00	15.00
Non credible offer	2880	0.07	0.25	0.00	1.00
1st period dummy	2880	0.04	0.20	0.00	1.00
Last 10 period dummy	2880	0.42	0.44	0.00	1.00
Period	2880	12.50	6.92	1.00	24.00
Gender (investor)	2880	0.58	0.49	0.00	1.00
Age (investor)	2880	27.38	6.81	18.00	58.00
Gender (firm)	2880	0.45	0.50	0.00	1.00
Age (firm)	2880	28.33	7.98	18.00	60.00
Experience at experiment (investor)	2880	0.83	0.37	0.00	1.00
Knowledge at investing(investor)	2880	2.48	1.07	1.00	5.00
Experience at experiment (firm)	2880	0.83	0.38	0.00	1.00
Knowledge at investing(firm)	2880	2.43	1.00	1.00	5.00

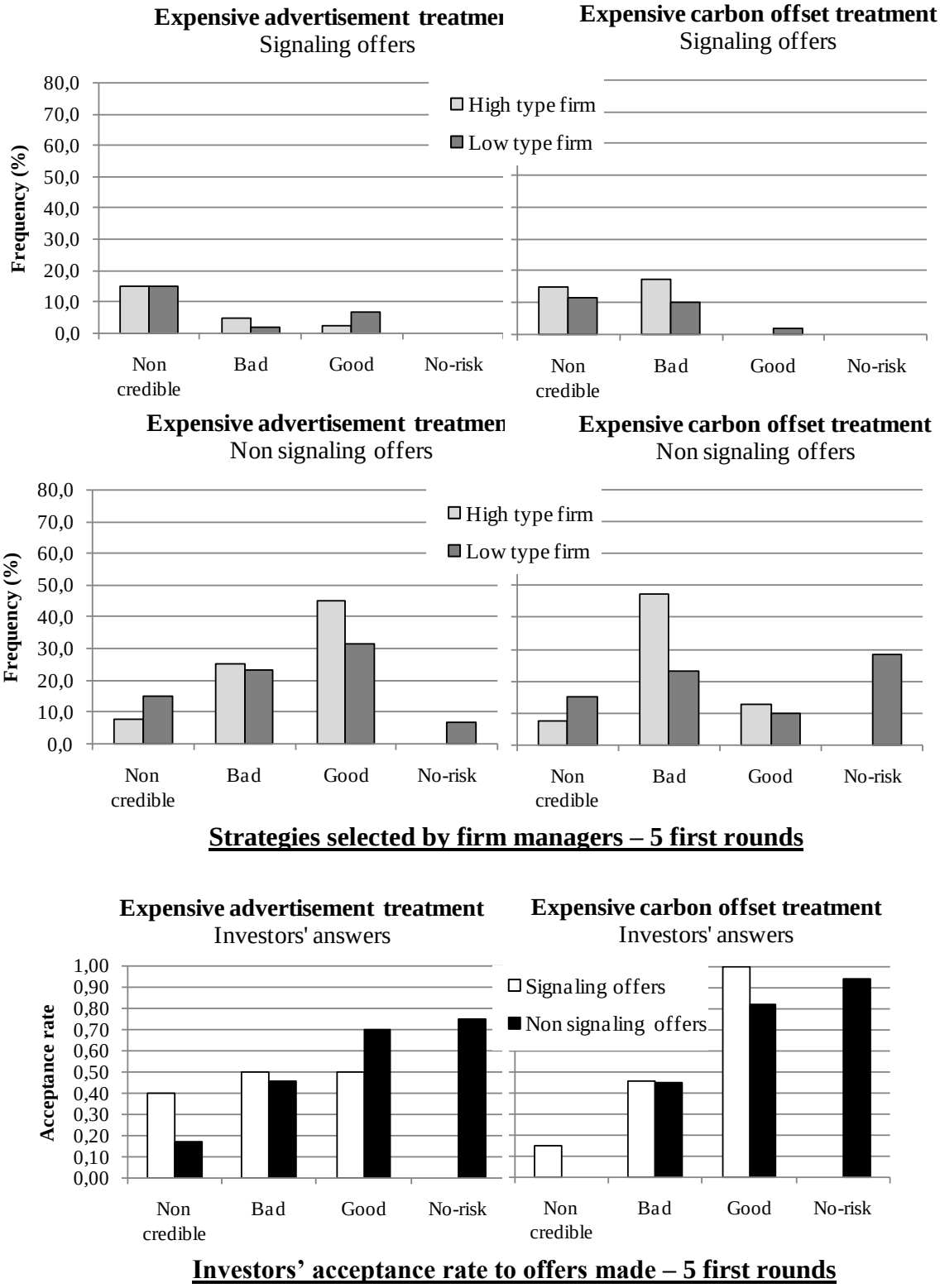

FIGURE C.4.1.

Offers made by firm types and investors' acceptance rate in expensive advertisement (E1) and expensive carbon offset (E2) treatments over the first five periods of play

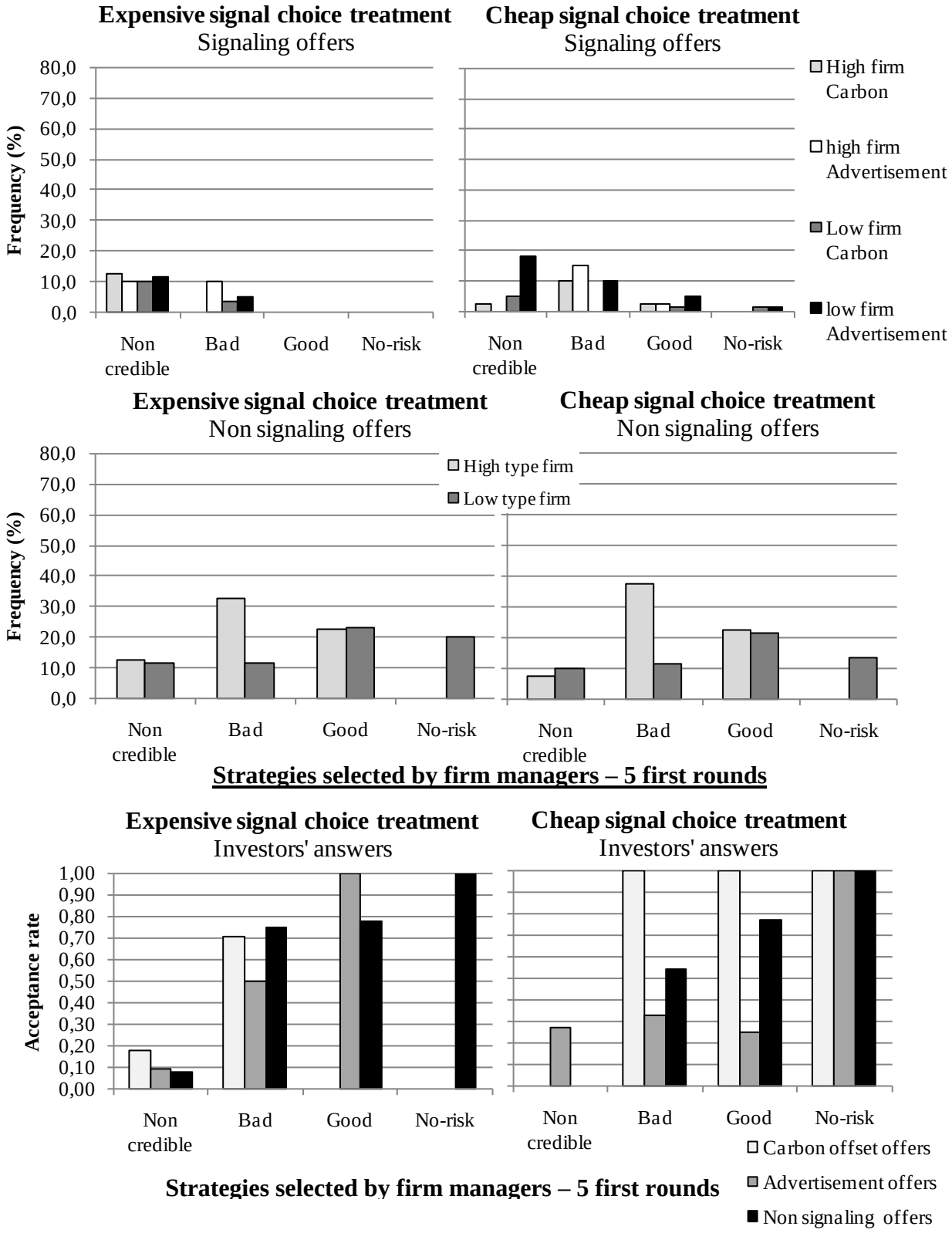

FIGURE C.4.2.

Offers made by firm types and investors' acceptance rate in expensive signal choice (E3) and cheap signal choice (C3) treatments over the first five periods of play

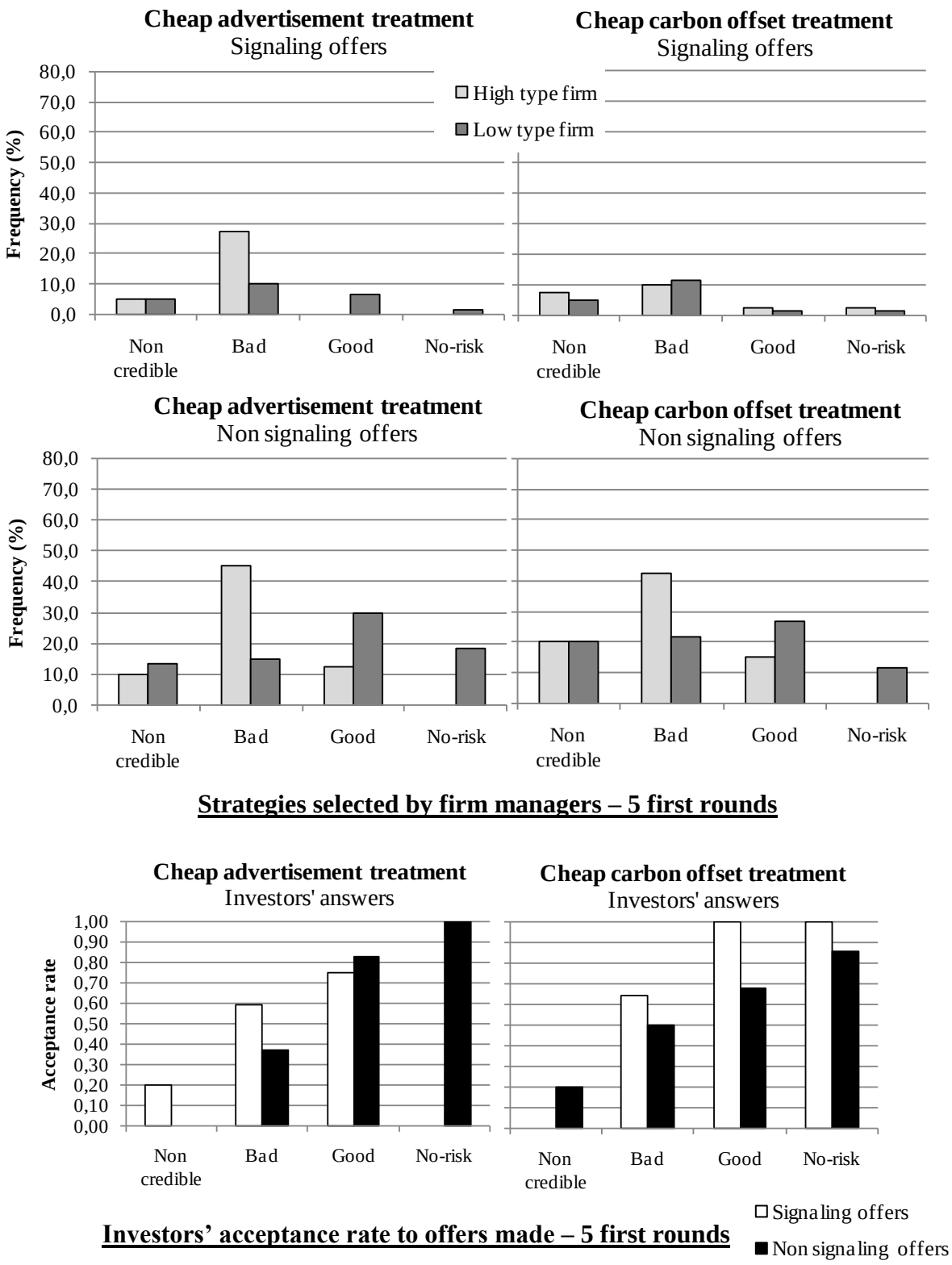

FIGURE C.4.3.

Offers made by firm types and investors' acceptance rate in cheap advertisement (C1) and cheap carbon offset (C2) treatments over the first five periods of play

APPENDIX C.5.: EXPERIMENT INSTRUCTIONS[29]

The Experiment:

This experiment consists in simulating investment decisions.

In this experiment, you will randomly be divided into three groups: Group A, Group B and Group C.

Group A participants manage an *Initial Project* of a given value. Group A participants can be of two types: *Type 1* and *Type 2*. *Initial Projects* of *Type 1* participants have a larger value than *Initial Projects* of *Type 2* participants.

Group A participants are asked to build a *New Project*, which will add value to their *Initial Project*. The value of the *Initial Project* added to the value of the *New Project* is called *Final Value*. To build the *New Project*, Group A participants have to get external financing from Group B participants. If they do not get financing, Group A participants cannot build their *New Project*. *New Projects* of Type 1 participants also have a larger value than *New Projects* of Type 2 participants. Hence the *Final Value* of Type 1 participants' projects is always larger than the *Final Value* of Type 2 participants' projects.

Each Group A participants knows his or her type (Type 1 or Type 2) but must keep this information private and confidential.

Group A participants have three options:

- He or she can choose to *purchase an advertisement* stating that he or she is a Type 1 participant. If he or she purchases the *advertisement*, Group C participant receives a commission.
- Or, Group A participant can choose to *purchase the carbon offset* of his or her project emissions. If he or she chooses to purchase the *carbon offset*, the commission will be paid to the not-for-profit carbon-offset Canadian organization Planetair on their website, at the end of the session.
- Finally, Group A participants can choose *not to purchase anything*.

Group B participants can choose to provide financing or not to Group A participants. In return from the financing they provide, Group B participants get a share of the Final Value plus fees. Group B participants do not know whether the Group A participant they are matched with is Type 1 or Type 2. However, they know that 40% Group A participants are Type 1 and 60% are type 2. They also know if the participant they are matched with purchased an advertisement stating that he or she is Type 1; or the project carbon offset; or nothing.

Group C participant do not take any decision. His or her results only depend on the decisions of the other participants.

What you are going to do

All participants are endowed at the beginning with 6$CAN, which are brought into play.

Group A participants will discover their type (*Type 1* or *Type 2*), randomly allocated. This information must be kept private. 40% of Group A participants are type 1 and 60% are type 2.

Both Type 1 and Type 2 Group A participants need to get a 6$CAN financing to build their New Projects. The two possible types are:

- ***Type 1*** participant: his or her *Initial Project* is worth 20 $CAN. If the 6$CAN financing is obtained, the *New Project* is financed and yields 15 $CAN. The *Final Value* of a Type 1 project is thus worth 35 $CAN. If financing is not obtained, the *Final Value* stays at 20 $CAN.

[29] Instructions have been translated from French. Original French instructions are available upon request.

- ***Type 2*** participant: his or her *Initial Project* is worth 6 $CAN. If the 6$CAN financing is obtained, the *New Project* is financed and yields 8 $CAN. The *Final Value* of a Type 1 project is thus worth 14 $CAN. If financing is not obtained, the *Final Value* stays at 6 $CAN.

After having discovered his or her type, Group A participant proposes a share (percentage) of his or her project to Group B participant against financing and has three options:

- **Option 1:** Offer a share and purchase an advertisement stating that he or she is type 1. Purchasing the advertisement costs 8 $CAN. If the offer is accepted by the Group B participant, the Final Value to be shared is thus equal to 35–8 =27 $CAN for type 1, and 14- 8 = 6 $CAN for type 2. If the offer is rejected by Group B participant, the Group A participant has a result of -8 $CAN. Whether the offer is accepted or not, each time an advertisement is purchased, Group C participant earns a 1 $CAN commission.
- **Option 2:** Offer a share and purchase the carbon offset of the project emissions. Purchasing this carbon offset costs 8 $CAN. If the offer is accepted by the Group B participant, the Final Value to be shared is thus equal to 35–8 =27 $CAN for type 1, and 14- 8 = 6 $CAN for type 2. If the offer is rejected by Group B participant, the Group A participant has a result of -8 $CAN. Whether the offer is accepted or not, each time a carbon offset is purchased, 1 $CAN is given for carbon offset to Planetair.
- **Option 3:** Offer a share and purchase nothing. If the offer is accepted by the Group B participant, the Final Value to be shared is thus equal to 35$CAN for type 1, and 14$CAN for type 2.

Group A participants select option1, or option 2, or option 3. Then their offer is sent to their Group B partner. Only their Group B partner at the round knows the share offered and if the Group A participant purchased an advertisement stating that he or she is type 1, or carbon offset, or nothing.

Group B participants discover the offer made by their Group A partner for the round. Then they decide:

- **Either to accept the offer** and to finance the New Project. To finance the New Project, Group B participants invest 6 $CAN and want in return to earn at least a 1 $CAN fees. The produced Final Value is then shared between the Group A participant and the Group B participant following the share agreed upon.
- **Or to reject the offer** and not to finance the project. In this case, if Group A participant had bought nothing, both players neither loose nor earn money. If Group A participant had purchased an advertisement, he or she loses 8$CAN and Group C participant earns 1 $CAN. If he or she had purchased a carbon offset, Group A participant looses 8$CAN and 1 $CAN is given for carbon offset to Planetair.

Summary of task parameters (given in $CAN)

	Type 1	**Type 2**
Financing needed by Group A participant	6	6
Group B participant fees	1	1
Value of a Group A participant's Initial Project	20	6
Value created by Group A participant's New Project	15	8
Final Value of Group A participant's global project (to be shared)	35	14
Advertisement cost	8	8
Final Value after advertisement purchase (to be shared)	27	6
Group C participant's commission if an advertisement is purchased	1	1
Carbon offset cost	8	8
Final Value after carbon offset purchase (to be shared)	27	6
Transfer to Planetair if carbon offset is purchased	1	1
Type probability	40%	60%

Results of one round:
At each round, a Group A participant makes an offer to a Group B participant. An advertisement or a carbon offset is or not purchased. Group B participant either accepts or rejects the offer. A screen is then displayed and indicates: the offer made; the answer to the offer; your results; and your partner results. If you are a Group C participant, the screen indicates how much commission you were given.
Your result for the round is calculated as your share of the created value (net of money invested). We will go through various examples in a few minutes.
Only your partner for the round knows your decision and your result.
At each round, and for the whole experiment, you will stay in the same Group and keep the same type. Yet at each round you will be matched with a new partner. Matching is random and anonymous.
You do not know in advance how many rounds you will be playing.

Example without purchase of advertisement or carbon offset:
Suppose that a Group A participant offers a 20% share to Group B participant and purchases nothing (no advertisement, no carbon offset).
Suppose his or her Group B partner accepts this offer.
Suppose that the Group A participant was type 1. Her or his project has then a Final Value of 35 $CAN. The Group B participant gets 20%*35=7 $CAN. To get his or her result for the round, we only consider the created value, so we subtract the 6$CAN financing. The group B participant earns finally 7– 6 =1 $CAN (which covers the 1 $CAN fees he asked for). Group A participant gets 80%*35=28 $CAN. To get his or her result for the round, we only consider the created value, so we subtract the value of the Initial Project, that is 20$CAN. The Group A participant thus earns 28-20 = 8 $CAN.
Suppose now that the Group A participant was type 2. His or her project then has a Final Value of 14 $CAN. The Group B participant gets 20%*14=2.8 $CAN. To get his or her result for the round, we subtract the 6$CAN financing. He or she thus looses 2.8 – 6 = -3.2 $CAN. The Group A participant gets 80%*14=11.2 $CAN. To get his or her result for the round, we subtract the value of his or her Initial Project, that is 6$CAN. He or she thus earns 11.2 – 6 = 5.2 $CAN.
If the Group B participant rejects the offer, nothing is earned nor lost.
In every case, Group C participant earns nothing and nothing is given for carbon offset to Planetair.

Example with advertisement purchase or carbon offset purchase:
Suppose that a Group A participant purchases the advertisement or the carbon offset for 8$CAN and offers a 20% share to Group B participant.
Suppose his or her Group B partner accepts this offer.
Suppose that the Group A participant was type 1. His or her project has then a Final Value of 35 - 8= 27 $CAN. The Group B participant gets 20%*27=5.4 $CAN. To get his or her result for the round, we only consider the created value, so we subtract the 6$CAN financing. The group B participant looses finally 5.4 – 6 =- 0.6 $CAN. Group A participant gets 80%*27=21.6 $CAN. To get his or her result for the round, we only consider the created value, so we subtract the value of the Initial Project, that is 20$CAN. The Group A participant thus earns 21.6-20 = 1.6 $CAN.
Suppose now that the Group A participant was type 2. His or her project then has a Final Value of 14 - 8= 6 $CAN. The Group B participant gets 20%*6= 1.2 $CAN. To get his or her result for the round, we subtract the 6$CAN financing. He or she thus looses 1.2 – 6 = - 4.8 $CAN. The Group A participant gets 80%*6=4.8 $CAN. To get his or her result for the round, we subtract the value of his or her Initial Project, that is 6$CAN. He or she thus looses 4.8– 6 = -1.2 $CAN.
If the Group B participant rejects the offer, he or she neither earns nor looses anything. However, Group A participant looses 8$CAN.

In every case, Group C participant earns 1$CAN if an advertisement has been purchased; or 1$CAN is given to Planetair for carbon offset if carbon offset has been purchased.

Tables to calculate your results at each round:

Table 1 presents results in every case for every possible offer made if *nothing has been purchased*. **Table 2** presents results in every case for every possible offer made if *carbon offset OR advertisement has been purchased.*
We are going to go though those tables together. Do you find in the Tables the lines corresponding to the examples?

Your payment for the experiment:
Whatever your results at the rounds, you will get 10$CAN for having completed the experiment.
Then, you will receive an additional payoff that will depend on your decisions and other participants' decisions.
At the beginning of the experiment, you are endowed 6$CAN, which are at stake. You can lose them in the experiment, or earn more, depending on your results.
You are going to play many rounds. At the end of the experiment, 2 rounds will be randomly selected. Your additional payoff will be calculated as the sum of your results at those two rounds, plus the 6$CAN endowment. If this sum is negative, we consider that the additional payment is null.

Payoffs examples:

1) If a participant got the results « 9 $CAN » and « 1 $CAN » at the randomly selected rounds, his or her additional payoff is 9 + 1 + 6 = 16. His or her final payoff is thus 16 + 10 = 26$CAN.
2) If a participant got the results « 9 $CAN » and « -12 $CAN » at the randomly selected rounds, his or her additional payoff is 9 -12 + 6 = 3= 16. His or her final payoff is thus 3 + 10 = 13$CAN.
3) If a participant got the results « 9 $CAN » and « -16 $CAN » at the randomly selected rounds, his or her additional payoff is 9 -16 + 6 = -1, which is considered as null. His or her final payoff is thus 0 + 10 = 10$CAN.

TABLE 1 – NO PURCHASE

% offered by A	Group A participant is Type 1				Group A participant is Type 2			
	Share of the Final Value that A gets	Result for A	Share of the Final Value that B gets	Result for B	Share of the Final Value that A gets	Result for A	Share of the Final Value that B gets	Result for B
0	35	15	0	-6	14	8	0	-6
1	34,65	14,65	0,35	-5,65	13,86	7,86	0,14	-5,86
2	34,3	14,3	0,7	-5,3	13,72	7,72	0,28	-5,72
…	…	…	…	…	…	…	…	…
99	0,35	-19,65	34,65	28,65	0,14	-5,86	13,86	7,86
100	0	-20	35	29	0	-6	14	8

Full tables available upon request

TABLE 2 – PURCHASE of advertisement OR carbon offset

% offered by A	Group A participant is Type 1				Group A participant is Type 2			
	Share of the Final Value that A gets	Result for A	Share of the Final Value that B gets	Result for B	Share of the Final Value that A gets	Result for A	Share of the Final Value that B gets	Result for B
0	27	7	0	-6	6	0	0	-6
1	26,73	6,73	0,27	-5,73	5,94	-0,06	0,06	-5,94
2	26,46	6,46	0,54	-5,46	5,88	-0,12	0,12	-5,88
…	…	…	…	…	…	…	…	…
99	0,27	-19,73	26,73	20,73	0,06	-5,94	5,94	-0,06
100	0	-20	27	21	0	-6	6	0

D. APPENDIX TO CHAPTER 5

Appendix D.1.: Case studies used in the experiment[30]

CASE STUDY OF FIRM A

Business summary

Firm A is a restaurant chain that employs over 1600 workers. All chain concepts, products and marketing tools apply to all restaurant units, empowering Firm A with a strong and visible brand image.

Along 17 other French restaurant chains, Firm A belongs to a restaurant sample group. Firm A stands as n°1 in terms of turnover growth in 2008, 2009 and 2010. It over-performed the market throughout the crisis, increased its turnover by +1.9% from 2008 to 2007 (market -1.8%) and only suffered a -0.2% loss from 2009 to 2008 when the market underwent -6.1%.

The average meal cost is lower than in its restaurant chain competitors. Moreover, the VAT reduction was passed on the average meal cost (- 3.5% from 2009 to 2010), in line with the special agreement for the restaurant industry (« Contrat d'avenir de la restauration »). The « fish and seafood » product benefits from a positive image in terms of nutritional quality. Those elements provide Firm A with a popularly-positioned price/product ratio, half-way between rapid and basic lunch catering and evening or weekend family dinner.

Three categories of establishments exist: downtown restaurants; mall restaurants, and « solo » restaurants, a growing category with a strong visual impact. On November 30, 2010, Firm A counts 74 establishments (12 in Paris, 26 en Paris region, 36 in other French regions). 9 openings are forecasted in 2011 and 8 in 2012. Full growth potential is estimated at 150 establishments in France.

For several years, Firm A has been engaged in an aggressive marketing policy (budget of 2% of turnover). Finally, Firm A had been managed by a high-quality top team for the past five years.

Financial Information

Business plan	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Turnover							
% growth							
EBITDA							
% turnover							
EBIT							
% turnover							

BALANCE SHEET (k€)	**2008**	**2009**	**2010**
Turnover			

[30] Translated from French. Original French version available upon request. Note that in the French version, ESG information were visually similar in terms of number of lines.

% change A-1 turnover restaurants
Raw material costs
Gross Profit
% gross profit restaurants
Personnel costs - Restaurant
Other costs - Restaurants
Gross Operating Income
% margin restaurants
Building rental costs
% margin restaurants
Head office costs
Gross Operating Profit -Total
% margin

Operating Capex : About 4 M€/year (openings put apart), which is in the industry average in turnover %.

Comparables Transactions Multiples	
	EBITDA Multiples
Max	
Min	
Average	

Comparables Firms	Stock price (€)	Market Cap (€)	Firm Value (€)	Multiple Turn./LTM	Multiple EBITDA/LTM	Multiple EBIT/LTM
X						
Y						
Z						
.....						

Average Stock Market Multiples			
	Mult Turn.	**Mult EBITDA**	**Mult EBIT**
Max			
Min			
Average			

DCF information:

WACC baseline: Firm value 150 M€
Risk premium increase: Firm value 130 M€
Risk premium decrease: Firm value 170 M€

Information Steps

Information 1:

Firm A Board of Directors is strongly involved in Human Resources Management, particularly for employee training.

In 2010, 95% restaurant employees were trained, including e-learning trainings (for management, kitchen and dining room workers). Trained employees benefited in average from 0.63 training day in 2010, against a 0.20

industry average. A “Challengers program” was implemented in 2009 to train future managers (Directors and Deputy Directors) over 18 months. Annual appraisals are formalized, with regular skill assessment for team managers.

In 2010, 191 employees (that is 11%) were granted an internal promotion against 56 (4%) in 2009. Employee promotion led to an average wage increase of +6%.

Information 2:

Firm A commits to ensure that the greatest value is attached to work and skills and therefore especially targets wage increase and working condition improvement.

Wages are in the high range of the chain restaurant industry, with performance incentives based on quantitative and qualitative objectives. In 2010, Firm A raised the salary scale higher that demanded by the collective agreements. Since 2008, wages systematically increased by +2 to +3%, while the inflation increased by about 1.5%. 92% workers have permanent contracts, against a 64% industry average. Working conditions have been improved with the installation of skylights in the dishwashing area and a reduction of the cook stove heat.

Employee turnover was reduced from 130% in 2000 to 42% in 2010. Work stoppages (WS) decreased by 1 WS/ 13 000 worked hours in 2009 to 1 WS/15 500 in 2010. Finally, shirking decreased from 7.3% in 2009 to 4.3% in 2010.

Information 3:

Firm A did not implement a voluntary policy of environmental footprint reduction.

The carbon footprint is not evaluated. Water, gas and electricity consumptions are not monitored by restaurant unit. Monitoring and implementing water and energy savings are not included in 2011 targets. Paper consumption for marketing and head office activities are not well-documented. New buildings do not follow the High Environmental Quality standards. There is no restaurant waste reduction policy and few recycling practices have been implemented.

Global energy and water consumptions increased between 2009 and 2010. Waste management deteriorated from an average 5.42 waste liters / consumer in 2009 to 5.78 liters in 2010.

Information 4:

Firm A does not possess any supplier chart with environmental guidelines and does not audit its key raw material suppliers (including shellfish suppliers) on those issues.

A European directive recently implemented water classification criteria for shellfish production based on *Escherichia coli* bacteria concentration. Only Area A –produced shellfish can directly be sold for human consumption. 100% shellfish sold by Firm A are produced in Area B, meaning human consumption is only allowed after sufficient treatment in a purification center.

The IFREMER national research center has shown that some pollutants (including heavy metals) and toxins (including endocrine disrupters) are not eliminated in the purification process.

CASE STUDY OF FIRM B

Business summary

Firm B produces packaging solutions for the agri-food industry. It has a twofold expertise: packaging and cooking products ; and a twofold trade : processing and distributing its products. It currently employs 227 workers.

Firm B is the French leader on its niche market (144 M€ in total size), with 35% market shares on its segment (over 50% in specialized segments). The agri-food paper/cardboard industry market has a strong resilience (relative certainty of yield, small risk), that follows in volumes the arifood product consumption. The market slightly decreased in volumes in 2008-2009 (-5% to -7%) due to the crisis, but should return to growth thanks to the population growth (0.5%/year). Firm B customers are wholesalers; large retailers (distribution channel well managed and with little competition); and large catering industrials.

Following the financial crisis, Firm B focused on maintaining a satisfactory level of profitability and underwent two years of activity decrease in 2008 and 2009 (-4.6%). Retailer price pressure exists but remains relatively limited, even though some competitors did several concessions over the period to maintain their volumes.

Since 2009, Firm A has undertaken a market consolidation with a focus on growth market segments and diversification thanks to external growth. In 2010, it acquired the tangible and intangible assets of a small promising packaging industrial, hence improving Firm B visibility in the industry, including at an international level. Salesmen have an active and substantial presence worldwide to defend Firm B markets. Despite decreasing results, Firm B acquires more than ever new clients and signs new contracts, developing profitable outlets. To sustain its aggressive action plan, an official growth-marketing position was created in 2010, giving Firm B new impetus. Firm A image is in the process of modernizing and this evolution creates a gap with its usual competitors.

Despite the crisis, Firm B has thus demonstrated its strength as a non volatile asset to built portfolio long-lasting value.

Financial Information

Similar to Case A (different values)

DCF information:	
WACC baseline:	Firm value 38.2 M€
Risk premium increase:	Firm value 33.4 M€
Risk premium decrease:	Firm value 44.5 M€

Information steps

Information 1:

Firm B implemented a policy to manage its environmental footprint.

Indicators were set up to monitor water, gas, electricity and paper consumptions and carbon emissions. A physical-chemical pre-treatment process for industrial water effluents was installed in 2000. A product waste (including toxic waste) monitoring system was also implemented. Finally, a policy of selective waste sorting and recycling is currently being installed.

Water and energy consumptions decreased in 2009 (-3%) and 2010 (-7%). 66% waster was recycled in 2010, against 55% in 2009.

Information 2:

Firm B diversified into the ecodesign segment and now produces and commercializes products with reduced environmental footprint.

In terms of ecodesign, Firm B invested to develop products that optimize raw materials (basis weight and/or packaging thickness reductions) and decrease toxic waste (use of vegetal inks, reduction of harmful volatile organic compounds). In 2009, Firm B launched the fabrication and sale of 100% labeled FSC product mix (label of sustainable and responsible forest management, delivered by an independent NGO).

In 2010, 72% cardboard and 33% paper supplied are FSC (respectively + 24% and + 12% compared to 2009), so without additional cost. The new product targets retailers, includes 20% less materials, without affecting the product quality.

Information 3

Firm B did not clearly formalize the organization and structure of authority delegation.

The current functional organization chart dates back to 2009 and has not been regularly updated. Authority delegation is not clearly established. No operational committee exists (management board, audit board, safety committee, sustainable development committee...) to formalize the firm strategic decisions. Audits and internal controls are not part of the corporate culture.

Most information on Firm B governance thus arises from dialog with its manager. Decision making is not participatory.

Information 4

Firm B is currently managed by Mister Z., CEO since 1991. His family founded the Firm in 1874.

Mister Z has a deep understanding on the firm's memory, background, know-how and key industrial and commercial account management. He largely supports the new Firm B growth-marketing strategy, influenced the recruitment in 2010 of Mister L. as head of the growth-marketing department, and follows its evolution.

For reasons of ill health, Mister Z. decided to retire starting from January the 1st, 2012. No successor is currently anticipated. Mister L. recently announced his resignation.

CASE STUDY OF FIRM C

Business summary

Firm C creates, produces and retails electronic components at the world scale. Its products are used in sensitive industries such as transport (airplanes, trains, aerospace). It currently employs 2608 workers. 2010 saw substantial increase in large contracts on new products.

Firm C is known for its important history in electronic components, with a worldwide market and production plants in Europe (4) and Asia (2) and commercial offices in Europe (4), Asia (2), the United States (2), and a network of salesmen in over 30 countries. Firm C encompasses a holding and a subsidiary company per production plant.

Due to the wide range of equipments and country-specific norms, the number of Firm C products is particularly important. Firm C markets are resilient despite a relatively low growth (about 1%/year). The competitive dynamics is in favor of Firm C, whose growth exceeds the market growth (including gains in market shares). The electronic component market for specific industries has above-average operational demands. Components indeed need to last long (above 5 years) without major machinery failure, so in demanding environments (shocks, vibrations, temperature changes...). Firm C brands benefit from a quality track record and a good image.

Firm C currently undergoes a high growth. In 2010, the firm achieved a 319,2 m€ turnover, that is +18,3% compared to 2009, with a 60,0m€ EBITDA (18,9% EBITDA margin). The 2011 budget shows a 335,2m€ turnover, that is a 5,1% increase. Productivity gains allowed by the automation of part of the production process and cost savings in the Chinese production enable a 68.0m€ EBITDA forecast (20.2% turnover).

The firm top management, mostly French, is acknowledged for its excellence. Over the past 5 years, it has been focusing on Firm C commercial growth, while keeping a tight hand on expenses. R&D efforts and upstream positioning on emerging products confirm Firm C management quality.

The growth potential of Firm C remains important considering the potential gains in world market shares. In particular, there is strong expectations on the commercialization of new products meeting the modern safety requirements of upcoming norms, which will likely lead clients to renew their demanding equipments.

Financial Information

Similar to Firm A (different values)

DCF information:	
WACC baseline:	Firm value 497.8 M€
Risk premium increase:	Firm value 447.4 M€
Risk premium decrease:	Firm value 560.8 M€

Information Steps

Information 1

Firm C decided to implement a new operational governance better involving its different subsidiaries.

A supervisory board exists since several years. It encompasses a former Firm C top manager and investors and meets every three months. At the management level, chairman and CEO are distinct posts and those managers constitute a balanced trio with the Financial Officer. Monthly meetings with managers of subsidiaries abroad are organized and formalized.

The Supervisory board members are highly satisfied by Firm C governance efficiency and their excellent relationships with the management.

Information 2

Firm C decided to increase the formalization of the organization with its subsidiaries.

Following this decision, an organization chart was set up to clarify each subsidiary's governance. Operational committees (commercial committee; R&D; Quality; industrial Production) were created at the holding level, gathering plant managers. Meetings between subsidiaries as well as between their departments (R&D; Quality; industrial Production) were also organized and formalized.

Those structures enable Firm C to develop a more transversal and less hierarchical management, which particularly well suits its activity.

Information 3

Firm C does not display its human resources policy as being a priority.

In terms of wages, Firm C is slightly lower than the industry average. Training programs implemented over the last four years focused on high-growth plant managers. The social dialog tensed over the last few months in two European production sites. Workers ask for a wage increase and a better management of their career in Firm C.

Employee turnover increased by + 12% between 2008 and 2010 and work stoppages increased by + 6%.

Information 4

Firm C leaves its subsidiaries with as much freedom as possible regarding human resources management.

Reports of the subsidiary meetings highlight that subsidiary Z in China has implemented a human resources policy which strongly differs from the other subsidiaries. In particular, it is underlined that employees work 10 to 12 hours a day, 6 days a week and work 80 to 200 extra hours monthly (whereas the regulation limits them to 36). A two-day strike occurred last month, workers asking for a wage increase and an improvement of their working conditions.

The Southern Daily, a popular Chinese newspaper, just published its black list of the 20 worst multinational to work for in China, and Firm C appears among them.

APPENDIX D.2.: PARTICIPANTS' PROFILE

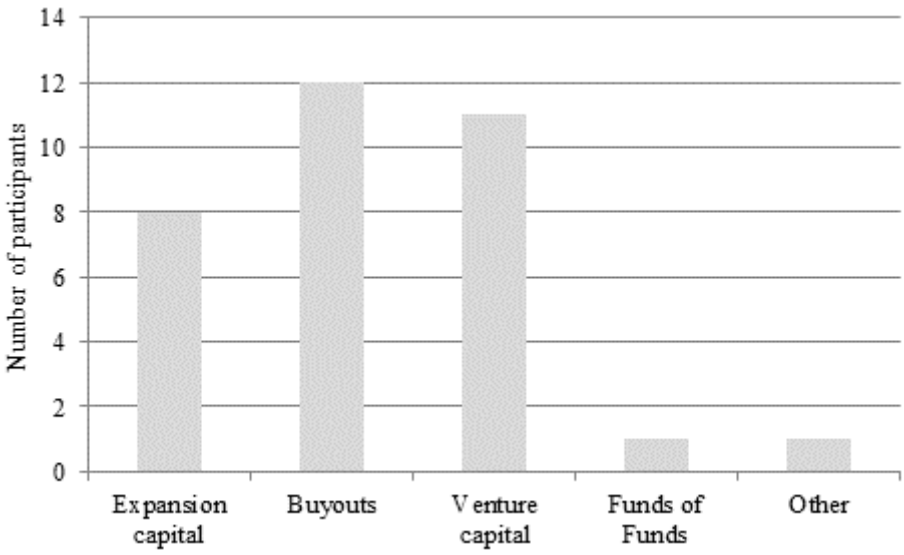

Fig. D.2.1. Distribution of participants by Private Equity specialty

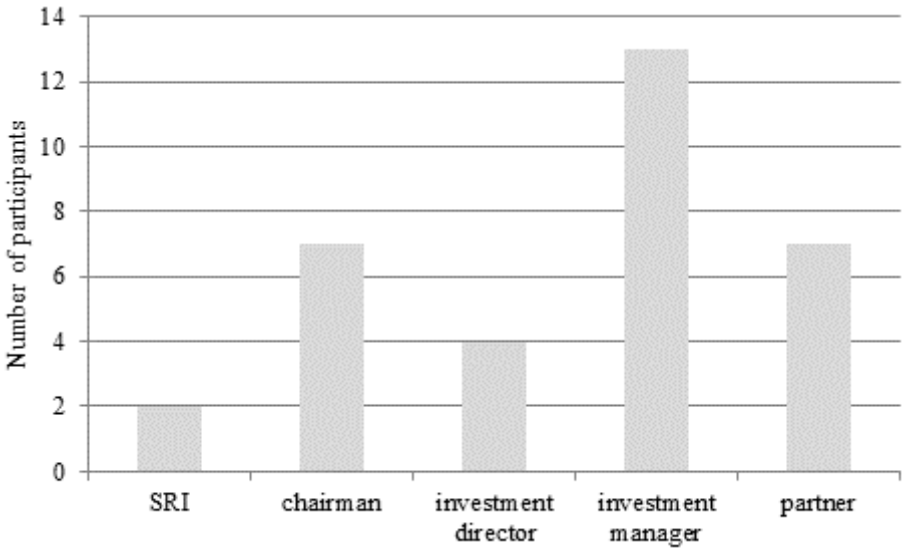

Fig. D.2.2. Distribution of participants by position in their Private Equity firms

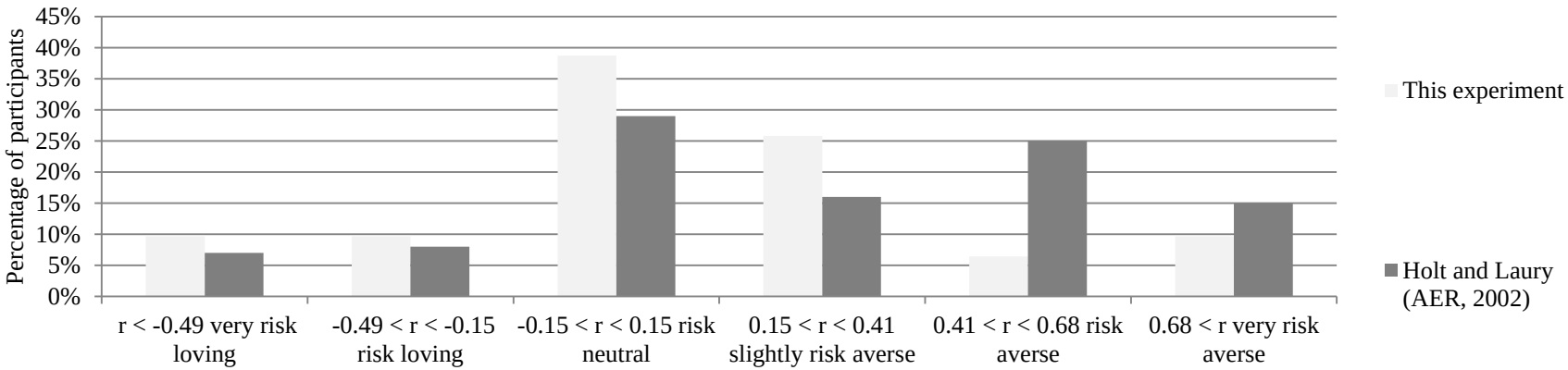

Fig. D.2.3. Distribution of the risk aversion of participants in our field experiment, compared to laboratory experiment participants

Table D.2.1

Descriptive statistics on participants' profile (from questionnaire)

	Treatment 1		Treatment 2		Treatment 3		Treatment 4		Full sample				
Variable (definition)	Obs	Mean	Obs	Mean	Obs	Mean	Obs	Mean	Obs	Mean	Std. Dv.	Min	Max
Number of participants	110	11	70	7	90	9	60	6	330	33	-		
Age	110	43.81	70	36.86	90	36.33	60	34.67	330	38.64	9.78	24.00	57.00
Gender (=0 if man, 1 if woman)	110	0.45	70	0.29	90	0.22	60	0.00	330	0.27	0.45	0.00	1.00
ESG training (= 1 if trained, 0 otherwise)	110	0.46	70	0.43	90	0.44	60	0.67	330	0.48	0.50	0.00	1.00
Risk aversion	110	2.18	70	2.71	80	2.63	50	2.00	310	2.39	1.31	0.00	5.00
Venture capital (= 1 if specialist, 0 otherwise)	110	0.27	70	0.14	90	0.56	60	0.33	330	0.33	0.47	0.00	1.00
Expansion capital (= 1 if specialist, 0 otherwise)	110	0.09	70	0.43	90	0.44	60	0.00	330	0.24	0.43	0.00	1.00
Buyouts (= 1 if specialist, 0 otherwise)	110	0.64	70	0.57	90	0.33	60	0.50	330	0.52	0.50	0.00	1.00
SRI (= 1 if specialist, 0 otherwise)	110	0.09	70	0.00	90	0.00	60	0.17	330	0.06	0.24	0.00	1.00

Appendix D.3.: Experiment instructions[31]

The experiment

You will successively be given two firm case studies during the experiment. For each case study, you will receive additional information as the experiment goes on. You will have to value each firm several times, as additional information is provided. You will write down your firm valuation after each new piece of information. You will undertake several valuation rounds, for each case study. You are competing against the other participants to make a deal with each of those firms. You can earn a Prize depending on your decisions and the other participants' decisions. This Prize consists in 3 bottles of Champagne.

At the end of the experiment, a valuation round will be randomly selected for each case study. For the randomly selected valuation round, the participant who will have proposed the highest value for the firm will make the deal. However, the Winner will only receive the Prize if he or she made a « good deal », that is if the firm was not paid at too high a price. You are not allowed to communicate with the other participants throughout the experiment. You must keep confidential your firm valuations for each information round.

What you are going to do in details

A first case study will be handed over to you. The case study encompasses quantitative and qualitative information: business summary, business plan, firm history, balance sheet, comparable transactions, multiples and DCF. You will then value the firm for the first time and decide whether you want to invest in it or not. This is the valuation round n°1. You have 12 min to do so. A calculator is at your disposal would you need one. You will write down your firm valuation and investment decision on the valuation sheet (that we will shortly give you). We will then pick up your valuation sheet.

A new piece of qualitative information (valuation round n°2) will be given to you. You can then choose either to change your first valuation and investment decision, or to keep to your first decisions. You can choose not to invest in the firm, but you still need to write down your valuation. You have 4 min to take those decisions. Three new pieces of qualitative information (valuation rounds n°3, n°4 and n°5) will successively be given to you in the same way. You will proceed for valuation rounds n°3, n°4 and n°5 as for valuation round n°2.For each case study, you will be thus asked five firm valuations.

Once the first case study is completed by all, the second case study will be handed over to you, following the same rules. Once both case studies are completed, you will have to fill up a questionnaire. Finally, we will discover who the Winners are.

Results and Winners:

One Winner is identified for each case study. Thus there will be two Winners in this experiment. For each case study, a valuation round (n°1; n°2, n°3, n°4 or n°5) is randomly selected using a dice at the end of the experiment. The selected round will be used to identify who is the Winner for each case study. The Winner for each case study is the one who « made the deal » with the firm at the randomly selected valuation round. It is the participant who proposed the highest firm valuation and decided to invest in the firm at the selected round. The Winner will be known to all.

The Winner only gets the Prize (3 bottles of Champagne worth about 120€) if he or she « made a good deal », that if he or she did not pay too high a price for the firm. If he or she paid too much for the firm

[31] Translated from French. Original French version available upon request.

(that is « made a bad deal »), then he or she loses the Prize. Whether the firm has been paid too much for or not is decided by the market consensus. The market consensus on the firm valuation is given by the median of all firm valuations proposed by participants (for this case study, at this selected round). If the Winner paid the firm more than 10% above the market consensus, the Prize is lost. If the Winner paid the firm less than 10% above the market consensus, the Prize is won. Whether the Winner keeps or loses the Prize is known to all.

If there are several Winners for a given case study (ex aequo), a draw will be used to identify who keeps the Prize. You have a few minutes to read those instructions again. Please let us know would you have any question; we will privately answer them. When all participants will be ready, we will start the experiment.

APPENDIX D.4.: POST-EXPERIMENTAL QUESTIONNAIRE

1. Do you agree with the following assertions?
a. The study cases were very clear.
☐ strongly agree ☐ agree ☐ neutral ☐ disagree ☐ strongly disagree
b. The study cases were comprehensive enough to give a valuation of the firm.
☐ strongly agree ☐ agree ☐ neutral ☐ disagree ☐ strongly disagree

2. For <u>case A</u>, do you agree with the following assertions?
a. You chose your valuation of the firm depending on your own judgment.
☐ strongly agree ☐ agree ☐ neutral ☐ disagree ☐ strongly disagree
b. You chose your valuation of the firm depending on your anticipations on other participants' judgment.
☐ strongly agree ☐ agree ☐ neutral ☐ disagree ☐ strongly disagree

3. For <u>case B</u>, do you agree with the following assertions?
a. You chose your valuation of the firm depending on your own judgment.
☐ strongly agree ☐ agree ☐ neutral ☐ disagree ☐ strongly disagree
b. You chose your valuation of the firm depending on your anticipations on other participants' judgment.
☐ strongly agree ☐ agree ☐ neutral ☐ disagree ☐ strongly disagree

4. Please indicate the following information:
a. Your age: _____
b. Your gender: _____
c. Your company: _____
d. Your function in this company: _____
e. Your specialization (VC, LBO...): _____

ESG criteria are criteria that are used to evaluate how a firm takes into account environmental, social and governance impacts in its financial management.
5. Did you receive training in your company about integration of ESG criteria into:
a. your target analysis?
☐ yes ☐ no
b. your due diligence contract?
☐ yes ☐ no
c. your portfolio management?
☐ yes ☐ no

6. Does your company have an ESG charter?
☐ yes ☐ no

7. Would you say that the integration of ESG criteria is important for:
a. LPs (Limited Partners) of your company?
☐ strongly agree ☐ agree ☐ neutral ☐ disagree ☐ strongly disagree
b. stockholders of your company?
☐ strongly agree ☐ agree ☐ neutral ☐ disagree ☐ strongly disagree
c. image of your company?
☐ strongly agree ☐ agree ☐ neutral ☐ disagree ☐ strongly disagree
d. risk management of your company?
☐ strongly agree ☐ agree ☐ neutral ☐ disagree ☐ strongly disagree

8. In your job, negative news:
a. about environmental practices has already led you to:
☐ decrease the valuation of a target firm
☐ refuse to invest in a firm
☐ negative news about environmental practices of firms has no impact on our decisions

b. about social practices has already led you to:
☐ decrease the valuation of a target firm

☐ refuse to invest in a firm
☐ negative news about social practices of firms has no impact on our decisions

c. about governance practices has already led you to:
☐ decrease the valuation of a target firm
☐ refuse to invest in a firm
☐ negative news about governance practices of firms has no impact on our decisions

9. In your job, positive news:
a. about environmental practices has already led you to:
☐ increase the valuation of a target firm
☐ accept to invest in a firm
☐ positive news about environmental practices of firms has no impact on our decisions

b. about social practices has already led you to:
☐ increase the valuation of a target firm
☐ accept to invest in a firm
☐ positive news about social practices of firms has no impact on our decisions

c. about governance practices has already led you to:
☐ increase the valuation of a target firm
☐ accept to invest in a firm
☐ positive news about governance practices of firms has no impact on our decisions

10. Please indicate for each decision if you choose option a of option b by ticking the corresponding box.

	YOUR DECISION
Decision 1 Option a: 3 chances over 10 to win 2 € and 7 chances over 10 to win 1.6 € Option b: 3 chances over 10 to win 3.85 € and 7 chances over 10 to win 0.1 €	Option a ☐ Option b ☐
Decision 2 Option a: 4 chances over 10 to win 2 € and 6 chances over 10 to win 1.6 € Option b: 4 chances over 10 to win 3.85 € and 6 chances over 10 to win 0.1 €	Option a ☐ Option b ☐
Decision 3 Option a: 5 chances over 10 to win 2 € and 5 chances over 10 to win 1.6 € Option b: 5 chances over 10 to win 3.85 € and 5 chances over 10 to win 0.1 €	Option a ☐ Option b ☐
Decision 4 Option a: 6 chances over 10 to win 2 € and 4 chances over 10 to win 1.6 € Option b: 6 chances over 10 to win 3.85 € and 4 chances over 10 to win 0.1 €	Option a ☐ Option b ☐
Decision 5 Option a: 7 chances over 10 to win 2 € and 3 chances over 10 to win 1.6 € Option b: 7 chances over 10 to win 3.85 € and 3 chances over 10 to win 0.1 €	Option a ☐ Option b ☐

At the end of the sessions, the results will be analyzed. We will be able to give you detailed and personalized conclusions of the study. You will thus know where you situate in terms of firm valuation regarding the other participants.
Do you wish to receive this personalized report?
☐ yes ☐ no
If yes, please indicate bellow your name as well as your email address.
Name: _____
Email : _____
Of course, your name as well as your company name will never be communicated in any result or publication.

APPENDIX D.5: DESCRIPTIVE STATISTICS

Table D.5.1.

Detailed descriptive statistics on experimental results by treatment

Treatment					Valuation	Change in valuation				Investment decision	Change in investment decision
Number	Firm	Factor	Sign	Obs.	Mean (M€)	Mean (%)	Std. Er.	Min.	Max.	Mean (%)	Mean (%)
1	**A**	**Base**		11	**166.82**					**90.91**	
		Social	+	11	169.82	1.92	2.99	0.00	8.55	90.91	0.00
		Social	++	11	171.91	1.20	1.43	0.00	3.13	90.91	0.00
		Env.	-	11	166.27	-3.28	6.24	-20.24	3.13	90.91	0.00
		Env.	- -	11	153.50	-7.26	8.74	-27.78	0.00	36.36	-54.55
	B	**Base**		11	**38.06**					**63.64**	
		Env.	+	11	39.18	3.08	3.85	0.00	11.11	63.64	0.00
		Env.	++	11	40.01	2.17	3.98	0.00	13.51	90.91	27.27
		Gov.	-	11	38.48	-3.88	6.56	-21.05	0.00	63.64	-27.27
		Gov.	- -	11	36.42	-5.82	5.76	-16.29	0.00	36.36	-27.27
2	**C**	**Base**		7	**458.29**					**85.71**	
		Gov.	+	7	460.00	0.34	0.73	0.00	1.96	85.71	0.00
		Gov.	++	7	459.71	-0.09	1.00	-2.17	0.00	100.00	14.29
		Social	-	7	453.00	-1.32	1.54	-4.00	0.00	71.43	-28.57
		Social	- -	7	432.14	-4.12	6.76	-18.60	0.00	28.57	-42.86
	A	**Base**		7	**133.71**					**71.43**	
		Social	+	7	135.14	0.96	1.32	0.00	3.03	71.43	0.00
		Social	++	7	138.14	2.51	3.62	0.00	10.00	71.43	0.00
		Env.	-	7	137.00	-0.75	1.29	-2.89	0.00	71.43	0.00
		Env.	- -	7	129.00	-6.68	7.02	-16.67	0.00	57.14	-14.29
3	**B**	**Base**		9	**40.68**					**77.78**	
		Env.	+	9	40.84	0.38	0.95	0.00	2.86	77.78	0.00
		Env.	++	9	43.44	5.90	5.95	0.00	16.00	77.78	0.00
		Gov.	-	9	40.19	-8.15	4.70	-16.67	-2.10	66.67	-11.11
		Gov.	- -	9	36.41	-9.60	8.56	-23.81	0.00	44.44	-22.22
	C	**Base**		9	**558.78**					**100.00**	
		Gov.	+	9	571.56	2.27	3.61	0.00	8.40	100.00	0.00
		Gov.	++	9	578.83	1.14	3.09	0.00	9.38	100.00	0.00

		Social	-	9	551.11	-4.26	8.03	-17.14	11.27	100.00	0.00
		Social	- -	9	495.00	-10.92	11.42	-38.20	0.00	66.67	-33.33
4	**A**	**Base**		6	**145.33**					**50.00**	
		Env.	-	6	135.33	-6.54	9.04	-23.08	0.00	50.00	0.00
		Env.	- -	6	116.67	-11.21	11.72	-31.82	0.00	50.00	0.00
		Social	+	6	131.67	11.17	18.55	0.00	46.67	33.33	-16.67
		Social	++	6	132.5	0.79	1.94	0.00	4.76	33.33	0.00
	B	**Base**		6	**33.17**					**50.00**	
		Gov.	-	6	30.83	-5.79	9.18	-20.45	0.00	50.00	0.00
		Gov.	- -	6	25.00	-18.56	10.74	-28.57	0.00	66.67	16.67
		Env.	+	6	25.33	1.11	2.72	0.00	6.67	66.67	0.00
		Env.	++	6	25.67	1.04	2.55	0.00	6.25	66.67	0.00

TABLE D.5.2.

Effects of corporate sustainability policies on the change in firm valuation – robustness check [a]

	Model 1 [b]			Model 1 [d]			Model 2 [c]			Model 2' [d]		
Pos. x Env (global)	4.88	***	(1.79)	5.09	***	(1.89)						
Neg x Env (global)	-11.16	***	(1.86)	-11.12	***	(1.97)						
Pos x Soc (global)	5.36	***	(1.85)	5.40	***	(1.96)						
Neg x Soc (global)	-10.24	***	(2.18)	-10.65	***	(2.33)						
Pos x Gov (global)	2.26		(2.18)	1.85		(2.33)						
Neg x Gov (global)	-15.32	***	(1.79)	-15.12	***	(1.89)						
Pos x Env x soft							1.73		(1.40)	1.89		(1.43)
Pos x Env x hard							3.25	**	(1.40)	3.40	**	(1.43)
Neg x Env x soft							-3.51	**	(1.44)	-3.53	**	(1.48)
Neg x Env x hard							-8.24	***	(1.44)	-8.25	***	(1.48)
Pos x Soc x soft							3.79	***	(1.44)	3.78	**	(1.48)
Pos x Soc x hard							1.33		(1.44)	1.32		(1.48)
Neg x Soc x soft							-2.81	*	(1.69)	-3.04	*	(1.75)
Neg x Soc x hard							-7.78	***	(1.69)	-8.01	***	(1.75)
Pos x Gov x soft							1.59		(1.69)	1.36		(1.75)
Pos x Gov x hard							0.77		(1.69)	0.54		(1.75)
Neg x Gov x soft							-5.75	***	(1.40)	-5.60	***	(1.43)
Neg x Gov x hard							-10.02	***	(1.40)	-9.87	***	(1.43)
Case study order	0.65		(1.13)	0.71		(1.18)	-0.13		(0.69)	-0.13		(0.71)
Internet session	-1.16		(1.65)				-0.67		(1.00)			
Investor age	0.10		(0.06)				0.06	*	(0.04)			
Investor gender	1.87		(1.32)				1.20		(0.80)			
Venture capital	-1.75		(2.17)				-1.24		(1.31)			
Buyout	-1.14		(1.86)				-0.83		(1.12)			
Expansion capital	-2.49		(1.80)				-1.64	**	(1.08)			
SRI	-3.98		(3.24)				-3.04		(1.95)			
ESG training	-0.14		(1.15)				-0.03		(0.69)			
Obs.	198			198			330			330		
Nb. investors	33			33			33			33		
Wald chi2	191.84	***					188.77	***				
F-test				23.83	***					12.96	***	
R^2 (within)	0.51			0.51			0.37			0.37		

[a] Model 1 and 1' use the change in firm valuation (%) between rounds 1, 3 and 5. Model 2 and 2' use all rounds. Corporate policy effects are decomposed into factor (Env., Social or Gov.), sign (Positive or Negative) and quality (soft or hard) and crossed effects are estimated. * p-value< 10%; ** p-value< 5%; *** p-value< 1

[b] Model 1 is a GLS model with random effects. Global effects (soft and hard practices cumulated) are estimated.

[c] Model 2 is a GLS model with random effects. Effects of hard and soft practices are distinguished.

[d] Model 1' and 2' are panel regression models with fixed effects.

Table D.5.3.

Effects of corporate sustainability policies on investment decision – robustness check [a]

	Model 3 [b]						Model 3' [d]		
	Estimates			Predictive margins [c]			Estimates		
Pos x Env x soft	-0.80		(0.73)	0.71	***	(0.11)	-0.84		(0.74)
Pos x Env x hard	0.43		(0.83)	0.86	***	(0.08)	0.45		(0.89)
Neg x Env x soft	0.37		(0.80)	0.85	***	(0.09)	0.49		(0.86)
Neg x Env x hard	-2.08	***	(0.72)	0.49	***	(0.13)	-2.05	***	(0.71)
Pos x Soc x soft	-0.06		(0.77)	0.81	***	(0.08)	0.00		(0.81)
Pos x Soc x hard	-0.09		(0.77)	0.80	***	(0.10)	-0.03		(0.81)
Neg x Soc x soft	0.93		(1.05)	0.90	***	(0.08)	0.92		(1.08)
Neg x Soc x hard	-2.44	***	(0.84)	0.43	***	(0.15)	-2.28	***	(0.80)
Pos x Gov x soft	2.03		(1.31)	0.96	***	(0.05)	1.96		(1.27)
Pos x Gov x hard [e]	22.91		(26832.8)	1.00	***	(0.00)	16.35		(1184.48)
Neg x Gov x soft	-1.44	**	(0.71)	0.60	***	(0.12)	-1.49	**	(0.72)
Neg x Gov x hard	-2.58	***	(0.72)	0.40	***	(0.12)	-2.52	***	(0.70)
Case study order	0.42		(0.39)				0.42	*	(0.38)
internet session	-2.38	*	(1.28)						
investor age	-0.01		(0.05)						
investor gender	-1.14		(1.03)						
venture capital	-1.61		(1.63)						
buyout	-2.99	**	(1.42)						
expansion capital	-1.86		(1.38)						
SRI	-3.35		(2.39)						
ESG training	0.58		(0.89)						
risk aversion	-0.24		(0.47)						
Obs.	330						240		
Nb. investors	33						24		
Wald chi2	35.83	**							
LR chi2							53.91	***	
log_likelihood	-128.98						-62.64		

[a] Effects of corporate policies on the investment decision (0 = don't' invest; 1 = invest) depending on their Factor (Env., Social or Gov.), Sign (Positive or Negative) and Quality (soft or hard), estimated as crossed effects.

[b] Model 3 is a random effects logistic regression.

[c] Predictive margins are the predicted probability of deciding to invest knowing the Factor, Sign and Quality, assuming the random effect is zero (i.e. that it is an average investor).

[d] Model 3' is a fixed effects logistic regression. 9 investors had all positive (invest) or null (don't' invest) outcome and were dropped from the sample.

[e] All observations = 1 when Factor = Governance, Sign = Positive and Quality = Hard

* p-value< 10%; ** p-value< 5%; *** p-value< 1