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Essais sur l'Analyse Économique de la Responsabilité Civile des Entreprises

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À Amandine, Christian et Bernadette

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Résumé :

L'accélération du rythme des innovations technologiques et les pressions exercées par la société civile constituent deux défis majeurs pour le droit de la responsabilité civile. Cette thèse étudie les effets incitatifs de la responsabilité civile sur le comportement de prévention des entreprises dans ce contexte. Notre contribution vise, en particulier, à approfondir l'analyse traditionnelle de la responsabilité civile des entreprises d'une part, et d'autre part à évaluer dans quelle mesure les sanctions non légales jouent un rôle au côté de ce cadre juridique. D'abord, nous mettons en évidence l'évolution de l'analyse économique de la responsabilité. Puis nous étudions la responsabilité civile dans un modèle théorique, avec pour contribution d'évaluer les effets incitatifs du concept juridique de causalité. Ensuite, nous examinons comment les difficultés de prévision des risques d'accident affectent les incitations fournies par la responsabilité civile, par un modèle théorique d'une part, et par une expérimentation en laboratoire d'autre part. Nous développons dans un modèle théorique une analyse du rôle des sanctions non légales, émanant de la société civile, aux côtés de la responsabilité délictuelle. Nous montrons que les incitations fournies par le boycott des consommateurs sur le comportement de prévention des entreprises sont limitées. Enfin, nous complétons ce modèle par une étude empirique, et nous étudions l'ampleur et les déterminants du phénomène de boycott des consommateurs en Europe.

Mots-clés :

Ambiguïté, boycott, causalité, confiance institutionnelle, prévention, responsabilité civile, responsabilité sociale de l'entreprise

Abstract :

The accelerating pace of technological innovations and pressures from civil society provide tort law with new challenges. This thesis studies the incentive effects of tort law on corporate investment in prevention in this context. Particularly, this study deepens the traditional economic analysis of corporate civil liability and assess the effects of the combination of non legal sanctions and the legal framework. First, we highlight the evolution of the economic analysis of liability and responsibility. Then, we study the incentive effects of civil liability in a theoretical model, with a particular emphasis on the role of the legal notion of causality. Next, we examine to what extent the difficulties of predicting accident risks affect incentives provided by liability with both a theoretical model and with a lab experiment. In a theoretical model, we develop an analysis of the role of non-legal sanctions, from civil society, alongside the tort law. We show that the incentive effects of consumer boycott on corporate investment in prevention are limited. Finally, through an empirical study, we complete this analysis by studying the magnitude and determinants of consumer boycott in Europe.

Keywords :

Ambiguity, boycott, causality, care, institutional trust, civil liability, corporate social responsability

Sommaire

Introduction générale

"*Il faut réparer le mal, faire qu'il semble n'avoir été qu'un rêve.*"

Jean Carbonnier, *Droit civil, Les obligations*

"*Parmi les illusions qui tentent notre paresse, aucune n'est plus présente aujourd'hui que celle-ci : le droit doit être, et sera de plus en plus, le seul régulateur de la vie sociale. Il est urgent de mettre au jour la vacuité de cette illusion.*"

Pierre Manent, *Cours familier de philosophie politique*

L'histoire de la démarche répressive au sein des groupements humains se présente communément comme une succession de trois phases : la vengeance privée, la justice privée - ou composition - et enfin la justice publique.[1] La vengeance privée désigne le fait que la victime d'un méfait, ou ses proches, exerce sa vengeance sur l'auteur de cet acte. Les Germains qui pratiquaient la vengeance familiale, les guerres privées qui ont duré longtemps au Moyen Âge ou encore la vendetta[2] illustrent cette phase.[3] En présence de justice privée, des règles viennent encadrer l'exercice de la vengeance afin d'en limiter les dégâts matériels et humains. La justice privée instaure un rapport entre le mal subi par la victime et celui qui sera imposé à l'auteur du dommage. Nous pouvons nous référer par exemple à la "loi du talion", qui consiste à rendre exactement le mal subi, et que l'on retrouve dans d'anciens textes, à caractère religieux ou non, comme le Code de Hammurabi (Mésopotamie, 1750 av. J.-C), la Bible et la Loi des Douze Tables (lois romaines, rédigées entre 451 et 449 av. J.-C). Quant à la justice publique, elle transfère le contrôle de la vengeance à la collectivité.[4] Il revient alors à une autorité publique de définir ce qui, dans la société, est acceptable ou non, et de fixer les sanctions légales en cas de déviance par rapport à ces règles.

Ce découpage en trois phases de l'histoire de la démarche répressive est remis en cause par

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1. Cusson, 1987
2. Pratique qui a eu cours jusqu'au 19ème siècle en Corse
3. Castaldo et Lévy, 2010
4. Rassat, 2014

la publication dans les années 1950 des Lois d'Eshnunna (Mésopotamie, 1930 av. J.-C.) et du Code d'Ur-Nammou (Mésopotamie, 2100-2050 av. J.-C). Ces codes sont, comme le Code de Hammurabi, en provenance de Mésopotamie ; et ces codes lui sont antérieurs. Alors que le Code de Hammurabi préconise une justice privée, les Lois d'Eshnunna et le Code d'Ur-Nammou dictent déjà des compensations pécuniaires en lieu et place de la loi du talion. Ainsi, Eshnunna et Ur-Nammou contiennent les caractéristiques de la justice publique, dernière étape de la démarche répressive, alors que Hammurabi, plus récent, correspond à une étape moins avancée. Par conséquent, Eshnunna, Ur-Nammou et Hammurabi montrent que la progression entre les trois phases ci-dessus présentées n'est point linéaire.[5]

La présentation en trois phases successives de la démarche répressive est aussi récusée par les anthropologues du droit tels que Hoebel (1954), Moore (1972), Rouland (1979) et Verdier (1980). Ceux-ci constatent que vengeance privée, justice privée et justice publique ne se succèdent pas nécessairement. En effet, ils expliquent que la vengeance privée coexiste avec la justice privée et la justice publique dans certains groupements humains. Dès lors, le contrôle des comportements au sein d'une société se ferait à la fois par des sanctions légales, provenant de la justice publique, et non légales, provenant de la vengeance et de la justice privée. Il convient alors de comprendre quelles sont les relations entre le cadre légal, imposé par une autorité publique, et les sanctions non légales, qui peuvent émerger, de façon décentralisée, au sein d'une société. Nous pouvons notamment nous demander s'il est possible de modeler les sanctions légales, voire les sanctions non légales, afin d'atteindre une situation jugée socialement désirable.

Nous savons que l'étude des sanctions légales est un thème majeur de l'analyse économique du droit (ci-après "AED"). Si l'analyse des sanctions remonte déjà aux travaux de Beccaria et de Bentham, l'article fondateur de Gary Becker intitulé "*Crime and punishment : an economic approach*" (1968) ouvre la voie à l'analyse économique des sanctions.

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5. Castaldo et Lévy, 2010

Cet article fait reposer l'étude de la sanction légale sur une approche utilitariste du comportement humain. Dans l'approche utilitariste, l'individu est supposé comparer l'utilité, *i.e.* la satisfaction qu'il retire de différents choix possibles d'action - comme le fait de respecter ou non une règle de droit. La probabilité qu'une personne décide de suivre une règle de droit dépend, dans cette théorie, du niveau des sanctions légales et de la probabilité d'être sanctionné. Dans cette perspective, la règle de droit et la sanction qui lui est associée, sont considérées comme un mécanisme de prix ; et sous l'hypothèse de rationalité des agents économiques, ce prix façonne le comportement de l'agent.

Le concept juridique qui permet de faire peser une sanction sur l'individu est la responsabilité. Il s'agit d'un concept qui irradie l'ensemble des branches du droit. En effet, on parle par exemple de la responsabilité politique, notion au centre du droit constitutionnel, qui correspond à l'obligation de rendre des comptes du pouvoir exercé ; il y a aussi la responsabilité administrative, qui régule les relations entre l'administration et les administrés ; la responsabilité pénale, qui vise à rétablir l'ordre social, perturbé par l'existence d'une infraction, et la responsabilité civile, objet de ce travail de recherche.

Le droit de la responsabilité civile vise à réparer le préjudice subi par la victime d'un dommage. Il s'agit de la réponse juridique au désir de réparation de la victime. Le principe général de cette responsabilité, énoncé dans l'article 1382 du Code civil nous précise que "*tout fait quelconque de l'homme, qui cause un dommage à autrui, oblige celui par la faute duquel il est arrivé, à le réparer*". Ainsi, être responsable, au sens civil du terme, c'est répondre sur ses biens des conséquences de ses actes. Deux éléments importants apparaissent dans cette conception de la responsabilité civile : la faute d'une part, et la réparation d'autre part. La faute est entendue comme un écart à un comportement normal, attendu, qui est défini par la loi. Il s'agit donc d'un écart par rapport à un standard légal, qui n'a ni un aspect moral, ni un aspect religieux. Par ailleurs, la faute en droit de la responsabilité civile n'ouvre pas la voie à une punition par la société, mais uniquement à une réparation du tort causé à la victime. C'est à ce titre que la responsabilité civile ne fait pas porter de peine infamante sur le responsable d'un dommage. En ce sens, la responsabilité civile se démarque de la

responsabilité pénale, qui par des privations de liberté atteint l'honneur et la réputation du condamné. A ce propos, lors de la discussion du Code civil, un des orateurs, Bertrand de Greuille, précise que concernant le responsable, "*tout ce qu'il a le droit d'exiger, c'est qu'on ne sévisse pas contre sa personne, c'est qu'on lui conserve l'honneur, parce que les condamnation pénales ne peuvent atteindre que le crime*".[6] Dire cela, c'est affirmer que la peine est le domaine réservé du droit pénal, associé à la notion de châtiment. La peine traduit la désapprobation de la société envers un crime ; alors que la responsabilité civile s'extrait de l'aspect punitif et met en avant la réparation du préjudice subi. Ainsi, la faute ne contient pas un aspect moralement condamnable, ni ne fait référence à une intention coupable. On parlera alors de négligence.

Concernant la réparation, on voit que c'est la sanction légale type de la responsabilité civile. La réparation prend la forme des dommages et intérêts que la personne tenue responsable doit verser à la victime d'un préjudice. Comme indiqué par la Cour de cassation, "*le propre de la responsabilité civile est de rétablir aussi exactement que possible l'équilibre détruit par le dommage et de replacer la victime aux dépens du responsable dans la situation où elle se serait trouvée si l'acte dommageable ne s'était pas produit*".[7] La responsabilité civile répond alors à un objectif de justice corrective : les règles de responsabilité permettent de rétablir un équilibre rompu, de restaurer l'ordre antérieur à la survenue du dommage. On répare donc, quand il est possible, tout le dommage et rien que le dommage.

La fonction réparatrice de la responsabilité civile est renforcée au 19ème siècle avec l'essor du machinisme durant la Révolution industrielle, associé à une multiplication des accidents du travail. Sous la conception originelle de la responsabilité civile, la faute de l'employeur devait être démontrée afin de percevoir une réparation - démonstration qui n'était pas toujours aisée. Par la loi du 9 avril 1898, il est reconnu une responsabilité de plein droit de l'employeur, pour les accidents survenus par le fait du travail, ou à l'occasion du travail.

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6. Bertrand de Greuille *in* "Recueil de lois composant le Code civil (des Français) : Avec les discours des orateurs du Gouvernement, les rapports de la commission du Tribunal et les opinions émises pendant le cours de la discussion", Volume 5, Moreaux, 1804

7. Cour de cassation, deuxième chambre civile, 13 janvier 1988

Cela signifie qu'il n'est pas nécessaire de démontrer la faute de l'employeur pour obtenir une réparation. Une réparation forfaitaire, non intégrale, est alors versée à la victime, sauf en cas de faute intentionnelle ou inexcusable de celle-ci.[8] La responsabilité s'affranchit alors du concept de faute : une responsabilité fondée sur le risque émerge. On parle alors de responsabilité "objective" : l'individu doit répondre des risques que son activité fait peser sur la société, peu importe si cette activité a été menée ou non avec diligence. Néanmoins, au sein des systèmes juridiques, la responsabilité pour faute et la responsabilité objective coexistent, et il appartient au législateur ou au juge de décider des conditions dans lesquelles l'une ou l'autre s'applique.

A ce titre, la différenciation faite entre la responsabilité civile atteinte à l'environnement (RCAE) et la responsabilité environnementale est remarquable. Ces deux régimes ont pour objectif de contrôler le comportement des entreprises dont les activités font peser un risque d'atteinte à l'environnement. Mais on constate que le juge et le législateur ont décidé de modalités d'application différentes pour chacun de ces régimes. La RCAE porte sur les dommages corporels, matériels et immatériels subis par une victime, à la suite d'une atteinte à l'environnement causée par l'entreprise. Sous l'impulsion de la jurisprudence, la RCAE s'apparente à une responsabilité objective.[9] Ainsi, une personne dont le bien-être a été dégradé suite à une pollution environnementale pourra demander réparation, sans avoir finalement à démontrer une quelconque faute de la part de l'entreprise. Le droit distingue la RCAE de la responsabilité environnementale. La responsabilité environnementale intervient en dehors de tout dommage à un tiers et est engagée en raison des dommages environnementaux causés par l'activité de l'entreprise. Elle permet ainsi de réparer les dommages occasionnés au milieu naturel lui-même, en dehors de tout préjudice subi par des

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8. On observe une évolution récente de la responsabilité civile de l'entreprise en matière d'accidents du travail et de maladies professionnelles, suite au procès des travailleurs de l'amiante. D'après la Cour de Cassation, chambre sociale, n.838, 28 février 2002, l'obligation de sécurité de l'employeur provient du contrat de travail le liant au salarié et non plus de la loi de 1898. Il y a ainsi un renforcement de la responsabilité de l'employeur.

9. Tchotourian, 2006

tiers. [10] Régime de responsabilité mixte, la responsabilité environnementale fait coexister responsabilité objective et responsabilité pour faute. La responsabilité objective est appliquée aux activités les plus risquées. Ce sont les activités listées par le décret d'application (article R 162-1), comme par exemple les industries d'activités énergétiques, les opérations de collecte, de transport, de valorisation et d'élimination des déchets et les activités concernant les organismes et les micro-organismes génétiquement modifiés. Pour les autres activités productives, non citées dans l'article R 162-1, la responsabilité pour faute s'applique. Pour résumer, la RCAE, sous l'impulsion du juge, s'apparente à une responsabilité objective, tandis que sous l'impulsion du législateur, la responsabilité environnementale est un régime mixte.

Par l'usage d'outils d'analyse tels que la théorie de la décision, l'approche économétrique ou expérimentale, l'AED permet d'apporter un éclairage nouveau sur ces choix particuliers de régimes de responsabilité. C'est l'objet de l'analyse économique de la responsabilité civile de comprendre sous quelles conditions les règles légales appliquées permettent d'aboutir à une situation optimale sur le marché. A ce titre, les travaux fondateurs de Coase ont ouvert la voie à une étude systématique de la responsabilité civile délictuelle. En effet, Coase (1960) montre que sous les hypothèses de faibles coûts de transaction et d'information parfaite, si les droits de propriétés sont bien définis, l'allocation optimale des ressources peut être atteinte par les agents économiques, via la négociation privée, quelque soit la distribution initiale des droits de propriété. Le rôle de l'État se limite alors à attribuer des droits de propriétés explicites aux différents agents. Néanmoins, lorsque les hypothèses du théorème de Coase sont violées, il apparait que les règles légales en matière de responsabilité peuvent être nécessaires pour orienter le comportement des agents et atteindre l'allocation optimale des ressources.

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10. Directive 2004/35/CE du Parlement européen et du Conseil du 21 avril 2004 tranposée dans le Décret n° 2009-468 du 23 avril 2009 relatif à la prévention et à la réparation de certains dommages causés à l'environnement

Plus particulièrement, la responsabilité civile oblige le responsable à compenser *ex post* la victime pour les dommages qu'il a pu occasionner par son activité. Ainsi, la responsabilité civile peut être présentée comme un mécanisme d'incitations, qui peut amener l'entreprise à internaliser les externalités négatives de ses activités. Ce mécanisme peut permettre de minimiser le coût social de l'accident. Remarquablement, Calabresi (1970), autre fondateur de l'analyse économique de la responsabilité civile, indique qu'en dehors de l'exigence de justice corrective, un objectif de la responsabilité délictuelle est de minimiser les coûts sociaux. Les coûts sociaux d'un accident sont définis comme la somme des coûts de l'accident lui même, des frais d'administration, des coûts de prévention, et des coûts d'allocation des risques via l'assurance.

Ces travaux fondateurs ont été suivis de ceux de Brown (1973) qui a formalisé la relation entre l'auteur du dommage et la victime comme un jeu non-coopératif, où chacun des agents a la possibilité de moduler son niveau de prévention et d'activité, deux possibles déterminants de la survenue d'un accident et de son ampleur. Ce cadre d'analyse permet alors de comparer, mathématiquement, les effets attendus de différentes règles de responsabilité civile, et, dans une approche normative, de montrer quel régime peut être préféré par l'autorité publique. De nombreux auteurs, tels que Posner et Shavell, ont par la suite suivi cette voie, et approfondi l'analyse économique de la responsabilité délictuelle - une revue de littérature exhaustive, a été, à ce propos, rédigée par Schäfer et Schönenberger (1999), ainsi que par Schäfer (1999).

Pour résumer, la responsabilité civile contient un mécanisme de prix qui peut permettre d'orienter le comportement des entreprises vers une situation jugée socialement désirable. L'objet de l'AED est de décrire comment fonctionne ce mécanisme et sous quelles conditions l'optimum social peut effectivement être atteint. Toutefois, les travaux récents en économie comportementale et expérimentale montrent qu'au delà des sanctions monétaires, les individus sont fortement influencés par les normes sociales et morales. Fehr et Schmidt (2006) soulignent qu'à partir des années 1980, la prééminence de l'intérêt personnel a été

contestée par des expériences de laboratoire portant sur les jeux de négociation bilatérales et les interactions dans les petits groupes. Par la suite, une série d'expériences contrôlées a mis en évidence le rôle des normes sociales dans des jeux de dilemme social, des jeux d'ultimatum, et des jeux de dictateur.[11] Ce constat a poussé les économistes à inclure les normes sociales de réciprocité et d'équité dans leurs modèles. Par exemple, Rabin (1993) inclue les normes d'équité dans un jeu à deux personnes, en présence d'information complète. Dans ce modèle les individus sont prêts à sacrifier leur propre intérêt afin de punir ceux qui n'ont pas été équitables. Par ailleurs, ce modèle suppose que les individus sont également prêts à sacrifier leur intérêt pour récompenser ceux qui se montrent bienveillants à leur égard.

Appliqué à la conformité des comportements aux règles de droit, ce raisonnement a donné naissance, au sein de l'AED, au courant "Social Norms and Law" (ci-après "SNL"). Le courant SNL nous indique que les prix implicites contenus dans les sanctions légales ne sauraient à eux seuls expliquer la conformité des comportements aux règles de droit - les normes sociales jouent aussi un rôle important. Selon McAdams (1997), les normes sociales peuvent être définies comme les régularités sociales que les individus se sentent obligés de suivre à cause d'un sens du devoir qui serait interiorisé, en raison d'une crainte de sanctions externes non-juridiques, ou les deux. L'intériorisation d'une norme par un individu peut donner lieu à de la culpabilité, si celui-ci dévie de la norme considérée. Cela signifie que l'individu a une perte d'utilité s'il ne se conforme pas à la norme, même si son comportement n'est pas observé par d'autres individus. Quant aux sanctions externes non-juridiques, elles sont déclenchées par les observateurs qui constatent un comportement conforme ou non conforme à une norme sociale qu'ils ont eux même intériorisée. De ce fait, en cas de conformité du comportement observé, une approbation sociale peut être émise par les observateurs, donnant lieu à un gain d'utilité chez l'auteur de ce comportement. De même, toute déviance par rapport à la norme peut entrainer une perte d'utilité due à la

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11. Voir Camerer and Thaler, 1995 ; Camerer, 2003 ; Forsythe et al., 1994 ; Güth, Schmittberger and Schwarze, 1982 ; Roth, Malouf and Murningham, 1981 ; Roth, 1995

désapprobation sociale. Cette désapprobation sociale peut prendre une forme symbolique par le biais de remarques déplaisantes voire d'ostracisme dans sa forme la plus extrême. Elle peut aussi prendre une forme monétaire lorsque les observateurs d'une déviance souhaitent rompre leurs relations marchandes avec le déviant. Concernant l'approbation sociale, les récompenses correspondantes peuvent aussi avoir une forme non monétaire ou monétaire. Le courant SNL, parallèlement aux anthropologues du droit, reconnait que les sanctions légales et non légales peuvent coexister au sein d'une société ; et renouvelle ainsi l'analyse économique des sanctions, qui ne peut se cantonner à la seule prise en compte des sanctions légales. Nous pouvons alors nous demander si ces sanctions sont des compléments ou des substituts. [12] La réponse à cette question permettrait à l'autorité publique de comprendre comment modeler un système de justice publique efficace. Il se peut aussi que les sanctions non légales, bien qu'existantes, ne donnent que de trop faibles incitations pour induire un comportement socialement acceptable, laissant la sanction légale comme moteur primaire du comportement. [13]

Bien évidemment, l'entreprise en tant qu'entité impersonnelle n'est ni capable de ressentir de la culpabilité ni de la honte face à la désapprobation sociale. Que nous apportent alors les normes sociales dans l'étude des comportements d'une organisation lucrative telle que l'entreprise ? Le courant SNL n'est-il pas dans une impasse dès lors que l'on s'intéresse à des entités impersonnelles ? Au contraire, nous pourrions dire que la non-conformité des comportements des entreprises avec les normes sociales pourrait avoir un impact sur leurs revenus, via la pression des parties prenantes - et que c'est cette incitation monétaire qui peut pousser l'entreprise à se conformer à une norme sociale.

Ce poids des parties prenantes sur le comportement de l'entreprise se concrétise dans le concept de "*responsabilité sociale de l'entreprise*" (ci- après "RSE"). Une entreprise dite

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12. Cette question a été l'objet d'études théoriques par Bénabou et Tirole (2011), McAdams and Rasmusen (2004), Cooter (1998), Janssen and Mendys-Kamphorst (2004), Kahan (1998), Bohnet and Cooter (2003) et Zasu (2007).

13. McAdams et Rasmusen (2004)

"socialement responsable" pourrait bénéficier de récompenses monétaires pour son comportement, tandis que les entreprises qui s'écartent de cette norme de comportement devraient supporter des sanctions monétaires de la part de leurs partenaires commerciaux et financiers. La RSE est définie par la Commission européenne, comme "*la responsabilité des entreprises concernant leurs impacts sur la société. Cette responsabilité intègre les préoccupations sociales, environnementales, éthiques, des droits humains et des consommateurs au coeur des politiques commerciales des entreprises*".[14] Dans la conception européenne, la RSE est une démarche volontaire, que les firmes sont disposées à entreprendre, car incitées par les parties prenantes à le faire. Il s'agit de respecter le droit, mais aussi d'aller au-delà des exigences légales dans les domaines cités ci-dessus. Il y a donc, avec la RSE, une extension du concept juridique de responsabilité, avec la mise en avant du rôle des sanctions non légales que pourraient subir les entreprises.

Il s'agit là du problème au coeur de cette thèse. Alors que l'AED est déjà dotée d'études détaillées sur les effets incitatifs de la responsabilité civile, aujourd'hui des dépassements de cette analyse traditionnelle sont nécessaires. Notamment, l'AED offre un cadre de travail permettant d'étudier à la fois les sanctions légales et non légales. Pourtant, ce double système de contraintes qui accompagne les entreprises est encore peu abordé en AED. Par exemple, si la RSE est une manifestation des sanctions non légales qui peuvent être déclenchées par la société, nous pouvons nous interroger sur ses interactions avec le droit de la responsabilité civile. Nous pouvons nous demander si ces pressions exercées par les parties prenantes ne sont qu'anecdotiques. Peuvent-elles suffire à induire un comportement socialement responsable de la part des entreprises ? Le droit ne reste-t-il pas le principal moteur de la conformité des comportements à un standard donné ? A côté de ces dépassements de l'AED rendus nécessaires par la présence de sanctions non légales visant les entreprises,

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14. Communication de la Commission au Parlement européen, au Conseil, au Comité économique et social européen et au Comité des régions du 25 octobre 2011, intitulée "Responsabilité sociale des entreprises : une nouvelle stratégie de l'UE pour la période 2011-2014"

il est aussi important de poursuivre l'approfondissement de l'analyse standard de la responsibilité civile des entreprises. Nous avons vu dans cette introduction que le législateur n'a de cesse de faire évoluer le droit de la responsabilité, afin d'accompagner les évolutions de la société mais aussi des risques liés aux évolutions technologiques. La responsabilité environnementale est à ce titre emblématique. Cette complexité et cette évolution de la responsabilité civile conduit l'économiste du droit à raffiner son analyse.

C'est l'objet de cette thèse d'aborder à la fois les approfondissements et les dépassements possibles de l'analyse économique de la responsabilité civile des entreprises. Nous nous emploierons à répondre à ces questionnements au moyen de cinq essais A cette fin, nous utiliserons les différents outils qui appartiennent à l'escarcelle de l'économiste du droit, à savoir la modélisation théorique, l'outil économétrique et l'approche expérimentale. L'usage d'outils variés contribue à améliorer notre compréhension de la responsabilité civile. Dans ce domaine où les données manquent, nous avons souhaité exploiter les quelques chiffres existants et créer de nouvelles données pour éclairer les analyses théoriques auxquelles nous contribuons.

Cette thèse s'articule en trois parties. La **première partie** contient un unique chapitre dédié à la présentation du cadre d'analyse de cette thèse. Dans ce **premier chapitre**, nous montrons la nécessité de renouveler l'analyse économique de la responsabilité des entreprises. En effet, nous constatons que l'étude économique traditionnelle de la responsabilité explique les effets incitatifs de ces règles légales, sans prendre en compte les éventuels effets des sanctions non légales. Cette première phase observable dans la littérature - que nous appelons "analyse standard" - est nécessaire et reste encore à approfondir pour bien comprendre les mécanismes de la responsabilité. En effet, ce concept juridique est complexe, et pose encore de nombreuses questions pratiques. Par exemple, pour certains comportement socialement indésirables, on peut se demander s'il est préférable d'avoir recours à de la responsabilité civile ou pénale, ou bien encore s'il faut sanctionner les employés ou la firme elle-même. Le traitement seul de ces questions traditionnelles de l'AED n'est pas

encore épuisé. Néanmoins, à partir des travaux récents en sciences de gestion, en économie expérimentale et comportementale nous mettons en avant le besoin de dépasser ce schéma classique d'analyse. Ces travaux indiquent que les agents économiques sont aussi influencés par des sanctions non légales provenant de normes sociales ou morales. Nous préconisons alors l'introduction de ces sanctions non légales dans les modèles standards d'analyse de la responsabilité civile, afin de mieux comprendre le système de contraintes qui conditionne *in fine* le comportement des entreprises. Matériellement, cet entrelacement des normes juridiques et sociales se concrétise dans le concept de RSE. Extension du concept juridique de responsabilité, la RSE renvoie à une conception de la responsabilité qui ne relève pas du domaine légal, mais d'un corpus de normes morales et sociales sur les comportements des firmes. Les consommateurs, investisseurs et employés qui ont internalisé ces normes peuvent sanctionner les manquements des entreprises. Ce chapitre précise que ce contrôle par le marché du comportement des entreprises peut bénéficier de politiques de soutien ou fonctionner aux côtés de la responsabilité civile. Or, l'interaction entre RSE et cadre légal a peu été étudié. Nous esquissons alors comment les travaux récents sur les interactions entre normes légales et non légales peuvent être appliqués à l'étude de la RSE. Nous mettons enfin en évidence les axes de recherche correspondants.

Les parties suivantes de cette thèse abordent sous la forme d'essais les deux principales voies d'étude de cette thèse : d'une part nous approfondissons l'analyse standard en explorant des questionnements qui ont été peu abordés dans la littérature (Partie 2), d'autre part nous dépassons ce cadre traditionnel en explorant le rôle des sanctions émanant des consommateurs aux côtés de la responsabilité civile (Partie 3).

Dans la **seconde partie** de cette thèse nous proposons un approfondissement de l'étude traiditionnelle de la responsabilité civile des entreprises. Cette partie contient deux chapitres (chapitres 2 et 3). Dans le **chapitre 2**, nous nous intéressons à une notion peu étudiée en analyse économique de la responsabilité civile : le concept juridique de "causalité". La

Cour établit la responsabilité de l'auteur d'un dommage par la démonstration de trois éléments : l'existence d'un fait générateur, d'un dommage, et d'un lien de causalité entre les deux précédents éléments. Ce chapitre porte sur une notion de causalité répandue au sein des systèmes de *common law* et de droit civil qui est la condition "*sine qua non*". Elle signifie que l'action du défendant (l'auteur du dommage) a été une condition nécessaire à la survenue du dommage. Ce chapitre met en avant les effets incitatifs de la notion de causalité. Dans un premier temps, nous montrons d'abord que sous des hypothèses standards, garder la notion de causalité dans la définition de la responsabilité civile permet d'aboutir à l'optimum social, dans le sens où le défendant adoptera *ex ante* un niveau de prévention qui minimise le coût social des accidents dans les régimes de responsabilité objective d'une part, et de responsabilité pour faute avec condition *sine qua non* d'autre part. Dans un second temps, nous abordons cette même question des incitations fournies par le principe de causalité dans des situations où la responsabilité civile fournit, d'ordinaire, des incitations sous-optimales - à savoir les cas de la responsabilité limitée et de l'observabilité imparfaite du niveau de prévention fournie par le défendant. Pour ces cas complexes, il peut être intéressant, du point de vue du bien-être social, d'abandonner le principe de causalité. Ainsi, le chapitre 2 montre comment la responsabilité civile des entreprises peut être modelé de manière à atteindre l'optimum social, en fonction des conditions présentes sur le marché.

Le **chapitre 3** montre comment fonctionnent les régimes types de la responsabilité objective et sans faute en présence d'ambiguïté. Nous suivons la définition de l'ambiguïté de Klibanoff et al. (2005), qui la décrivent comme l'imprécision *ex ante* de la distribution de probabilité des événements, modélisée par une distribution de probabilité sur laquelle les agents peuvent former des croyances. Ce concept d'ambiguïté caractérise en partie les accidents environnementaux, dont on a vue que le législateur s'est récemment emparé. La question qui se pose alors est de savoir quels sont les effets incitatifs de la responsabilité objective et pour faute ; et, ensuite, quel régime peut être préféré par l'autorité publique. Afin de répondre à cette question, ce chapitre fournit d'abord un modèle théorique qui

décrit les comportements de prévention et d'assurance des entreprises en situation d'ambiguïté, et qui compare ces comportements par rapport au contexte standard - la présence de risque (probabilités d'accident précises). Puis, ces prédictions théoriques sont testées via un protocole expérimental original. Les résultats de l'expérimentation confirment le modèle théorique sur le point suivant : en présence d'ambiguïté, la responsabilité pour faute et objective ont des effets incitatifs différents. La responsabilité pour faute permet à une majorité d'agents d'adopter l'optimum social, tandis que la responsabilité objective amène des comportements plus erratiques. Par ailleurs, les résultats expérimentaux remettent en cause un résultat standard de l'analyse économique de la responsabilité délictuelle. En effet, sous les hypothèses traditionnelles, en présence de risque, responsabilité pour faute et objective sont équivalentes dans leurs effets incitatifs. Les résultats expérimentaux montrent que la propensité à adopter l'optimum social est plus importante sous la responsabilité pour faute.

Dans la **troisième partie** de cette thèse, nous montrons dans quelle mesure les sanctions non légales jouent un rôle aux côtés des règles de responsabilité civile. Cette partie contient deux chapitres (chapitres 4 et 5). Le **chapitre 4** introduit un modèle théorique simple de responsabilité civile où l'on considère la présence de consommateurs dotés de motivations morales. Dans ce modèle, on considère que les sanctions légales peuvent fournir des incitations insuffisantes à investir dans des systèmes de prévention des accidents pour les entreprises. Dans ce cadre, des sanctions non juridiques peuvent émaner des consommateurs, par le biais de boycott, en fonction des informations qui leur parviennent. Nous considérons les décisions de justice comme un canal d'information possible, et nous analysons les différents équilibres de marché qui peuvent émerger en fonction des régimes de responsabilité civile mis en oeuvre. En effet, différents régimes de responsabilité peuvent être associés à différents signaux publics sur le comportement des entreprises. Nous montrons alors que le régime de responsabilité pour faute a des effets incitatifs différents du régime de responsabilité objective. En effet, le régime de responsabilité pour faute permet de faire émerger un mécanisme réputationnel qui favorise l'investissement en prévention des

entreprises. Toutefois, ce mécanisme n'émerge réellement que pour des niveaux élevés de dispositions à payer pour un comportement socialement responsable. Nous concluons à un effet limité de l'action des consommateurs, lorsque les régimes de responsabilité sont leur seul canal d'information. Néanmoins, ce modèle s'appuie sur des hypothèses relativement simples, comme par exemple l'homogénéité des préférences sociales des consommateurs. Ces hypothèses limitent la portée de nos résultats. Pourtant, dans un monde où les préférences sont hétérogènes, la pression exercée par les consommateurs pourrait s'avérer moindre que celle esquissée dans ce modèle. Cette étude théorique doit être complétée pour refléter les caractéristiques du marché considéré et enrichir l'analyse du mécanisme de sanctions non légales et légales.

Ainsi, l'objet du **dernier chapitre** de cette thèse est d'évaluer l'importance réelle des sanctions non légales qui proviennent des consommateurs. Nous nous concentrons sur le phénomène particulier du boycott des consommateurs, qui est la sanction la plus radicale que ceux-ci peuvent émettre à l'égard d'une entreprise. Ce chapitre consiste en une étude économétrique sur des données européennes datant de 2010, l'*European Social Survey*. Elle montre que près de 20% des sujets sondés déclarent avoir boycotté un produit dans l'année précédent leur interview. Cependant notre étude indique que cette propension à boycotter varie en fonction des pays considérés. Ainsi, ce chapitre contribue à montrer l'effet limité des sanctions non juridiques émanant des consommateurs. Nous analysons les détermi- nants de l'hétérogénéité du boycott des consommateurs en Europe. Nous montrons, en particulier, que le cadre institutionnel et légal dans lequel vivent les consommateurs n'est pas sans effet sur leur propension à boycotter. En effet, les boycotts sont parfois déclen- chés par des affaires à caractère éthique ou politique, qui peuvent être traités directement par des institutions judiciaires ou politiques - à moins que celles-ci soient perçues comme inopérantes par les individus. La question est alors de comprendre si des différences dans les institutions impliquent des différences dans les propensions à boycotter.
La littérature s'intéresse habituellement à la relation entre la confiance dans les institu-

tions politiques et le boycott des consommateurs. Ce chapitre complète la littérature en regardant également la relation entre la confiance dans les institutions juridiques et le boycott des consommateurs. Pour ce qui est de la relation entre la confiance dans les institutions politiques et le boycott, ce chapitre confirme la corrélation négative usuellement présente dans la littérature. Pour ce qui est de la confiance dans les institutions judiciaires, ce chapitre indique qu'il y a bien une relation significative entre celle-ci et la propension individuelle à boycotter. La relation avec la confiance dans la justice est radicalement différente de la confiance dans les institutions politiques. En effet, notre étude montre que la relation entre confiance dans les institutions judiciaires et la boycott n'est pas négative, mais en forme de cloche inversée. Pour obtenir ces résultats, nous avons mis en oeuvre une méthode d'estimation qui n'a pas encore été utilisée pour l'étude du boycott. Cette stratégie d'estimation distingue les effets de la confiance dans les institutions au niveau micro-économique et les effets de la qualité des institutions au niveau macro-économique. Nous montrons que les perceptions subjectives et la qualité objective des institutions ont des effets différents. Au niveau macro-économique, ce chapitre montre que la qualité des institutions a un effet positif sur la propension à boycotter. Par conséquent, ce dernier chapitre améliore la compréhension des effets des institutions sur le boycott des consommateurs. Il souligne aussi que ces sanctions non légales ne sont pas indépendantes du cadre juridique.

Première partie

Analytical framework

1   Sanction as a tool to control corporate behavior [1]

1.1   Introduction

Corporate social responsibility (hereafter "CSR") is defined by the European Commission as "*the responsibility of enterprises for their impacts on society*", meaning that firms shall "*integrate social, environmental, ethical human rights and consumer concerns into their business operations and core strategy*".[2] The voluntary integration of non economical objectives in corporate strategies can be explained by monetary incentives provided by the stakeholders of firms. Indeed, one expects that profit-maximizing firms are willing to achieve such ethical aims if this enhances their profitability. These norms of behavior embodied in CSR are non legal. They originate from stakeholders' moral or social norms. These norms can complete or depart from legal injunctions.

Law and Economics is a powerful tool to understand how both legal and non legal sanctions can shape corporate behavior. On the one hand, Law and Economics provides an analytical framework to understand what are the specific incentives provided by the law.

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1. This chapter is based on a paper jointly written with Bruno Deffains (Université Panthéon-Assas), forthcoming in "Company Law and CSR - New Legal and Economic challenges", dir. I. Tchotourian, ed. Bruylant

2. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions : "A Renewed EU Strategy 2011-14 for Corporate Social Responsibility", COM/2011/0681 Final

On the other hand, it helps to describe the incentives for socially responsible behaviors. This chapter aims at demonstrating how legal sanctions and non legal sanctions from CSR shape corporate behavior and what the relationships between these groups of incentives are.

A considerable amount of literature in Law and Economics has been published on the effects of legal sanctions on corporate behaviors. These studies assess the role of the liability regimes on the propensity of corporations to adopt socially desirable behaviors (section 1.2). Nevertheless, during the past twenty years much more information has become available on the effects of social sanctions on economic agents. Particularly, Experimental and Behavioral Economics provide evidence for the importance of moral and social norms on economic decisions. This prompts to renew the theoretical analysis of the legal control of behaviors. Non legal sanctions originated from social norms can constraint human behavior alongside the legal sanctions. This leads to draw a parallel with CSR, a concept which embodies the social rewarding and sanctions of corporate stakeholders. Thus, this chapter summarizes the different implications of social rewarding for CSR (section 1.3). Moreover, it has been demonstrated that according to the context, the legal norms can encourage or impede social sanctioning and rewarding. As such, current CSR-supporting policies may not reach their expected effects. These policies may fail to induce corporations to engage in social or environmental friendly activities (section 1.4). On the basis of this review of the literature, we define the possible lines of research for legal and non legal sanctions applied to corporations (section 1.5).

1.2   Legal sanction as a tool to control behaviors

Punishment as a tool to control behavior has first been extensively studied in Philosophy, with illustrious authors such as Beccaria (1764), Bentham (1811), Kant (1785) and Montesquieu (1748). Although the problem of enforcement through sanctions is an old concern in Philosophy, Law and Economics shows that microeconomics is particularly

powerful for working on the issue of legal sanctions.

1.2.1 The theory of deterrence

The theory of deterrence explains how the characteristics of legal rules - such as legal sanctions - and enforcement policies may deter wrongdoings. The economic study of sanction relies on the utilitarian approach of human behavior. Indeed, in classical Law and Economics, legal rule is seen as a price mechanism. Under the assumption of rationality of the economic agents, an individual responds to the incentives provided by the legal rule. Consequently, the probability that an individual decides to follow the rule rather than to depart then depends on the level of sanctions and the probability of being sanctioned. To be more precise, under the utilitarian approach, the behavior of rational agents is guided by the comparison of expected utilities in situations of compliance and non compliance with the legal rule. Therefore, in order to shape behavior, it would be sufficient to formulate a requirement by means of a rule and to impose a penalty policy in order to ensure the effectiveness of the rule.

These features are particularly relevant in the seminal paper by Gary Becker (1968) on the economics of crime and punishment. In this paper, Becker builds a rational theory of crime, in which "*[...] a person commits an offense if the expected utility to him exceeds the utility he could get by using his time and other resources at other activities*". He paved the way to the economics of punishment, which is well summarized by Shavell and Polinsky (2000, 2007) in their papers on the public enforcement of law. Shavell and Polinsky define the public enforcement of law as "*the use of governmental agents to detect and to sanction violators of legal rules*". The economic approach to punishment considers that the public enforcement of law is oriented towards the maximization of social welfare. Indeed, public enforcement policy is meant to reduce the number of torts and crimes, while the resources to enforce the law are used in an efficient manner. To build a systematic study of the public enforcement of law, Shavell and Polinsky suggests a list of issues to address, which are :

- The form of the sanction - should the form of the sanction imposed on a liable party be a fine, an imprisonment term, or a combination of the two?

- The sanctioning rule - should the rule of liability be strict or fault-based?

- The magnitude of the sanction - if violators are caught only with a probability, how should the level of the sanction be adjusted?

- The probability of detecting offenders and imposing sanctions - how much of society's resources should be devoted to apprehending violators?

The standard theory of deterrence is well suited to the study of individuals' behaviors. However, this model becomes more complex when it addresses corporate wrongdoings.

1.2.2 Applying the standard theory of deterrence to corporations

The simple model of deterrence cannot be directly applied to corporations (Arlen, 2012). Firms are characterized by the existence of a principal-agent relationship. Hence, the design of the legal norm also supposes to build an allocation of the sanctions between the firm and its corporate agents. Another crucial issue for the legislator is to decide what type of sanction can be imposed. Particularly, the rule-maker can choose between civil or criminal sanctions. This latter question induced a vivid debate among legal scholars.

1.2.2.1 Allocation of legal sanctions between firms and corporate agents

One could first consider the case where only employees are targeted by sanctions for corporate crimes. Indeed, a first intuition for this allocation is to note that the firm, as a legal fiction, cannot commit a crime or a tort itself. Only managers or employees, who are physical persons, are able to commit a wrongdoing.

However, corporate agents belong to a principal-agent framework (Arlen and Kraakman, 1997; Kornhauser, 1982; Privileggi and al., 2001; Segerson and Tietenberg, 1992). The firm gives incentives to the corporate agents to perform some tasks in the interest of

the firm. Thus, the firm can either deter or encourage crimes through an incentive scheme. Several examples of incentives can be given such as indemnification of legal sanctions (Mullin and Snyder, 2004), job security, job status (Arlen, 2012), etc. These incentives ensure that employees have a private benefit to commit a crime on behalf of the corporation. Therefore, if an incentives scheme inside the firm leads corporate agents to commit a wrongdoing in the interest of the firm, it is relevant to wonder if the firm itself should be liable. Moreover, if the firm receives a private benefit from a crime, it should also bear the consequences of that crime through legal sanctions (Pradel, 2008).

Such a trade-off between corporate and individual liability is in practice far from obvious. Indeed, until the mid-nineteenth century, it seemed inconceivable to blame a company directly for an offense committed by a person acting on its behalf. The reason for this is the assumption of the absence of freewill and conscience of the firm (Pradel, 2008). For a long time in Western Europe only Great Britain has recognized corporate criminal law. The concept of corporate criminal liability has recently spread in Western Europe : it has been adopted in France in 1994, in Belgium in 1999, in Switzerland in 2002, and finally in Spain in 2010 (Pradel, 2008 ; Clifford Chance Report, 2012). At any rate, corporate and individual liabilities may in some cases be complementary. For instance, in the French legislation, concerning corporate criminal law, there is no substitution between corporate and individual liability. Both liabilities can be imposed for the same offense (Art. 121-2 Code Pénal, al. 3).

Why has there been such a spread of the corporate criminal liability regime ? First, there has been a constant increase in the number of firms, their size and their complexity (Planque, 2000). Thus, it is sometimes not easy to detect the specific physical person who caused an offense. Focusing on firms rather on corporate agents allows the state to reduce enforcement costs. Besides, corporate criminal liability avoids the so-called "*syndrome of the lamplighter*" (Planque, 2000). This syndrome means that the judicial system often condemns the physical person who has the decision rights - namely the manager - even if he has no direct participation in the offense. Consequently, the creation of corporate

criminal liability diminishes the propensity of managers to be scapegoats for corporate offenses. Furthermore, the creation of corporate criminal liability is linked to the doctrine of the "*respondeat superior*", for which offenses made in the corporation are often aimed at fulfilling the corporation's interests. Consequently, if the corporation makes a profit out of an offense, it should also bear its potential costs through corporate liability. Moreover, sanctioning at the corporate level may induce firms to choose optimal levels of activity - also called the activity level goal - and to implement enforcement measures that can minimize the joint costs of misconduct and enforcement - namely the enforcement goal (Arlen and Kraakman, 1997). Effectively, sanctions at the corporate level may lead the firm to internalize the damages generated by its activity, particularly with the implementation of a strict vicarious liability regime (Arlen and Kraakman, 1997; Arlen, 2011). To be more precise, with a strict vicarious liability, the firm is liable for the corporate crimes, whatever the level of precaution undertaken by the firm. If the legal sanction equals the social cost of the corporate crime, the firm will minimize the social cost of the crime, in order to minimize its expected sanctions. This suggests that the firm adopts an optimal level of precaution to minimize the probability and magnitude of corporate crimes. In the same way, corporations have incentives to create internal compliance structures and contractual arrangements that deter *ex ante* and sanction ex-post agent's wrongdoing, and to run their activities at an optimal level. Nevertheless, strict vicarious liability has been criticized, and commentators advocate the advantages of a composite regime of corporate liability (Arlen, 2012; Oded, 2011). Another argument for sanctioning at the corporate level is the limited assets of employees. If employees have wealth constraints, they could lack the assets to pay the optimal fines. Further, the use of non-monetary sanctions such as imprisonment has ambiguous effects on social welfare (Arlen, 2012).

Besides, detection of the specific agents that have committed a corporate crime in the scope of their employment by the firm is not possible without cost. Particularly, monitoring and detection may be more costly for the State than for the firm (Shavell, 2007; Arlen and Kraakman, 1997; Buell, 2006). Thus, it is a cost-effective solution to delegate the

monitoring and detection to the firm. Though, the State has to give sufficient incentives to the firms to induce them to self-report and cooperate (Arlen and Kraakman, 1997 ; Arlen, 1994). Given the preceding arguments, targeting the firm as a whole seems to be preferable to sanctioning the employees, ensuring that the firms bear the expected social costs of the crimes committed by their employees.

Yet, the literature has considered some conditions under which joint liability is necessary to seek the objective of maximizing the social welfare through optimal deterrence (Arlen, 2012). For example, in the case where corporate assets are insufficient to pay the optimal fines, imposing a non-monetary sanction such as imprisonment on the corporate agent helps to get optimal deterrence. Besides, when agency costs are too high, the internal compliance structures cannot operate at an optimal level, and individual liability is needed.

1.2.2.2 Corporate civil and criminal liabilities

Given there is a corporate civil liability, one can wonder why there is a corporate criminal liability. To understand this question, it is useful to compare corporate criminal liability against other liability strategies from a deterrence perspective. Corporate liability strategies can be represented as a continuum. Corporate criminal liability is an extremum of this continuum (Khanna, 1995 ; 2000). Corporate criminal and civil liabilities are alike in a sense because they impose liability on the corporation or its agents and further the goal of deterrence. However civil and criminal liabilities differ on their procedural protections, their enforcement devices and the severity of their sanctions. Moreover, criminal sanctions bring stigma to the wrongdoer, contrary to civil sanctions (Lynch, 1997). Thus, there is a non-pecuniary disutility for the wrongdoer in the form of a stigma. Further, criminal liability may be needed if the victims have little incentives to sue the firm (Posner, 1985), which can be the case for a minor expected recovering of the damages and high transaction costs.

Fischel and Sykes (1996) provide a theory of optimal penalties for crimes of corporate agents. The optimal penalty is equal to the social harms caused by the crimes of corporate agents, adjusted for the probability of non-detection. If penalties exceed this optimal level (for instance higher penalties depending on the level of the corporate agent in the hierarchy), there would be a problem of excessive product prices and litigation costs. According to them, criminal liability could be detrimental. Indeed, the incremental stigmatization induced by corporate criminal law is underproductive and produces over-deterrence. Consequently, the civil justice system would be a "*more natural form for dealing with corporate criminal misconduct*", knowing that the problem of under-detection can be dealt with the use of punitive damages.

Hence, the economic literature shows that there is an ambiguous relationship between the nature of the liability regime and its effect on social welfare. Moreover, the trade-off between corporate or employees' liability is complex and depends on multiple factors.

1.3 Social sanctions matter for corporate behaviors

In section 1.2, we considered law as a price-system for corporate illegal behavior. Law is seen as a constraint device that may induce firms and their corporate agents to take socially optimal actions. Nevertheless, later contributions to Law and Economics have enriched this approach, considering social and moral norms as powerful determinants of the human behavior.

1.3.1 Moral norms, social norms and law

Norms are the informal social regularities that individuals feel obligated to follow, because of an internalized sense of duty or the fear of external non legal sanctions or both. They are what McAdams and Rasmusen (2004) call "*normative attitudes*". Norms are priva-

tely enforced, whereas law is enforced by the State. There are two types of self-enforcement mechanisms triggered by individuals : the external social incentives and the internal incentives. Thus, social norms are sustained by social approval or social disapproval, whereas moral norms are sustained by guilt, which is defined as the individual disutility of non compliance with the moral norm. Finally, social norms can only be sustained for observable actions, whereas observability is not needed for moral sanctions to be self-enforced.

One question that needs to be asked, however, is whether a firm cares about the sense of duty or the fear of external non legal sanctions ? To what extent are normative attitudes a relevant incentive for the corporate behavior ? Indeed, the representation of the firm in the neoclassical economic theory focuses on how the price system influences the behaviors of the agents, who are disembedded from society, in the sense that the only conceivable interactions are market relationships. Firms are rational profit maximizers, and the neoclassical theory assesses how firm behaves depending on monetary incentives. Our claim is that conformity of behaviors of firms with social norms matters ; otherwise self- enforcement mechanisms are triggered, which has an impact on profits.

1.3.2   Conformity of behavior with social norms as a signal to potential exchange partners

Obeying social norms may be an instrument to signal trustworthiness to potential exchange partners (Posner, 1998). Thus, even if firms do not intrinsically value social norms or more extensively the respect of environment, human rights, etc., they have an incentive to respect them, because it makes them valued associates. Therefore, this gives a rationale for socially responsible behaviors of firms.

1.3.2.1   Attracting consumers

One motive often analyzed for explaining the engagement of firms in socially responsible actions is the attraction of consumers (Fleckinger and al., 2011). Firms can link the

provision of public good (namely environmentally friendly or socially responsible activities) to sales of their private goods, as part of their marketing or business strategy (Bagnoli and Watts, 2003). Baron (2001) names it "*strategic CSR*", because these firms hope to increase their profits by attracting green or socially responsible consumers. Those consumers have effectively a higher willingness to pay for "green" products than for "brown" products (Arora and Gangopadhyay, 1995 ; Björner and al. 2004 ; Bagnoli and Watts, 2003 ; Baron, 2010).

This higher willingness to pay for green products can be assimilated to a consumer sanctioning of firms, which do not comply with their social norms. In the Social Norms and Law literature, violators of norms are punished through third-party enforcement. That is to say that the observer of the violation, if he has internalized the norm, is willing to punish the violator. If only individuals are involved, the punishment can take the form of dirty looks, disparaging remarks or ostracism (Cooter, 2000). This punishment is triggered, even if it is costly for the observer to punish. Indeed, if he has internalized the norm, he is willing to pay a net price to uphold the norm.

If the violator is a firm, the sanction can be monetary, as it is highlighted by the higher willingness to pay of green consumers for green firms' products. Boycotts are somewhat similar to ostracism. Indeed, boycotts are the individual or concerted refusal to buy (Tyran and Engelmann, 2005), which leads to ban the targeted firm from the group of the potential exchange partners. Therefore, green consumers have a higher willingness to pay if the firm complies with social norms, and they have a lower willingness to pay if the firm does not comply, similarly, they could bear the disutility of not buying the good by ostracizing the firm. These observed behaviors among consumers argue for a consideration of social norms as a tool for controlling corporate behavior.

1.3.2.2 Attracting investors

Socially responsible investments (SRI) translates also the influence of social norms on the corporate behaviors. With the development of SRI, firms have an incentive to self-regulate and engage in socially responsible activities. For instance, Heinkel and al. (2001) assimilate the ethical restricted investment to a type of boycott. They show in an equilibrium model that exclusionary ethical investing leads to a rise in the cost of capital for polluting firms, because fewer investors are ready to hold the stock of "brown" firms. Thus, firms have an incentive to become socially responsible if the cleaning-up costs are lower than the increase in the costs of capital while they pollute.

Motives for investing in CSR firms have been investigated by Baron (2007, 2008, and 2010). In his framework, CSR is assimilated to the voluntary provision of a public good and/or donation for social causes by firms. Citizens who can be heterogeneous in their moral concerns have the possibility to allocate a part of their revenue to social giving or to hold a share from a CSR firm. Therefore, individual and corporate altruisms are substitute, even if Baron acknowledges that they are imperfect substitutes most of the time (Baron, 2007, and 2008). If individual and corporate altruism are perfect substitutes, CSR is not necessary. On the contrary, shareholders could prefer corporate altruism to individual altruism. In this case, they would rather hold shares of a CSR firm and do no personal gift. Finally, CSR firms extend the set of opportunities to fulfill the altruistic preferences of both entrepreneurs and private citizens (Baron, 2007 ; Carbonara and Ogus, 2011).

1.3.2.3 Attracting employees

Obeying social norms allows firms to attract employees who are highly morally motivated (Brekke and Nyborg, 2008 ; Nyborg and Zhang, 2011). Morally concerned individuals care more about the effects of their actions on social welfare (Nyborg and Zhang, 2011), leading them to apply for firms which actions do not harm the environment for instance.

Attracting this type of employees may be interesting for firms, because "green" employees may have a willingness to pay for working in a socially responsible firm. Thus, it becomes profitable for firms to engage in costly CSR activities, as the worker's willingness to pay for green employment results in a differential in equilibrium wages with non CSR firms (Nyborg and Zhang, 2011; Vitell and Davis, 2004; Reinikka and Svensson, 2003; Blanco and al., 2007; Altmann and al., 2007). Moreover, it seems that green employees have a better productivity (Nyborg and Zhang, 2011).

1.4 The possible drawbacks of the CSR-supporting policies

The previous section indicates that there is an increasing amount of literature by the economists on CSR. One major drawback of this literature is the lack of consideration of the interactions between the current CSR-oriented public policies run in countries such as the EU Member States and the social rewarding triggered by market-agents for CSR. Indeed, a large and growing body of literature has investigated the issue of the interactions between legal norms and social rewarding. A number of studies have found that there can be a crowding-in or a crowding-out effect between material incentives such as the legal norms and the normative incentives, leading to an increase or a decrease in the pro-social behavior of the individuals. Despite the previous findings on the relationship between the legal instruments and the normative incentives, the relationship between CSR policy and social rewarding has been poorly investigated in the economic literature. Hence, in the following of this paper, we give a detailed presentation of policies which aims to foster CSR. Understanding the characteristics of these policies is important to capture how the literature on the crowding-out effect can be applied to CSR.

1.4.1   The different forms of CSR policies

CSR policy can take multiple forms that can be more or less legally binding for the industry. For instance, CSR-supporting policy frameworks try to give a voluntary complement to traditional regulation. Indeed, the decision to engage in CSR remains voluntary, but the way in which this is done by companies can be regulated. The forms of State's support for CSR are detailed in the EU report on the national public policies for CSR (2010). The report puts an emphasis on the different kinds of tools Member States use, which are legal instruments (legislation), economic and financial instruments (incentives), informational instruments (awareness-raising), partnering instruments (multi-stakeholder encouragement), or the hybrid instruments. This tools are used in order to harness the potential of CSR for public policy goals. However, as we will see in the section below, depending on the context the CSR-supporting policies may encourage or impede the firm to adopt socially desirable behaviors.

The legal instruments of the CSR-supporting policies regroup the legislative, executive and judicial powers to mandate CSR practices, such as laws, directives and binding regulations. The emblematic example is the adoption of Environmental Liability Directive (2004) by the European Union. This directive aims at preventing and remedying pure ecological damages originated from corporate activities. While stakeholders may encourage firms to adopt environmental friendly behaviors, the Environmental Liability Directive makes compulsory the integration of environmental risk in corporate strategies. Nevertheless, the use of legal instruments to mandate CSR practices remove the voluntary basis of CSR actions. Even if a mandatory regulation should push the firms to internalize the externalities of their activity, as demonstrated below there is a chance that it cancels stakeholders' social rewarding. The same rationale holds for the financial and economic incentives (Bénabou and Tirole, 2010).

Concerning the informational instruments, they are aimed at disseminating knowledge about CSR, as for instance campaigns, training courses and websites. Therefore, by raising

awareness on CSR-related issued, these instruments try to influence the formation of social norms that would help to sustain pro-social behaviors by firms, without the use of legal sanctions. However, empirical studies are needed in order to assess the efficiency of such instruments.

The partnering instruments encourage the voluntary cooperation between government, business and relevant stakeholders, through stakeholder forums and negotiated agreements for instance. These instruments belong to the cooperative forms of governance, also called co-regulation (Fleckinger and al., 2011). Negotiated public agreements are jointly created by firms and regulators. They can be legally binding or legally non-binding, depending on the fact that they can or not be enforceable by courts and non-compliance be likely to be punished by penalties. Legally non-binding agreements rely on a moral obligation of each parties to respect its commitments.

There are several incentives for firms to engage in voluntary agreements (VAs). It is possible to group these incentives in two groups : incentives driven by market forces and incentives driven by political forces. Among the market forces, cost-effectiveness incentives can induce firms to engage in VAs. Indeed, these agreements give the opportunity to develop environmental innovations, share of technological information and tacit knowledge, and provide of coordination mechanisms to the different partners or competitors of an industry. There is also a reputational effect linked to the participation to VAs. Participation to VA signals the environmental performance of a firm, it gives a credible commitment to a certain environmental program, some VAs also provide labels to the adherent firms. Consequently, participation to VAs is useful to attract green consumers, shareholders, or motivated employees. Concerning the political forces, VAs help the firms to preempt regulatory threats (Segerson and Miceli, 1998 ; Lyon and Maxwell, 2000), to shape future regulations (Fleckinger and Glachant, 2011 ; Lyon and Maxwell, 2003) or to deflect monitoring and enforcement (Lyon and Maxwell, 2007 ; Maxwell and Decker, 2006). Nevertheless, to get some results on the behavior of firms, there must be a strong leadership by the State agencies. Otherwise, without any detection or monitoring mechanisms, the free-riding be-

havior of the firms would be likely to increase.

1.4.2 The crowding-out effect of the CSR-supporting policies

The previous section has described the variety of CSR-supporting policies. The effectiveness of these policies is difficult to assess. Indeed, there is a lack of data on the effects of CSR-supporting policies on corporate strategies and social outcomes. Nevertheless, it is possible to predict the theoretical effects of these policies. Particularly, the recent developments in Law and Economics provide a pessimistic perspective of CSR-supporting policies.

For instance, the theory of expressive law indicates that the law contributes to express social values (Cooter, 1998). The mechanism at stake is simple : the enactment of a legal rule by the Parliament provides information about compliance of others with the norm. Indeed, if one specific rule has been enacted, it is likely to be already followed by a major part of individuals in the country. Therefore, an individual or a firm whose strategy is to conform with the social norms of the society is likely to conform with this newly expressed social value. Interestingly, in this setting, law may have an effect without imposing sanctions. More precisely the law, by changing the social norms of the society, could sometimes only rely on the social sanctions triggered by the individuals in order to promote a new behavior. This theoretical framework can be applied to informational instruments used by CSR-supporting policies. These instruments promote a norm of behavior without imposing any legal sanction. They help coordinate economic choices by proclaiming the expected behavior and providing information on corporate behaviors.

However, CSR-supporting policies can sometimes impede the expression of social rewarding or sanctioning through CSR. Indeed, the creation of a legal norm ruling a specific behavior may decrease the social sanctions attached to non-compliance. Thus, the final effect on the propensity to comply may be uncertain. For instance, Gneezy and Rustichini (2000) study parents' behavior in a kindergarten after a fine was fixed for those who picked

their child too late. The fine in the parents' mind is considered as a price for being late, and the result of this is the decrease in the disapproval costs for the parents being late. Thus, total costs of being late have decreased. Finally, the introduction of the fine has induced a change in the social norm equilibrium, since parents were more and more late to pick their children. One can wonder if the creation of an environmental liability in Europe could have a similar effect on corporate behavior. Particularly, do the monetary sanctions for environmental damages introduced by the Environmental Liability Directive reduce the propensity of third-parties to socially disapprove and monetarily punish corporations ?

Material incentives provided by the policies may crowd-out the esteem-based incentives of decision-makers (Bénabou and Tirole, 2006 ; 2010). If corporate managers are driven by such incentives, the introduction of material incentives through environmental liability or financial instruments may decrease their willingness to adopt a socially responsible behavior. Bénabou and Tirole show for instance that observers cannot tell with precision if compliance to a norm is driven by material incentives or by the propensity of the cooperator to belong to the "good type". This is the image-spoiling effect of rewards. What is interesting in the setting by Bénabou and Tirole is that agents' pro- or anti-social behavior reflects an endogenous and unobservable mix of three motivations : intrinsic motivation (degree of altruism or greed for instance), extrinsic motivation (material incentives such as fines or tax rebates), and reputational motivation. Observers infer the level of these three motivations from the agents' choices and from the context. More precisely, Bénabou and Tirole indicate that the material incentives spoil the reputational value of good deeds. Indeed if a moral behavior is performed in the presence of material external incentives, observers will less consider the behavior as morally-driven. As a result, rewards crowd-out the reputational motivation to contribute. The direct implication for CSR-behavior is that a CSR-supporting policy which would offer economic incentives to the firms engaging in social or environmental friendly actions could decrease the social rewarding coming from the commercial partners of the firm.

1.5   Lines of research

Recent developments in Law and Economics indicate that CSR-supporting policies can foster corporate socially desirable behavior or have contrary effects. Further studies are needed in order to have a proper analysis of the impact of CSR-supporting policies on corporate strategies. We have seen that civil liability can be categorized as one of these CSR-oriented public policies. In this perspective, the study of non legal and legal sanctions such as civil liability needs not only an expansion of the economic approach of civil liability, but also the production of suitable data for the evaluation of the public policies of interest.

Our first line of research is dedicated to the integration of social sanctions in the economic analysis of civil liability. Although criminal liability is a strong legal tool to control corporate misbehavior, we do not deal with this issue in this thesis. For some aspects of CSR, such as the environmental and social consequences of corporate strategies, the civil liability and the social norms of stakeholders may have the same objectives. The Environmental Liability Directive and environmental concerns of some consumers are a particular example of this point. Therefore, it seems more suitable to include the stakeholders' social sanctions in the analysis of civil liability. The chapter 4 of this thesis corresponds to this research project. We study in this chapter how sanctions from consumers, and particularly consumer boycott, may control corporate behavior. We investigate also how these non legal sanctions interact with corporate liability.

One difficulty of this line of research is the lack of data. It is not easy to test the eventual theoretical predictions that the economists can draw on the basis of the recent developments in Law and Economics. In chapter 5, we evaluate the volume and the determinants of consumer boycotts in Europe on the basis of the *European Social Survey* of 2010. Although this data set does not allow to specifically test the theoretical predictions of chapter 4, we use it to understand how boycott behavior can be influenced by the legal and institutional context. Hence, this chapter demonstrates that this type of non legal sanction is not independent from the law.

Our second line of research is dedicated to the deepening of the standard analysis of corporate civil liability. Although section 1.2 demonstrates that the theoretical standard analysis of corporate civil liability is well developped, some aspects of tort law or the corporate context of decision are still to be studied. Chapter 2 investigates for instance the legal notion of causality, which has been little explored in the Law and Economics of civil liability. Merely considered as a philosophical concept, the literature in Law and Economics has long disregarded the potential incentive effects of causation. This chapter contributes to the relatively small field of the economic analysis of causation by looking at the effects of causation in non standard situations such as limited liability and unobservability of care. Chapter 3 contributes both to the literature in Law and Economics and in Economics of insurance. It studies corporate demand for prevention and liability insurance for accidents characterized by ambiguity. Ambiguity corresponds to the imprecision of the prevision of the probability of accident or its magnitude. It can be encountered in environmental accidents, industries with new technologies or with high information costs. However, there are few papers dealing with the issue of ambiguity in corporate civil liability. We investigate this problem with both a theoretical model and an laboratory experiment. Thus, we provide new data, which allows to test the standard model of civil liability under risk and our theoretical predictions under ambiguity.

Deuxième partie

Deepening of the standard analysis of corporate tort law

2   Causation and standard of proof from an economic perspective [1]

2.1   Introduction

The aim of this paper is to analyze the extent to which causation requirement is consistent with the provision of efficient incentives to potential tortfeasors. Specifically, we focus on the role of the well-known "but for" or "*sine qua non*" test. According to the "but for" test, an action is a "*sine qua non*" condition of an accident if, given the state of the world, the accident would not have occurred had another action been taken. Thus, the "but for" test seems to isolate something we care a lot about in explaining events and in assessing responsability : the idea that the defendant's act makes a difference. Reaching beyond the sole "metaphysical" interest of this causation concept, the theoretical analysis developed in this paper investigates to what extent the "but for" causation requirement has a deterrence effect on the behavior of potential tortfeasors, particularly in situations where the tort system may provide sub-optimal incentives. Already Pigou (1920) emphasized that if the purpose of tort law is to force the economic agents to pay the true costs of their activities, including damages incurred to others, a robust use of the concept of causation is needed. Accordingly, we show to what extent the "but for" test is useful for making the potential tortfeasors internalize the social costs of their activities.

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1. This chapter is based on an article jointly written with Bruno Deffains (Université Panthéon-Assas) and Claude Fluet (Université Laval), forthcoming in the Chicago-Kent Law Review

This study falls into the framework of Law and Economics (hereafter "L&E") - remarkably, L&E provides a unified framework, using tools from decision theory and statistics to expound the definitional issues of causation and its potential consequences on human behavior. [2] Nevertheless, it is not a commonplace in L&E to claim that the causation requirement may have incentive effects. Indeed, L&E is primarily interested in how the law and institutions provide or should provide incentives for efficient behavior, and as underlined by Ben-Shahar (1999), a part of the literature in L&E has disregarded the possibility of a distinct role of causation in shaping incentives for potential tortfeasors. For example, Landes and Posner (1983) indicate that the discussion on causation is fruitless, because "*the key factors in the economic analysis are not cause but the probability of accident and the costs of legal administration.*" [3] Consequently, the choice of a particular notion of causation could be disregarded as a crucial question in L&E. Accordingly, Landes and Posner assert that the "Judge Hand" formula is sufficient, and that a legal concept of causation is not necessary. Indeed, following Landes and Posner, the Judge Hand formula could be viewed "*as an algorithm for deciding tort questions generally - not just issues of negligence*". [4] Similarly, according to Calabresi (1975), liability should be assigned to the injurer if she is the lower-cost avoider, in order to ensure efficiency of preventive measures. Thus, information on causation seems to not affect the result of this cost-benefit analysis, and the assignment of legal cause can be reduced to a normative evaluation of the economic efficiency of the preventive measures undertaken by the involved parties. This skeptism in L&E on causation is also visible on the question of the implementation of legal causation, while other sources of criticism come from the American Legal realists, such as Edgerton (1924), Malone (1956) and Green (1962). Accordingly, it seems difficult to assign liability on the basis of causation as both the injurer and the victim are necessary cause for any harm to occur (Coase, 1960). Therefore, the solution to assign liability to the cheapest cost-avoider

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2. For a survey of L&E contributions to the study of causation, see Ben-Shahar (1999)
3. Landes and Posner, 1983, p.134
4. Landes and Posner, 1983, p. 111

seems to overcome this difficulty of implementation and, simultaneously, achieve efficiency. Following Coase (1960), tort law helps to achieve efficient allocation of resources, and this prominent feature of tort law seems feasible whether tort law tracks responsibility or not. Indeed, in the Coasian approach of tort law, if transaction costs are high, it is sufficient to impose the harm on the cheapest cost avoider to achieve efficiency. Hence, if efficiency is the goal to be attained, causation should be assigned to any activity that increases the conditional probability of a harm.[5]

Another part of the L&E literature acknowledges that causation can have effects on human behavior, but cast into doubt the role that causation requirement could play regarding the efficiency objective. It rather seems that the doctrinal requirement of causation serves goals other than efficiency.[6] For instance, Calabresi (1975) suggests that causation is a functional concept in the sense that different notions of causation may further different human goals, which are the deterrence, spreading and distributional goals. To demonstrate this proposition, Calabresi differentiates between three different notions of causation : the "but for" causation (also called "cause in fact"), the "proximate cause" and the "causal link".[7] Calabresi concludes his study by showing that " *(...) in the law "cause in fact" (as it was once called), like proximate cause, is in the end a functional concept designed to achieve human goals.*", which means that the use of specific notions of causation is tailored to meet specific objectives.[8] Therefore, one cannot once and for all choose a definitive notion of causation to be uniformly applied to all tort cases. Earlier, Edgerton (1924) has given a similar view point, by pointing out that "*the solution of cases depends upon a balancing of considerations which tend to show that it is, or is not, reasonable or just to treat the act as the cause of the harm - that is, upon a balancing conflict interests, individual and*

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5. Moore (2011)
6. Epstein (1973), Ben-Shahar (1999)
7. There is a causal link between an act and an injury if the recurrence of that act or activity will increase the chances that the injury will also occur. Whereas with the proximate cause, one must remember, in the chain of events that could have caused the damage, the one that is closest to its realization
8. Calabresi, 1975, p.107

social (...)".[9] That means that the choice of a particular causation notion seems to be less a matter of efficiency than a matter of justice, and that the decision to choose a particular causation notion is likely to be context-dependent. Like Calabresi and Edgerton, Shavell (1980) adopts an instrumental approach to causation, which means that he analyzes this component of law with the aim to understand "*how law functions to promote postulated social goals, given assumptions about the behavior of individual parties*".[10] Therefore, he compares the incentives provided by two different causation notions, which are the "but for" cause and the "probability cause".[11] However, Shavell acknowledges that such an instrumentalist approach can face one major criticism : *"Questions about causation are to an important extent resolved by resort to intuitions about the justness of applying a rule of liability. In practice (...) it is not asked how liability would affect incentives or otherwise influence the attainment of certain basic social goals*".[12] Hence there is a gap between the L&E debate on the efficiency of causation and the legal practice, which may disregard efficiency when evaluating the cause requirement. Indeed, the cause requirement could be simply considered as a matter of justice, and as Edgerton suggests, it may depend on "*(...) our free and independant sense of justice and - perhaps - the interest of society*".[13]

Notwithstanding these different approaches of causation, a third path in the L&E literature considers that the understanding of causation is determinant to set the socially optimal level of care or activity of the potential tortfeasor. Our paper is in line with this sub-part of the literature. In this line of argument, Shavell defines an action, such as the level of care or activity, to be "*the 'necessary cause' of a consequence relative to another action if, given the state of the world, the consequence would have been different had the second action been taken*".[14] Building on this notion of "necessary cause", Shavell shows that the

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9. Edgerton, 1924, p. 211
10. Shavell, 1980, p. 464
11. The probability cause is close to the German school theory of "adequate cause". An act is considered to be a probabilistic cause of an injury relative to another act if the probability of occurence of this injury would have been lower, had the other act been taken
12. Shavell, 1980, P.502
13. Edgerton, 1924, p.347
14. Shavell, 2009, P.106

socially optimal level of care or activity is determined only by the states of the world in which the injurer's action would be the necessary cause of harm. It follows directly that the "scope of liability" can be more or less restricted to these "necessary causes". The "scope of liability", presented by Shavell (1980), can be understood as the set of the states of the world under which the tortfeasor is held liable. This scope of liability can be restricted to necessary causes, or unrestricted - in which case the injurer is held liable even in the event that the harm would have occured in the absence of the injurer's activity, or finally overly restricted - which leaves outside the scope of liability some cases of necessary causes. Hence a well defined scope of liability may be determinant to achieve the socially optimal level of care or activity. [15] Moreover, in this strand of the literature, the effect of the causation requirement in negligence-based liability regimes is the object of an in-depth analysis by Grady (1983, 1989), Kahan (1989), Marks (1994) and Hylton and Lin (2013). Specifically, these authors show that the causation test removes the discontinuity in the incentives to provide care. Indeed, as highlighted by Hylton and Lin (2013), "*in a negligence regime that does not incorporate the factual causation inquiry, there would be a discontinuous jump in liability once a potential injurer adopts a precaution level slightly below the reasonable care level. When the factual causation test is incorporated, there is no longer such a discontinuous jump*". [16] Furthermore, this strand of the literature has focused on the role of causation requirement in both strict liability and negligence-based liability regimes, in situations where causation is ambiguous. Our paper departs from this approach by investigating the role of causation in situations in which causation is unambiguous i.e. there is no uncertainty over causation. We focus on situations where the tort system may provide sub-optimal incentives because of (i) limited liability problems or, (ii) other sources of uncertainty, as particularly the uncertainty about the injurer's actual level of care. We ask whether information about causation then plays a useful role to achieve efficiency. The understanding of the potential effects of the "but for" test in these settings is particularly

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15. Shavell(1980, 2009) ; Landes and Posner (1987)
16. Hylton and Lin, 2013, P.80

important, given that the "but for" test is a widespread causation test in both civil law and common law countries on the one hand, and given the relative frequency of limited liability and informational issues in tort cases on the other hand. [17] The remaining of the paper is as follows. Section 2.2 introduces the hypothesis and the notations of the model. Section 2.3 presents the results of our theoretical analysis under the assumptions of the standard model, as well as the results for the special cases of limited liability and imperfect observability of care. Section 2.4 concludes the paper.

2.2 The model

This theoretical analysis relies on a standard model of unilateral accident. In this setting, an agent - the potential injurer - can engage in a risk generating activity ; that is, in some circumstances, the activity is likely to generate a harm of amount L to some third party. Nevertheless, when he engages in the activity, the agent can invest in preventive measures which may have an effect on the occurence or non occurence of harm. We define below the states of the world under which the decision to engage in the activity and the level of care are necessary causes of the occurence of the harm, under the "but for" notion of causation.

2.2.1 Level of care as a necessary cause of harm

Suppose a continuum of possible states of the world $s \in S = [0, 1]$ with a cumulative distribution function $F(s)$. The occurence of the harm depends on both the values of s and the level of care provided by the agent, denoted e. Let $\varphi(e, s) \in \{0, 1\}$ denote respectively the non occurrence and the occurrence of the harm L when the agent has engaged in the risk generating activity. A given level of effort e produces different effects in terms of occurence of harm, given the state of the world. There are two possible care levels, which

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17. Hart and Honoré (1985)

are e_l and e_h, with $0 < e_l < e_h < 1$. The level of care is chosen by the agent before the realization of the state of the world. After realization of the state of the world, the outcome is

$$\varphi(e, s) = \begin{cases} 1 & \text{if } s > e \\ 0 & \text{if } s \leq e \end{cases}$$

Thus, the probability of accident is $p(e) = 1 - F(e)$ for $e \in \{e_l, e_h\}$.

Consequently, in the event that $s \leq e_l$, a low level of care e_l is sufficient to avoid the occurence of harm - and no harm occurs whether e_l or e_h is chosen by the agent. Similarly, if the agent engages in the activity and s is such that $0 < e_l < s \leq e_h$, then a low level of care is the necessary cause of the occurence of the harm.

2.2.2   Activity as a necessary cause of harm

There are cases where a harm can occur without the activity or without the level of care of the agent being its necessary cause. Let $k \in S = [0, 1]$ be a threshold defining when the activity is a *sine que non* condition of the occurence of the harm. If $s > k$, the harm occurs even if the agent does not engage in the activity. Consequently, if $s > k$, the activity is not considered to be the cause of the harm. Conversely, according to the "but for" notion of causation, the activity is the cause of harm when $s \leq k$. Hence, if the scope of liability is restricted to instances of necessary causes, the agent may be held liable for harm only if $s \leq k$.

Note that for $k = 1$, the activity is always a necessary cause of the occurence of the damage, as the "but" for condition $s \leq k$ is fulfilled for all s in $S = [0, 1]$. Observe also that for $k = 1$, the model corresponds to the famous example of the cricket game and fence developped by Kahan (1989). In this example, the level of care e would represent the height of a fence surrouding a stadium in which a cricket game takes place. The state of the world s represents the height at which a ball flies. In this example, no accident occurs if no cricket game takes place - which corresponds to the hypothesis of the activity as a

necessary cause of harm. If the ball flies higher than the fence and harms someone, that is if $s > e$, the level of care is a necessary cause of harm.

2.2.3 Occurence of harm

To summarize, the timing of the game is as following. At the first stage, the agent chooses whether to engage in the activity or not. If she enters the activity, she chooses her level of care $e \in \{e_l, e_h\}$. At the second stage, "Nature" chooses the state s in $[0, 1]$. Hence, four different situations can be observed : (a) $s \geq k$: harm occurs even in the absence of activity. The activity and the level of care of the agent are not causes of harm. Conversely, if $s < k$, harm occurs only in the presence of the activity. The activity is the cause of the harm. Under this latter condition, we have the three following remaining cases : (b) $s \leq e_l$ and $s < k$: for any level of care exercised by the agent, no harm occurs. (c) $e_l < s \leq e_h$ and $s < k$: harm occurs if and only if the agent engages in the activity with a low level of care e_l. (d) $e_h < s$ and $s < k$: for any level of care exercised by the agent, harm occurs. The activity is then the cause of harm, but not the level of care exercised by the agent. Figure 2.1 summarizes the combined role of the engagement in the activity, the level of care and the state of the world in the occurence of the harm. It shows a situation where $0 < e_l < e_h < k < 1$. Depending on the location of s on the graph, the activity and the level of care may or may not be the cause of the harm.
At the third stage of the game, if harm has occured, the case is examined by the court and liability is assigned.

2.2.4 Social optimum

For simplicity, we assume in the following computations that the situation described in figure 2.1 holds, i.e. we have $0 < e_l < e_h < k < 1$. Let c denote the cost of high care. The cost of low care is normalized to zero. Let b denote the benefit from engaging in the activity. Suppose also that c differs between potential injurers. Let c be distributed
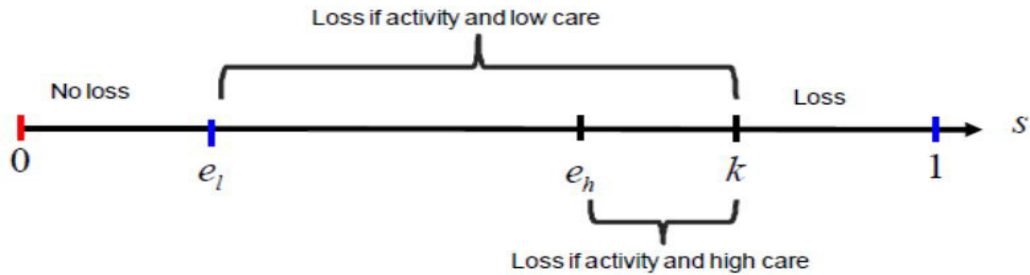
FIGURE 2.1 – Occurence of harm depending on the state of nature and the level of care

according to the cdf $H(c)$ with support $[0, \bar{c}]$. We know that high care is socially efficient when $\forall c \in [0, \bar{c}]$, $Lp(e_l) \geq Lp(e_h) + c$, equivalently when

$$L\left[F(e_h) - F(e_l)\right] > c, \tag{2.1}$$

and engaging in the activity is socially efficient if

$$b \geq L\left[F(k) - F(e_h)\right] + c. \tag{2.2}$$

2.2.5   Liability regimes

Three different liability regimes are considered : the strict liability regime, the negligence rule with causation requirement and the negligence rule without causation requirement. Under the strict liability regime, the liability is assigned in all cases where the activity is the cause of the harm, i.e. if $s < k$ - which includes situations (b), (c) and (d) previously described. Under the negligence rule with causation requirement (NC), liability is assigned to the tortfeasor only if the harm would not have occured but for inappropriate care. Therefore, under (NC), liability is assigned only if the case (c) is met ($e_l < s \leq e_h$ and $s < k$) and the agent has chosen e_l. By contrast, under the negligence rule without causation requirement (NN), liability is assigned if the activity caused the harm and low care was exerted. In other words, liability is assigned whenever the level of care is e_l and $s < k$

(cases (b), (c) and (d)).

2.3 Results

2.3.1 Standard model

Suppose that (2.1) holds for all possible cost levels among the population of potential injurers, meaning that high care is always socially warranted when one has engaged in the activity. Suppose further that the benefits from the activity are "large", in the sense that they they always satisfy (2.2). The issue is then simply to induce high rather than low care from those who engage in the activity (rather than to regulate entry in the activity). We now compare the different liability rules, assuming that an injurer can be found liable only if the harm was caused by the activity.

2.3.1.1 Strict liability

Let C_l denote the injurer's expected cost if he exerts low care, C_h his expected cost if he exerts high care. We have $C_l = L\left[F(k) - F(e_l)\right]$, indeed liability is assigned only for $s < k$, and $C_h = L\left[F(k) - F(e_h)\right] + c$. Given the benefits b, the incentives provided by a liability regime are given by the difference in the expected costs of care. The agent is induced to choose e_h if $C_h - C_l < 0$. Under strict liability, we have

$$C_h - C_l = c + [F(e_l) - F(e_h)]L < 0$$

This expression is indeed negative if equation 2.1 holds.

2.3.1.2 Negligence rule with causation requirement

Similarly, if the (NC) regime is implemented, the difference in the expected costs of care is

$$C_h - C_l = c + [F(e_l) - F(e_h)]L < 0$$

Indeed, we have $C_l = L\left[F(e_h) - F(e_l)\right]$ and $C_h = c$.

2.3.1.3 Negligence rule without causation requirement

Conversely, under the (NN) regime, we have

$$C_h - C_l = c + [F(k) - F(e_h)]L < 0$$

This is explained by the cost structure under (NN), which is $C_l = L\left[F(k) - F(e_l)\right]$ and $C_h = c$.

2.3.1.4 Choice of a liability regime

Given equations 2.1 and 2.2 are met, ensuring that engaging in the activity and choosing a high level of care optimal, the achievement of the social optimum can be done equally well with strict liability or with a negligence rule setting due care at e_h and assigning liability only when inadequate care is the cause of harm. Indeed, the strict liability and the (NC) regime both leads to incentives corresponding to equation 2.1.

Now that we have presented the effects of the causation requirement in the standard model of civil liability, we investigate what are the efficiency incentives provided by the "but for" test in situations that usually provide sub-optimal incentives : the presence of limited liability on the one hand, and imperfect information about care on the other hand.

2.3.2 Limited liability

The above results presumed that injurers pay fully for the harm caused when they are held liable. Suppose now that, due to limited liability (or because legal damages are capped), the damages actually paid are in fact $D < L$. Let us assume

$$D\left[F(e_h) - F(e_l)\right] < \bar{c}. \tag{2.3}$$

Combining (2.1) and (2.3) yields

$$D < \frac{\bar{c}}{F(e_h) - F(e_l)} < L. \tag{2.4}$$

Consequently, some injurers, those with larger costs, will not exert efficient care and this will be true either under strict liability or under the negligence rule.

Moreover, to abstract from inefficient incentives to engage in the activity, let us also assume that

$$b \geq L\left[F(k) - F(e_l)\right]. \tag{2.5}$$

Thus, engaging in the activity is socially warranted even when low care is exerted.

We now compare the three different liability rules under analysis. Given the cap on damages, the incentives provided by a liability regime are given by the difference in the probability of being found liable when one exerts low rather than high care. Denote this difference by Δ, which we will refer to as *deterrence.* Note that in the present context, the best regime is the one that maximizes deterrence. Specifically, an injurer exerts adequate care if $c \leq D\Delta$. The proportion of injurers exerting adequate care is therefore $H(D\Delta)$.

2.3.2.1   Strict liability

We have $C_l = D\left[F(k) - F(e_l)\right]$, $C_h = D\left[F(k) - F(e_h)\right] + c$. Under strict liability, we have

$$\Delta_{SL} = F(e_h) - F(e_l),$$

2.3.2.2   Negligence with causation requirement

Under the (NC) regime, we have $C_l = D\left[F(e_h) - F(e_l)\right]$, $C_h = c$. The incentives satisfy

$$\Delta_{NC} = F(e_h) - F(e_l)$$

and are the same as under strict liability.

2.3.2.3   Negligence without causation requirement

Under the (NN) regime, we have $C_l = D\left[F(k) - F(e_l)\right]$, $C_h = c$. Incentives are now

$$\Delta_{NN} = F(k) - F(e_l)$$

The rule maximizing deterrence is the negligence rule (NN), implying that one should disregard whether inadequate care was the cause of harm. The reason is straightforward : from the point of view of incentives, a negligence rule amounts to a monitoring system with stochastic audit. An agent's behavior is audited following the occurrence of harm. If the agent is then found to have complied with due care, he is not sanctioned. If the agent is found not to have complied, he should then be sanctioned if the objective is to maximize deterrence. The probability of sanctioning "deviant" behavior (conditional on being audited) is larger under the negligence rule NN than under the rule NC, hence incentives are greater under NN.

If D is sufficiently large, even though (2.4) holds, a switch to the negligence rule NN may yield first-best incentives. Indeed, we could have $c \leq D\Delta_{NN}$ and equation (2.4)

simultaneously fullfilled. Otherwise, one could go a step further.

2.3.2.4   No causation requirement regarding the activity

Suppose one drops the requirement that the activity be the cause of harm. Under strict liability we would then have $C_l = D\left[1 - F(e_l)\right]$, $C_h = D\left[1 - F(e_h)\right] + c$ and deterrence would remain the same. Under the rule NC, nothing would change either. However, under the rule rule NN we now have $C_l = D\left[1 - F(e_l)\right]$, $C_h = c$ and incentives are

$$\widehat{\Delta}_{NN} = 1 - F(e_l).$$

Thus disregarding all causation issues increases deterrence still further. When he is "audited", a non-complying injurer is then *always* sanctioned.

2.3.3   Imperfect information about care

Now suppose that care is unobservable. Under this assumption, the strict liability regime remains feasible, as well as the negligence rule (NC). Indeed, after the realization of the state of the world, s and k remain perfectly observable, moreover the possible values of care e_l and e_h are also public information. Hence, even if the level of care actually implemented is unobservable, , it is possible to implement the "but for" test to the injurer's choice to engage in the activity, by comparing s and k. Moreover, inadequate care can be inferred from the occurrence of harm and the comparison of s with e_l and e_h. However, the negligence rule (NN) is not implementable. For instance, if we have $e_l < e_h < s < k$, harm occurs, but it is impossible to infer if e_h or e_l has been chosen by the agent.

Suppose next that care is imperfectly observable. One observes a signal x with the conditional densities $g(x \mid e_l)$ and $g(x \mid e_h)$ and common support $[\underline{x}, \overline{x}]$. Without loss of generality, suppose the signal satisfies MLRP with the likelihood ratio $g(x \mid e_l)/g(x \mid e_h)$ strictly decreasing in x. The available evidence is then the occurrence of harm and the

observation of s and x. Let $\psi(s, x) \in [0, 1]$ denote the court's decision, defined as the probability of holding the injurer liable given the available evidence.

The injurer's expected cost given his level of care is then,

$$C_l = \int_{e_l}^k \int_{\underline{x}}^{\overline{x}} f(s)g(x \mid e_l)\psi(s, x) \, dx \, ds$$

$$C_h = \int_{e_h}^k \int_{\underline{x}}^{\overline{x}} f(s)g(x \mid e_h)\psi(s, x) \, dx \, ds + c$$

Deterrence can be written

$$\Delta = \int_{e_l}^{e_h} \int_{\underline{x}}^{\overline{x}} f(s)g(x \mid e_l)\psi(s, x) \, dx \, ds + \int_{e_h}^k \int_{\underline{x}}^{\overline{x}} f(s)\psi(s, x) \left[g(x \mid e_l) - g(x \mid e_h)\right] \, dx \, ds$$

Therefore, choosing $\psi(s, x)$ to maximize deterrence yields $\psi(s, x) = 1$ when $s < e_h,$ for all x; and conversely,

$$\text{when } s \in [e_h, k), \ \psi(s, x) = \begin{cases} 1 \text{ if } g(x \mid e_l) > g(x \mid e_h), \\ 0 \text{ otherwise.} \end{cases}$$

In other words, when $s < e_h$, the mere occurence of harm allows to infer that e_l has been chosen by the agent. Thus, negligence is inferred from the occurrence of harm, and the injurer is found liable, under the above decision rule.

Nevertheless, when $s \in [e_h, k)$, the occurrence of harm, once again, provides no information by itself. Under the above decision rule, the injurer is then found negligent if, on the basis of the imperfect evidence x, low care is "more likely" than due care. Given our convention that the likelihood ratio $g(x \mid e_l)/g(x \mid e_h)$ is decreasing in x, negligence is therefore found for some threshold $\hat{x}$. Our findings are summarized in figure 2.2. Figure 2.2 shows that the liability rule amounts to the negligence rule (NC) with the "preponderance of evidence" standard for a finding of negligence. According to this standard, the injurer is held liable if negligence is more likely than not on the basis of the evidence, which consist here of both
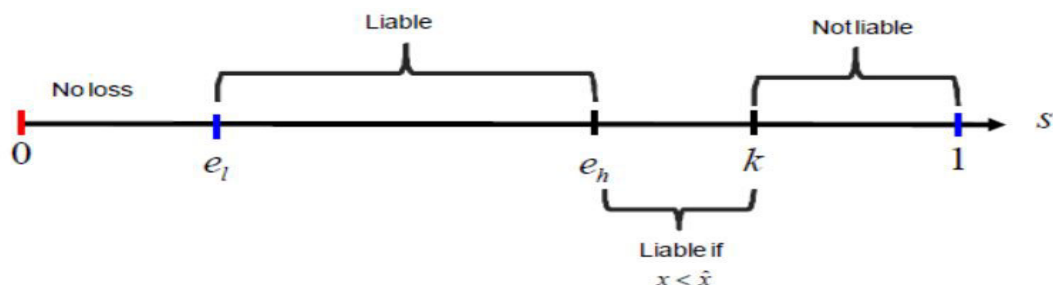
FIGURE 2.2 – Assignment of liability when care is imperfectly observable

s and x.

As in the previous section, and for the same reason, deterrence can be increased further by dropping the requirement that the activity caused the harm. The injurer would then be found liable when $s < e_h$ or when $s \geq e_h$ and $x < \widehat{x}$.

2.4   Conclusion

In the legal tradition, the notion of cause is needed to make the link between the harmful event and the damage. Indeed, the causation requirement illustrates the simple, and yet highly justice oriented idea that "one who has caused harm must compensate for the harm caused". Pragmatically, economists view the tort system as a victim triggered *ex post* incentive mechanism (i.e. post accident) providing *ex ante* incentives to prevent harm. In this spirit, L&E investigates whether the traditional legal notion of causation yield efficient incentives. This note shows that the answer to this question is nuanced. In simple situations, such as described in the standard model, it seems that the causation requirement, operationnalized with the "but for" test leads to efficient incentives. Indeed, our theoretical analysis shows that both the strict liability and the negligence rule with causation requirement (NC) induce the agent to adopth the socially optimal level of activity and care, if liability is restricted to the cases where the activity is a necessary cause of

harm. In situations where there are traditionnaly sub-optimal incentives, the answer is more complex.

First, in the event of limited liability, disregarding all causation issues - concerning the care level or the activity - induces greater incentives to provide care. Thus, under the assumption of limited liability, the implementation of a negligence rule without causation requirement (NN) can be preferred. In our framework, under limited liability, the tort rule (NN) ensures a higher probability of sanctioning negligent behavior.

Moreover, when care is imperfectly observable, dropping the causation requirement may increase the deterrence effect of the liability regime. When the "but for" test is still applied concerning the role of the activity in the occurence of the harm, the model shows that the optimal liability rule amounts to a negligence rule with a causation requirement regarding the level of care (NC), together with the preponderance of evidence standard. Hence, when care is imperfectly observable, the causation requirement would have two aspects : a *sine que non* condition is applied to the level of activity, while the level of care is evaluated with a probabilistic notion of causation. The model also shows that dropping the causation requirement on the activity level induces higher incentives for preventive measures. Hence, while in the literature the discrepancy between liability regimes is often ascribed to uncertainty over causation, this note shows that it may also arise without uncertainty over causation.

3 Self-Insurance And Liability Insurance Under Ambiguity [1]

3.1 Introduction

Liability is a legal rule which obligates a party who causes harm to make a repayment to the victim of the harm (Shavell, 1980, 2007). As liability rules set monetary contraints on those who harm others, they induce the potential injurers to provide care, in order to avoid accidents. In Europe, the Environmental Liability Directive (ELD) establishes a framework for environmental liability based on the "polluter pays" principle, with a view to preventing and remedying damage to animals, plants, natural habitats, water resources, and damage affecting the land. With the ELD pure ecological damage is acknowledged and treated distinguishly from damage to property, economic loss and personal injury in the European Union. [2] Environmental damage is tackled with two different liability regimes, depending on the nature of the corporate activity. Strict liability can be held against operators whose occupational activities are listed in Annex III of the ELD. Other operators face negligence rule. This chapter questions the efficiency of these liability regimes under

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2. See Directive 2004/35/EC

the assumption that environmental damage can be described with ambiguity. Ambiguity is a concept introduced by Ellsberg's seminal article (1961). It relates to situations in which probability distribution of possible events is vague, dubious, uncertain (Cabantous and Smith, 2006; Camerer and Weber, 1992; Frisch and Baron, 1988). This imprecision of probabilities can come from an imperfect knowledge of the phenomenon at stake, or even a lack of statistical data.[3] Ambiguity characterizes partly environmental risk. For instance, Chakravarty and Kelsey (2012) highlight that in environmental accidents such as the British Petroleum Deepwater Horizon oil spill, corporations may not be able to form correct beliefs about the probability of an accident or to estimate the potential damages because of the insufficient information or time to assign precise probability to accident.[4] This feature of environmental damages drives to an in depth discussion of the implications of an ambiguous context for the efficiency of liability regimes, particularly given the expansion of environmental liability in Europe.

Moreover, in recent years a market for corporate insurance coverage for environmental damages has been developped in Europe, given the implementation of the ELD.[5] Nevertheless, the development of the market for environmental liability coverage is heterogenous in Europe.[6] Hence, one can wonder what are the effect of different degrees of availability of liability insurance on the demand for prevention in this setting.

Focusing mainly on self-insurance in the sense of Ehrlich and Becker (1972) - prevention investments dedicated for loss reduction - this chapter investigates two connected questions. From a positive perspective, we wonder what would be the specific effects of ambiguity and the availability of liability insurance on the demand for self-insurance for each liability regimes implemented by the ELD. From a normative perspective, we investigate which

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3. For a complete review of the descriptive models of ambiguity, see Camerer and Weber (1992) and Abdellaoui et al. (2011).

4. For insights on the predictability of environmental risk, see also Michael Faure (2000).

5. Report From The Commission To The Council, The European Parliament, The European Economic And Social Committee And The Committee Of The Regions Under Article 14(2) of Directive 2004/35/CE on the environmental liability with regard to the prevention and remedying of environmental damage /* COM/2010/0581 final */

6. Survey Of Environmental Liability Insurance Developments, Insurance Europe, June 2014.

liability regime gives the better incentives to provide the socially optimal level of self-insurance under the assumptions of our model. In this chaoter, the socially optimal level of self-insurance is operationnalized as the one which minimizes the expected social cost of accident. Hence, this chapter is primarily interested in the deterence effect of the liability regimes, with a view to minimize the cost of preventing and remedying environmental damages.

In this work, we do not address the insolvency problem, although it may characterize environmental damage, and leave this particular issue for further research. We are particularly interested in the specific effect of ambiguity on self-insurance and insurance, since there are few theoretical papers on the effects of ambiguity on the deterrence function of liability regimes. Notable examples are Chakravarty and Kelsey (2012), Teitelbaum (2007) and Franzoni (2013). Regarding the substitution property between insurance and self-insurance, revealed in the seminal article of Ehrlich and Becker (1972), the literature developed relatively few extensions. Courbage (2001) show the robustness of the substitutability property under the dual theory of choice while Konrad and Skaperdas (1993) prove that most of the properties of self-insurance demand remain true with a rank-dependent expected utility. Meanwhile to our knowledge, none has theoretically study these interactions under ambiguity. Consequently, this chapter contributes to the literature on the economics of accident law and insurance.

From an empirical point of view, few articles study the substitutability property, always under risk. Carson et al. (2013) find an empirical evidence for this substitution in the case of homeowner insurance and catastrophic risks. Pannequin et al. (2014), in an experimental setting, also corroborate this property but obtain an imperfect matching to the theory. This chapter contributes to the experimental economics literature by proposing an original experimental design to test self-insurance and insurance behavior for different liability regimes under both ambiguity and risk. Few experiments can be found on liability rules.[7]

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7. See King and Schwartz (1999,2000) ; Dopuch and King (1992) ; Dopuch et al. (1997) ; Wittman et al. (1997) ; Korhnauser and Schotter (1990).

Our experimental approach particularly builds upon the previous experiment by Angelova et al. (2014). Our experiment differs somewhat, as their study focuses on self-protection - an investment in prevention intended for reducing the accident probability, while we consider self-insurance, an investment that can reduce the magnitude of damages. Moreover, precautionary measures in their setting is modeled by a binary decision : either the agent invests a lump sum cost $c > 0$, either she does not invest. In our experiment, we allow for a wider range of investment possibilities in self-insurance. Contrary to Angelova et al., we do not deal with insolvency, but we introduce ambiguity and availability of liability insurance.

The experiment relies on an original theoretical analysis, built upon the standard model of civil liability (Brown, 1989). A potential injurer has an economic activity which can generate an accident. He has the opportunity to invest in self-insurance in order to decrease the magnitude of harm and to buy an insurance coverage for the potential claims for damages of any kind. We introduce ambiguity in this framework, considering the probability of accident can be vague under some circumstances. The modeling of ambiguity relies upon Klibanoff, Marinacci and Mukerji (hereafter "KMM", 2005) and Snow (2010). We derive the demand for self-insurance under two different liability regimes, namely the strict liability and the negligence rule, and compare it to the social optimum.

The main finding derived from the experimental results is that strict liability and negligence rule are not equivalent in their deterrence effect. If one retains the criterium that a majority of individuals chooses the socially optimal level of prevention, negligence rule always meets this requirement, whereas the strict liability regime never does. This result holds under the four different characteristics of the decision context, which are the presence of risk or ambiguity on the one hand, the availability or not of liability insurance coverage on the other hand. This experimental result is particularly important regarding the literature on accident law.

Surprisingly, contrary to the traditional theoretical analysis of liability rules, in the simplest setting with risk and unvailability of insurance, strict liability and negligence rule are

not equivalent at the sample level. A majority of investments result in an over-provision under the strict liability regime, whereas a majority of investments are socially optimal under the negligence rule. Moreover, the introduction of liability insurance in the risk context does not affect the deterrence effect of the negligence rule, while the introduction of liability insurance drops the level of investment in prevention under strict liability, with a majority of decisions relating to an under-provision in self-insurance. Hence, from a normative perspective, the experiment shows that the negligence rule is preferred to the strict liability regime under risk, for different degrees of availability of liability insurance. From a positive perspective, this result provides evidence for the substituability of insurance and self-insurance under strict liability.

Regarding the effect of ambiguity on the deterrence effect of these two liability regimes, the experimental results indicate that ambiguity does not affect the deterrence effect of the negligence rule. This result holds for different degrees of availability of insurance. Meanwhile, under strict liability, the behavior of the agents is more erratic and depends on attitudes towards ambiguity and availability of insurance.

The remainder of this chapter is as follows. Section 2 introduces the assumptions and the behavioral predictions derived from the model. Section 3 presents the design and procedures of the experiment. Results are displayed and discussed in section 4. Section 5 ends the chapter with some concluding remarks.

3.2 The model

3.2.1 The standard model of civil liability

Assumptions and notations   Before presenting our model with self-insurance and liability insurance under ambiguity, we introduce the standard model of civil liability under risk. We consider a standard unilateral accident model. Let be a producer whose activity is likely to generate an accident. In this setting, the potential victim is not able to invest

in preventive measures in order to decrease the probability or the magnitude of accident. Only the producer can affect those latter parameters. Moreover, the producer is supposed to be not harmed by the accident.

When an accident occurs, the magnitude of damages is a function of a, the investment in self-insurance. The level of damages is noted $x(a)$ with $x'(a) < 0$ and $x''(a) > 0$. These conditions on $x(a)$ induce that the more the agent invests in self-insurance, the lower are the potential damages on the one hand; the returns to scale of self-insurance being decreasing on the other hand. We also suppose $-x'(a) > 1$, which requires that the marginal cost of self-insurance (equal to 1) is inferior to the marginal decrease in damages $-x'(a)$. The producer is supposed to operate on a market with imperfect competition. The technology of production on this market gives a gross return $W_0 > 0$, which one can interpret as the initial level of wealth of the producer.[8] We suppose that the producer is not exposed to an insolvency issue in the event of an accident. To rule out this possibility, we suppose $W_0 - x(0) \geqslant 0$, which means that the producer can cover the damages with her assets even if she has not previously invested in self-insurance.

When the probability of accident is known, this probability is noted q. When an accident occurs, the producer can be submitted to a liability rule which obligates a party who causes harm to make a repayment to the victim of the harm (Shavell, 1980, 2007). Therefore, the level of wealth of the producer is noted $W_N = W_0 - a - pI$ when no accident occurs, and $W_A = W_0 - a - pI + h(a, I)$ in case of accident, with $h(a, I)$ a function describing the result of the liability rule and the insurance policy. The decision-maker can purchase an amount of insurance I at price p. He receives an indemnity I in case he is held liable for an accident. We limit the insurance coverage I to a maximum amount equal to $x(a)$ to ensure that the producer has no incentive to encourage occurences of accidents.

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8. In this paper we do not endogenize the output level of the producer and her decision to enter the market.

Liability regimes   Under the strict liability rule, the injurer is liable under all circumstances, no matter if he is at fault or not. Therefore, $h(a, I) = -x(a) + I$. When an accident occurs, the producer has to compensate the victim for the harm $x(a)$, but the insurance can cover this extra-cost with an indemnity I. The last liability scheme is the negligence rule where the victim bears the cost of accident unless the injurer is found negligent. Negligence lies in the insufficience of investment a in prevention compared to a legal standard $\bar{a}$. Therefore, for $a < \bar{a}$, $h(a, I) = -x(a) + I$ and for $a \geqslant \bar{a}$, $h(a, I) = 0$. The legal standard $\bar{a}$ in this setting is equal to the socially optimal level of self-insurance, noted a^s. The level of self-insurance is such that it minimizes the total social cost of accident $SC(a) = qx(a) + a$, which means that a^s is such that $\frac{1}{q} = -x'(a^s)$.

Expected utility   Individual preferences are supposed to be characterized by a utility function $U(W)$ with $U'(W) > 0$ and $U''(W) < 0$ for risk-averse agents and $U''(W) = 0$ for risk-neutral agents. [9] Therefore the expected utility of the agent depends on self-insurance a and insurance I and can be written

$$EU(a, I; q) = (1 - q)U(W_0 - a - pI) + qU(W_0 - a - pI + h(a, I))$$

In this setting, the insurer is assumed to be risk neutral and to charge an actuarial price of insurance. Insurance market is assumed to be competitive, there is no profit, while transaction costs are neglected. As a consequence, the price of insurance p is actuarial and equal to the probability of accident q. The expected utility can then also be written

$$EU(a, I; q) = (1 - q)U(W_0 - a - qI) + qU(W_0 - a - qI + h(a, I)) \qquad (3.1)$$

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9. We do not model the behavior of risk loving agents in this paper. Risk lovers typically arbitrate between full insurance and risk retention as documented in Pannequin et al. (2014).

3.2.2 Modeling ambiguity in the standard model of civil liability

Evaluation function of the expected utility under ambiguity In presence of ambiguity, the decision-maker is uncertain about the value of the propability of accident. This uncertainty is represented following the KMM model with a second-order probability distribution $F(\pi)$, where π is a possible value of the unknown probability. We can now write the expected utility

$$EU(a, I; \pi) = (1 - \pi)U(W_0 - a - pI) + \pi U(W_0 - a - pI + h(a, I))$$

We assume that the insurer has unbiased beliefs on the probability of accident on the one hand, and that he is risk-and-ambiguity neutral on the other hand. Moreover, we assume the price of insurance to be actuarial in the experimental setting. Therefore, the price of insurance p is fixed and equal to the prior q in the ambiguity context. The expected utility can be rewritten

$$EU(a, I; \pi) = (1 - \pi)U(W_0 - a - qI) + \pi U(W_0 - a - qI + h(a, I)) \tag{3.2}$$

In presence of ambiguity, the expected utility at π of the decision-maker is evaluated by a function ϕ with $\phi'(.) > 0$, with $\phi''(.) = 0$ for an ambiguity-neutral agent, $\phi''(.) < 0$ for an ambiguity-averse agent and $\phi''(.) > 0$ for an ambiguity-loving agent. Based on Snow (2011), we make the assumption that the agent has unbiased beliefs i.e. $E_F[\pi] = q$. This assumption allows to disentangle the effect of beliefs and the effect of attitudes towards ambiguity on the agent's behavior.

Therefore, the expected utility of an ambiguity-averse or ambiguity-loving agent can be written

$$E_F[\phi(EU(a, I; \pi))] \tag{3.3}$$

Whereas the expected utility of an ambiguity-neutral agent is

$$(1 - E_F(\pi))U(W_0 - a - qI) + E_F(\pi)U(W_0 - a - qI + h(a, I))$$

Indeed, when the agent is ambiguity neutral, $\phi(.)$ is a linear function. Consequently, under the assumption of unbiased beliefs on the probability of accident, the evaluation under ambiguity of the expected utility of an ambiguity-neutral agent becomes

$$(1 - q)U(W_0 - a - qI) + qU(W_0 - a - qI + h(a, I))$$

Choices of an ambiguity-averse and an ambiguity-loving agent   It is straightforward to see that the decisions of the ambiguity-neutral agent are identical under risk and ambiguity. Concerning the ambiguity-averse agent, to compare the self-insurance and insurance choices under risk and ambiguity, we apply the proposition by Rothschild and Stiglitz (1970) according to which the expected value of any concave function of a random variable increases with a mean-preserving contraction, and decreases with a mean-preserving spread. Similarly, the expected value of any convex function of a random variable decreases with a mean-preserving contraction, and increases with a mean-preserving spread in the distribution of this random variable.

Let $(a*, I*)$ be the optimal decision of the agent under risk. If an increase in a (resp. I) at point $(a*, I*)$ results in a mean-preserving contraction in the distribution of the expected utility at point $(a*, I*)$, we know that $E_F[\phi(EU(a, I; \pi))]$ is increasing in a (resp. I) at point $(a*, I*)$. In this event, the agent is willing to increase her demand for a (resp. I) under ambiguity compared to risk.

The increase in a results in a mean-preserving contraction in the distribution of the expected utility at point $(a*, I*)$ if

$$\forall \pi, \frac{\partial^2 EU}{\partial a \partial \pi}\big|_{(a*, I*)} > 0$$

Indeed, under this condition at $\pi = q$, $EU'_a(a^*, I^*; \pi) = 0$, at $\pi > q$, $EU'_a(a^*, I^*; \pi) > 0$, and $\pi < q$, $EU'_a(a^*, I^*; \pi) < 0$.[10] Thus, for $\pi = q$ the mean EU is unchanged. For high values of the EU ($\pi < q$), an increase in a evaluated at point a^* decreases the EU. For low values of the EU ($\pi > q$), an increase in a evaluated at point a^* increases the EU. Then, $E_F[\phi(EU(a, I; \pi))]$ increases in a at a^*, which gives $E_F[\phi'(EU(a, I; \pi)) EU'_a(a, I; \pi)] > 0$. In this case, this means that the ambiguity-averse agent is willing to invest in a higher amount of self-insurance a (resp. I) under ambiguity compared to risk, while the prior q is unchanged. Meanwhile, the ambiguity-loving agent is willing to decrease her demand for a (resp. I). Conversely, if $\forall \pi$, $\frac{\partial^2 EU}{\partial a \partial \pi}|_{(a*, I*)} < 0$, an increase in a (resp. I) at point $(a*, I*)$ results in a mean-preserving spread in the distribution of the expected utility. Hence, in this event an ambiguity-averse agent is willing to decrease her demand for a (resp. I) at point $(a*, I*)$ under ambiguity, while the ambiguity-loving agent is willing to increase her demand.

Social welfare function In this setting, we assume that the social planner is risk-and-ambiguity neutral on the one hand, and that he minimizes the expected social cost of accident $SC(a) = qx(a) + a$. Therefore, the socially optimal level of self-insurance is a^s s.t. $\frac{1}{q} = -x'(a^s)$, both under risk and ambiguity. We also assume that the negligence rule sets a legal standard $\bar{a}$ equal to the social optimum a^s previously defined, both under risk and ambiguity.

However, it can be argued that both risk and ambiguity aversion could be included in the social welfare function, as shown by Franzoni (2014) and Teitelbaum (2007). We leave this question for further research. Nevertheless, these simplifying assumptions help us to create a reliable experimental setting. Indeed, they allow to create the same legal standard for negligence rule both in the risk and ambiguity treatments. Therefore, the amount of self-investment required to comply with the legal standard is the same in these two

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10. At point $(a*, I*)$ and for $\pi = q$, $EU'_a(a^*, I^*; \pi) = 0$ corresponds to the first-order condition in the risky context.

treatments. Hence, we can compare the results for the negligence rule regime under the risk and the ambiguity treatments. Indeed, in this experimental setting we are interested in how ambiguity modifies the demand for self-insurance, other things being equal.

3.3   Behavioral predictions

3.3.1   Demand for self-insurance and insurance under risk

We sum-up here the results of the standard model of civil liability. These behavioral predictions under risk are derived from equation (3.1). Details are given in appendix 3.7.1. As explained in section 3.2.2, these results also hold under ambiguity for the ambiguity-neutral agent.

H1 : Equivalent deterrence effect of strict liability and negligence rule   In a risk context, both risk-neutral and risk-averse individuals invest in the same amount of self-insurance. The level of investment is equal to the socially optimal level of self-insurance a^s. This results holds under both availability and unavailability of insurance, if the price of insurance is set at the actuarial level q when insurance is available. Hence, the introduction of the opportunity to buy insurance coverage does not modify the deterrence effect of both liability regimes, when the price of insurance is actuarial.

H2 : Differences in demand for insurance coverage   In a risk context, if the strict liability regime is implemented, a risk-averse individual has a full insurance coverage such that her demand I^* is equal to $x(a^*)$, the potential level of damages she would face in the event of an accident, given she takes the socially optimal level of self-insurance investment. On the contrary, a risk-neutral agent is indifferent to her level of insurance coverage, and her demand $I^* \in [0; x(a^*)]$ under strict liability. If the negligence rule is implemented, both the risk-neutral and the risk-averse individuals choose a null insurance coverage $I^* = 0$.

3.3.2 Demand for self-insurance and insurance under ambiguity

We present the result of our model which introduces ambiguity in the standard model of civil liability, and we consider alternatively the availability and the unavailability of insurance coverage. These behavioral predictions correspond to the theoretical results for the ambiguity-averse and the ambiguity-loving individuals. These results are derived from equation (3.3). Details of computation are given in appendices 3.7.2 and 3.7.3.

H3 : Differences in the deterrence effect of the liability regimes

H3Av : Ambiguity-averse individual   The strict liability regime induces an overprovision of self-insurance. On the contrary, the negligence rule induces a socially optimal level of investment in self-insurance. This result holds both for the risk-averse and risk neutral individuals, and both for availability and unavailability of insurance purchase.

H3Lv : Ambiguity-loving individual   The strict liability regime induces an underprovision of self-insurance. This result holds both for the risk-averse and risk neutral individuals, and both for availability and unavailability of insurance purchase. The results are undetermined under the negligence rule.

H4 : Differences in the demand for insurance coverage

H4Av : Ambiguity-averse individual   Similarly to the demands in risk context, the demand for insurance is null under negligence rule. On the contrary, if the strict liability regime is implemented, the demand for insurance increases compared to the risk context and is positive, both for risk-averse and risk-neutral individuals.

H4Lv : Ambiguity-loving individual   If the strict liability regime is implemented, the demand for insurance decreases compared to the risk context. The results are undetermined under the negligence rule.

3.4   Experiment

The objective of this experiment is to test the theoretical predictions of our model. Therefore, the experiment consists of three parts. The first part is dedicated to the measure of attitudes towards risk and ambiguity. The second part brings a laboratory choice situation which reproduces the features of the theoretical model. The third part collects data on the socio-demographic characteristics and other control variables.

Attitudes towards risk and ambiguity   To measure the attitudes towards risk and ambiguity, we used a multiple price list procedure *à la* Holt and Laury (2002 ; 2005) and Chakravarty and Roy (2009). The attitudes towards risk and ambiguity are measured with an ordinal variable between 0 and 11. The higher this coefficient is, the more risk or ambiguity averse the subject is. The individual is neutral towards risk or ambiguity for a coefficient equal to 6 or 7 (see table 3.1 in appendix 3.7.4.) The subjects could randomly begin with the elicitation of attitudes towards risk or ambiguity. This sequence between the two multiple price lists was randomly selected by the computer. At the beginning of this first part of the experiment, it was announced to the players they could win up to 10 euros in this section. The computer would select randomly one of the decisions that the player had taken during this part. The result of this draw was communicated at the end of this part of the experiment for each participant and the gains were disclosed at the end of the experiment.

Liability game   The second part of the experiment consisted of a serie of decisions split into two groups, one group corresponding to negligence rule ("NR" treatment), and the other group corresponding to strict liability ("SL" treatment). We implemented eight different treatments, which differ in the liability regime (NR or SL), the availability or unavailability or insurance ("I" and "NI") and finally the presence of risk or ambiguity ("RK" and "AM"). Each treatment was repeted three times in a row. All treatments were played by all participants. However, the appearance order of the treatments was randomly

selected by the computer to eliminate any order bias. The computer selected either the participant would begin with the negligence rule decisions group or the strict liability. Once a group was chosen, the participant had to play all the possible treatments of this group before being allowed to play with the other decisions group. Then, for each of these groups, the computer chose randomly and independently for each group either to begin with availability or unavailability of insurance. Finally, for each of these latter case, the computer randomly and independently selected to begin with risk or ambiguity. This way we collected 24 self-insurance decisions and 12 insurance decisions per participant.

In each of the three decision periods, with a probability of 10% in the RK treatment and with a probability $\pi \in \{0\%; 10\%; 20\%\}$ in the AM treatment, an accident would occur and result in a loss for the participant, depending on the treatment and her self-insurance and insurance choices. It was explained to the participants that they exercised an activity which was exposed to a 10% risk (RK) or an *a priori* unknown probability (AM) to generate an accident. They were told that if the accident occured, the environment would suffer damages and that they would have to pay compensations, resulting in a loss in their wealth. At the beginning of each decision period, participants were endowed with 10,000 Experimental Currency Units (ECU). 10,000 worth 10 euro. When an accident occured, the participant could loss her entire wealth if she had not invest in self-insurance or insurance. In each period, the participant made her self-insurance and insurance choices.

After these choices were made, the occurence of the accident was simulated with a draw from an urn and the participant was informed whether she generated an accident or not. To simulate risk and ambiguity, we used draws from an urn. The description of the urn was common to both treatments RK and AM : " *A ten different color balls urn is used for the lottery. These balls can be colored in red, black, blue or yellow. The urn contains : 1 red ball ; 7 yellow balls ; 2 balls whose color is unspecified but which can be both blue or both black, or one black and one blue.*"

In RK treatments, we completed this description followingly : "*A draw will take place. If the red ball is picked, an accident occurs. The accident probability is therefore 10 %.*" In AM

treatments, it was not the draw of the red ball which generated accident. The participant was asked to pick between the colour blue and the colour black. If she picked colour blue and a blue ball was drawn by the computer, an accident occured. If a different colour was drawn, there was no accident. The same holds for the black colour. Given the previous description of the urn, there are consequently three possible urns. The description of these urns was given to the participants (see table 3.2).

The participants had to choose their level of self-investment in each decision period with the help of a decision table, providing them ten possible different levels from 0 ECU to 1,000 ECU. The more one invested in self-insurance, the less important the damage was, as shown in the table 3.3.

The effect of self-insurance on the environmental damage was identical between the SL and NR treatments. However, the corresponding loss in wealth for the participant differed as shown in table 3.4. In the SL treatment, the individual loss equaled the damages. In the NR treatment, if the participant invested a positive amount equal or superior to 400, the loss in wealth was reduced to zero. If the level of self-insurance was inferior to 400, then the loss equaled the damages. This threshold was labelled as a "critical value" for the participants, and we did not mention the term of "legal standard" - we did not as well mention other terms refering to liability or a legal framework of any kind. Given the values of the parameters in this experiment, 400 is also the value of self-insurance that minimizes the social cost of accident.

When insurance was available, the participants could purchase insurance coverage up to the amount of possible loss they could suffer in the event of an accident. Table 3.5 displays the characteristics of the different insurance contracts the participants could choose.

Control variables   At the end of the experiment, we collected socio-demographic data on the participants, and we gave a questionnaire aimed at measuring the degree of altruism and attitudes towards the environment. Our measures of altruism is based on the Schwartz theory of basic values (Schwartz, 2012) and especially on the version of the Schwartz survey

used in the European Social Survey. This survey allows to distinguish between universalism and benevolence. Benevolence corresponds to the willingness to preserve and enhance the welfare of people with whom one is in frequent personal contact, whereas universalism is about the welfare of all people and nature. We measure attitudes towards the environment by constructing an ecocentric scale (see Milfont and Duckitt, 2010). This scale indicates the degree of concern or regret over environmental damage.

3.5 Results

3.5.1 Descriptive statistics

Sample We conducted the experiment between May and September 2015 at the École Normale Supérieure de Cachan, in the Paris area. Overall, 124 subjects participated in the experiment. Among the participants, 2 are removed from the data analysis because of the inconsistency of their behavior in the first part of the experiment. Indeed, an inconsistent behavior in this part of the experiment prevents from correctly eliciting their attitudes towards risk or ambiguity. Thus, the final sample contains 122 subjects. As each subject is asked to participate to each treatment with three decision periods, we collected 2,928 self-investment choices and 1,464 insurance choices. The summary statistics of the sample are displayed in table 3.6. Table 3.7 shows the distribution of the risk and ambiguity attitudes in the sample under study. The sample contains 40.98% of risk-loving subjects, 47.54% of risk-neutral and 11.48% of risk-averse subjects. The sample contains 42.62% of ambiguity-loving subjects, 49.18% of ambiguity-neutral and 8.20% of ambiguity-averse subjects. Therefore, the average demand for self-insurance or insurance under risk will be mainly driven by risk-loving and risk-neutral attitudes, while under ambiguity, they will be driven mostly by ambiguity-loving and ambiguity-neutral attitudes.

General results The experiment reproduces the decision context of the theoretical model to understand the specific effects of ambiguity and availability of insurance on the deterrence effect of the liability regimes. In this setting, the social optimum is set at 400 ECU. At the sample level, figure 3.1 shows the average demand for self-insurance for the 8 different treatments of the experiment across each decision period. The average demand is superior to 400 for the SL-RK-NI and SL-AM-NI treatments. Meanwhile, the investment in self-insurance is below the social optimum in average under the other treatments, which are SL-RK-I, SL-AM-I and the negligence rule. Consequently, figure 3.1 points out that the combination of strict liability and unavailability of insurance leads to over-provision in average at the sample level, whereas the other treatments lead to under-provision. This figure seems to indicate that under strict liability, the introduction of insurance is a substitute to self-insurance both under risk and ambiguity.

Table 3.8 provides a more nuanced picture, by presenting the percentage of under-provision, over-provision and socially optimal decisions in the experiment. Table 3.8 shows that the percentage of socially optimal decisions is maximized with the negligence rule, other things being equal. Hence, if the objective is to maximize the number of socially optimal decisions, rather than the average level of investment, the negligence rule is the preferred liability regime. Negligence rule treatments produce a percentage of socially optimal decisions superior to 50% for each negligence rule treatments. That means that a majority of investment choices under the negligence rule is exactly equal to 400 ECU. Meanwhile strict liability fails to induce the subjects to invest this amount of 400 ECU. The probability of the subjects to invest in the socially optimal level of investment is below 50% in this case. The strict liability treatments produce higher rates of over-provision choices, in the sense that the investment is greater than 400 ECU. The percentage of over-provision choices across the three decision periods is equal to 51.37%, 68.93%, 28.14% and 28.96% respectively for the "SL-RK-NI", "SL-AM-NI", "SL-RK-I" and "SL-AM-I" treatments, while it is equal to 3.55%, 4.10%, 2.19% and 4.37% respectively for the "NG-RK-NI", "NG-AM-NI", "NG-RK-I" and "NG-AM-I".

Consequently, these descriptive statistics document the differences in the deterrence effect of the strict liability and the negligence rule for different decision contexts, characterized by the presence or absence of ambiguity and liability insurance. They show that differences in deterrence effect particularly appear in the absence of any opportunity to buy insurance coverage. In our sample, if one wants to maximize the average amount of self-insurance, strict liability is preferred to negligence rule in the absence of liability insurance. This result holds both under risk and ambiguity. When liability insurance is available, both under risk and ambiguity, if one wants to maximize the average amount of self-insurance, there is an equivalence between the strict liability and the negligence rule. This result holds both under risk and ambiguity. On the contrary, in this sample, if one wants to maximize the percentage of socially optimal decisions, the negligence rule is preferred to the strict liability regime, whatever is the opportunity of insurance coverage and the degree of ambiguity. Concerning the demand for liability insurance, figure 3.2 shows that in average, the demand for insurance coverage is higher in the strict liability treatments than under the negligence rule treatments. Figure 3.3 completes this graphical analysis with the density of the demand for insurance coverage by treatment. Figure 3.3 indicates that a majority of null insurance coverage is observed in the negligence rule, whatever is the degree of ambiguity. Whereas the distribution of the demand for insurance coverage is more spread in the strict liability treatments, both under the risk and the ambiguity treatments.

Nevertheless, these results may be due to the particular composition of this sample, as displayed in table 3.7. Indeed, in this sample, risk-neutral, risk-loving, ambiguity-neutral and ambiguity-loving subjects are over-represented, with only 11.48% of risk-averse and 8.20% of ambiguity-averse subjects in the sample. Consequently, we test now the differences in the demand for self-insurance and insurance by differentiating between the attitudes towards risk and ambiguity.

3.5.2 Test of the deterrence effect of the liability regimes under risk

In a risk context, our data set shows that the strict liability and the negligence rule are not equivalent. The negligence rule maximizes the number of socially optimal decisions among both risk-neutral and risk-averse individuals. Hypothesis H1 declares the equivalence between both liability regimes, both for the risk-averse and risk-neutral individuals, in the presence or absence of the opportunity to purchase insurance coverage. Particularly, H1 states that both liability regimes lead to the socially optimal level of self-insurance. To examine this behavioral prediction, table 3.10 displays the summary statistics for the propensity to adopt a socially optimal level of self-insurance. Meanwhile, table 3.9 completes this analysis with a sign test of the demand for self-insurance conditional on treatment and risk-attitudes.

Provision of self-insurance by the risk-neutral subjects Concerning the risk-neutral subjects, table 3.9 shows that for "SL-RK-NI" the median of the differences between the demand for self-insurance and the socially optimal level 400 ECU is significantly positive at 90% confidence level. Hence, in the "SL-RK-NI" treatments, most of the choices of the risk-neutral agents over-provides or provides the socially optimal level of self-insurance. Meanwhile, for the risk-neutral agent, other treatments have a significant negative difference in median at 99% confidence level. Thus, "SL-RK-I", "NG-RK-NI" and "NG-RK-I" mostly induce under-provision or socially optimal decisions. Consequently, under the strict liability regime, the introduction of liability insurance decreases the average demand for self-insurance ie. the average demand is higher under "Sl-RK-NI" than under "SL-RK-I". The introduction of liability insurance modifies the deterrence effect of the strict liability regime for the risk neutral individuals.

This latter result contradicts the theoretical prediction for risk-neutral subjects. Indeed, risk-neutral subjects are supposed to maintain their self-insurance at the socially optimal

level, whatever is the availability of insurance. Given these results, when facing risk-neutral individuals, to maximize the number of socially optimal decisions, it would be preferrable to implement the negligence rule, while to maximize the average demand for self-insurance, it is preferrable to implement strict liability with unavailability of insurance.

Provision of self-insurance by the risk-averse subjects Concerning the risk-averse subjects, table 3.9 shows that with 99% confidence, we can reject the hypothesis that the median of the self-insurance demand equals the socially optimal level for treatments "SL-RK-NI" and "NG-RK-I". "SL-RK-NI" leads to a majority of over-provision or socially optimal decisions while "NG-RK-I" leads to a majority of under-provision or socially optimal decisions for the risk-averse subjects. Table 3.10 indicates that the percentage of socially optimal decisions equals 4.8% for "SL-RK-NI" and 59.5% for "NG-RK-I". Therefore, the risk-averse subjects provide in majority the socially optimal level of self-insurance under "NG-RK-I" and over-provide under "SL-RK-NI".

On the contrary, we cannot reject the hypothesis that the median demand equals the socially optimal level for treatments "SL-RK-I" and "NG-RK-NI". This does not mean that a majority of decisions are socially optimal for both treatments, but rather than the distribution is equally distributed around the median. Indeed, table 3.10 shows that the risk-averse subjects provide in majority the socially optimal level of self-insurance under "NG-RK-NI" (88.1%) but not under "SL-RK-I" (21.4%).

Consequently, the risk-averse subjects over-provide under the strict liability treatments - particularly in the absence of insurance, while they provide in majority the socially optimal level under the negligence rule. The deterrence effect of the strict liability and the negligence rule is different for the risk-averse subjects, contrary to the theoretical predictions.

Provision of self-insurance by the risk-loving subjects Table 3.10 also provides the experimental results for risk-loving subjects. It indicates that the risk-loving subjects have a probability to adopt the socially optimal level of self-insurance superior to 50%

under the negligence rule treatments. Meanwhile, this probability is significantly inferior to 50% under the strict liability treatments. Hence, the strict liability regime performs less than the negligence rule for any observable risk-attitude.

3.5.3 Test of the deterrence effect of the liability regimes under ambiguity

Hypothesis H3 predicts differences in the deterrence effects of liability regimes under ambiguity depending on the attitudes towards ambiguity. Particularly, for the ambiguity-averse individual, the strict liability regime is supposed to induce an overprovision of self-insurance. While for the ambiguity-loving individuals, the strict liability regime is supposed to induce an underprovision of self-insurance. To test these predictions, we run a sign test, which results are displayed in table 3.12. We complete this analysis with summary statistics on the number of socially optimal investments in self-insurance presented in table 3.11.

Strict liability and ambiguity-averse subjects Table 3.12 shows, concerning the ambiguity-averse subjects, that the median of the demand for self-insurance is superior to the socially optimal level of 400 ECU for the treatment "SL-AM-NI". Therefore, a majority of ambiguity-averse subjects either over-provides or provides the socially optimal level of self-insurance under "SL-AM-NI". Table 3.11 indicates that the percentage of socially optimal decision in this case is significantly below 50%. Thus, the ambiguity-averse subjects over-provide under "SL-AM-NI".

Meanwhile, the sign test does not provide significative results for the treatment "SL-AM-I". The demand for self-insurance is equally distributed around the socially optimal level of 400 ECU. However, only a small percentage of subjects invest in this level of self-insurance under "SL-AM-I" : table 3.11 indicates that the percentage of socially optimal decision equals 3.3%.

Consequently, under strict liability, the ambiguity-averse subjects over-provide self-insurance if insurance is not available, meanwhile the distribution of the demand is flat if insurance is available. These experimental results confirm our theoretical predictions in the absence of insurance opportunity but they do not correspond to our expectations in the presence of insurance.

Strict liability and ambiguity-loving subjects   Concerning the ambiguity-loving subjects, table 3.12 confirms that the ambiguity-loving subjects under-provide self-insurance under the "SL-AM-I" with a median of the demand for self-insurance statistically below the threshold of 400 ECU. Nevertheless, this median of the demand is superior to the socially optimal level of 400 ECU for the "SL-AM-NI" treatment. Moreover, table 3.11 confirms that the strict liability leads to a probability of choosing the socially optimal level inferior to 0.5 at a 95% level of confidence for the ambiguity-loving subjects. Hence, the ambiguity-loving subjects under-provide care under "SL-AM-I" and over-provide under "SL-AM-NI". This overcompliance of ambiguity-loving subjects under "SL-AM-NI" contradicts our theoretical predictions, while our theoretical predictions are confirmed in presence of insurance.

Negligence rule under ambiguity   Concerning the ambiguity-averse agent, table 3.11 indicates at 95% confidence level that we cannot reject the hypothesis that the probability to comply with the social optimal level of self-insurance is equal to 0.5. Indeed, the confidence interval at 95% confidence level contains the value 0.5. Hence the probability to achieve the social optimum is higher under the negligence rule than under the strict liability for the ambiguity-averse agent, both for the availability and unavailability of liability insurance. Concerning the ambiguity-loving, at 95% confidence level the probability of adopting the socially optimal level of self-insurance is superior to 0.5 as table 3.11 shows. Hence, the negligence rule provides better incentives to adopt the socially optimal level of self-insurance both for the ambiguity-averse and ambiguity-loving subjects.

3.5.4   Experimental results on the demand for insurance

Propensity to buy insurance coverage under risk   In the treatments characterized by the presence of risk, table 3.13 shows that the probability to buy insurance is significantly superior to 50% at a 95% confidence level under the strict liability regime for any type of risk-attitude. Therefore we can conclude that the strict liability regime induces a willigness to buy insurance coverage.

Meanwhile, under risk and negligence rule, the propensity to buy insurance coverage is significantly inferior to 50% under the negligence rule for both risk-neutral and risk-loving subjects. On the contrary, we cannot reject at a 95% confidence level that the risk-averse subjects have a 50% probability to buy insurance coverage under NG-RK-I. However, the propensity of the risk-averse subjects to buy insurance is higher under SL-RK-I than under NG-RK-I, with respective probabilities equal to 88.1% and 35.7%.

For the record, the model concludes that the demand for insurance coverage is null under the negligence rule in risk treatments, while the demand is positive under the strict liability regime. Hence, our experimental results confirm these theoretical predictions.

Ambiguity's puzzling effect on the demand for insurance   Concerning the demand for insurance under ambiguity, table 3.13 shows, for any type of attitude towards ambiguity, that strict liability induces a majority of subjects to buy an insurance contract. Meanwhile the negligence rule leads a majority of subjects to have a null insurance coverage.

Nevertheless, the experimental results fail to completely confirm the theoretical predictions for both the ambiguity-averse and ambiguity-loving agents. Table 3.14 displays the results of a Dunn's test on the distribution of the demand for insurance of the ambiguity-averse agents. Table 3.14 allows to test the hypothesis H4Av. The results show that there is no statistically significant difference between the demands under SL-RK-I and SL-AM-I on the one hand : ambiguity does not increase the demand for insurance under the strict liability regime for the ambiguity-averse subjects, contrary to the predictions of hypothesis H4Av.

However, table 3.14 shows also that there is no statistically significant difference between the demands under NG-RK-I and NG-AM-I. This confirms H4Av theoretical prediction, which states that the demand for insurance does not vary under the negligence rule for the ambiguity-averse agents.

Concerning the ambiguity-loving agents, the experimental results contradicts hypothesis H4Lv : table 3.14 shows that the ambiguity-loving subjects increase their demand for insurance coverage under ambiguity when the strict liability regime is implemented, compared to the risk context. Indeed, the Dunn's test confirms that the distribution of the demand for self insurance is statistically different between SL-RK-I and SL-AM-I at a 90% confidence level, and that in average the demand for insurance is higher under SL-AM-I. Moreover, the experimental results show that there is no statistically significant difference of the demand for insurance between the treatments NG-RK-I and NG-AM-I for the ambiguity-loving subjects.

3.5.5   Further analysis

We run a random effects logit regression of the variable "*optimum*", which value is 1 if the subject complies with the social optimum and 0 otherwise. The independent variables in this regression are the treatment variables (SL,I,AM), other characteristics of the context of decision (number of accident, period of decision), the socio-demographic characteristics of the individual and the attitudes towards risk and ambiguity. The regression is run on the complete data set, and also on the observations characterized by risk on the one hand, and ambiguity on the other hand.

Concerning the treatment variables, SL (respectively I and AM) equals 1 if strict liability (respectively availability of insurance and ambiguity) is implemented, and 0 otherwise. We collected also the number of previous accidents that the subject has faced at the time of the decision, and the period of decision (value between 1 and 24).

The results of the regression are displayed in table 3.15. The results confirm that, other

things being equal, the negligence rule increases the probability to adopt the socially op-timal level of care. Indeed, the coefficient of SL is statistically significant at 1% confidence level, and negative in our three regressions. Therefore, the strict liability and the negligence rule have different deterrence effect both under risk and ambiguity.

Table 3.15 shows that the the moral concerns of the subjects do not have a significant effect on the probability to comply. Indeed, the variables related to benevolence, universalism and ecocentrism are non significant in the regression. Meanwhile, among the socio-demographic variables, only the variable "female" is significant. This variable is significant at a 1% confidence level in our regressions and negative, meaning that in average the male subjects have a higher probability to comply than the female subjects. Moreover, as moral concerns are not significant, the subjects seem to be only responsive to the monetary incentives induced by the different implemented treatments.

The regression allows to test for any order bias or learning effect. We include a dummy variable for each order implemented in the experiment, and the estimation shows that their coefficients are not statistically significant. Hence, no order bias is present in the experimental results.

Furthermore, table 3.15 indicates that the period of decision is also non significant, suggesting that there is no learning effect in the experiment. Nevertheless, there is a memory effect in the experiment, as the cumulative number of accident is significant in our three regressions, with a positive coefficient. Hence, facing an accident in previous periods of decision enhance the propensity to adopt the socially optimal level of care.

3.6   Concluding remarks

The purpose of this article is to compare negligence rule and strict liability under ambiguity. Both the theoretical and experimental approachs are aimed to understand to what extent the deterrence effect of these tort rules differ on the one hand, and how ambiguity modifies the incentives provided by each liability regime on the other hand. The model

predicts that in risk context, the strict liability and the negligence rule are equivalent in their deterrence effect, which means that they both induce the agents to adopt the socially optimal level of prevention or self-insurance. This result holds both under availability and unavailability of insurance. The experimental results cast into doubt this standard result of the economic analysis of tort law. Indeed, the subjects have a significantly higher propensity to provide the socially optimal level of self-insuranc eunder the negligence rule than under strict liability.

Besides, the experimental results partially confirm the theoretical predictions under ambiguity. In line with the theoretical results, we find that the strict liability regime induces over-provision by the ambiguity-averse subjects, but only if insurance is not available. If insurance is available, contrary to our predictions, the demand of the ambiguity-averse subject has a flat distribution around the socially optimal level of self-insurance.

For the ambiguity-loving agents, the results are more nuanced, as the experiment confirms that strict liability induces under-provision under ambiguity, but only when insurance is available. Otherwise, if insurance is unavailable, over-provision is observed for the ambiguity-loving subjects. Meanwhile, the negligence rule leads to a socially optimal level of self-insurance of both ambiguity-averse and ambiguity-loving subject, as predicted by the model.

As our experimental results do not completely confirm our theoretical predictions, other tests of this experimental protocol are needed to test the robustness of our results. If the difference in the deterrence effect of the strict liability and the negligence rule is confirmed in risk contexts, this would be a major drawback for the standard analysis of civil liability. Hence, our experiment contributes to the Law and Economics literature on the analysis of tort law. This paper shows that from a deterrence perspective, the negligence rule induces better incentives both under risk and ambiguity. Nevertheless, if one considers environmental damages, one understands that compensation and remedying are also strong objectives of the tort law. Applying the strict liability to the most hazardous activities, even if it can either lead to under- or over-provision, guarantees the compensation of potentially catas-

trophic environmental damages. The trade-off between these two objectives is a matter of public policy.

Further experimental research needs to be done on ambiguity and liability regimes. Especially, this paper does not include the possibility for the insurer to charge a premium on the price of insurance, when there is ambiguity. One can wonder how the subjects would react to this characteristic of the insurance market. Moreover, our operational definition of the social optimum only includes the cost of preventing and remedying damages, following the objectives of the ELD. It can be argued that the social cost may include the cost of risk allocation via the purchase of insurance coverage or the psychological costs of ambiguity. Despite these drawbacks, this paper sets a framework for the experimental study of tort rules under ambiguity, which can be improved to deepen our understanding of environmental liability.

3.7 Appendices

3.7.1 Demand for self-insurance and liability insurance under risk

3.7.1.1 Strict liability

If an accident occurs, the agent is held liable whatever the level of safety measures that have been taken. Therefore $h(-x(a) + I) = -x(a) + I$. The expected utility can be written $EU(a, I) = (1 - q)U(W_0 - a - pI) + qU(W_0 - a - pI - x(a) + I)$. The optimal choice is described by the first order conditions [11]

$$\frac{\partial EU}{\partial a} = -(1 - q)U'(W_N) + q(-1 - x'(a))U'(W_A) = 0$$

$$\frac{\partial EU}{\partial I} = (1 - q)(-p)U'(W_N) + q(1 - p)U'(W_A) = 0$$

Therefore, at the optimum of the agent, we have the equality of the marginal benefit and cost of insurance on the one hand and the equality of the marginal benefit and cost of self-insurance on the other hand. Indeed, the first-order conditions can be rewritten [12]

$$-qx'(a)U'(W_A) = EU'$$

$$qU'(W_A) = pEU'$$

---

11. The second order conditions are

$$\frac{\partial^2 EU}{\partial a^2} = (1 - q)U''(W_N) + (-1 - x'(a))^2 qU''(W_A) < 0$$

$$\frac{\partial^2 EU}{\partial I^2} = p^2(1 - q)U''(W_N) + (1 - p)^2 qU''(W_A) < 0$$

12. with $EU' = (1 - q)U'(W_N) + qU'(W_A)$

The optimal level of self-insurance is characterized by the following equation

$$\frac{1}{q} = -x'(a^*)$$

Indeed, the first order condition $\frac{\partial EU}{\partial a} = 0$ and $U''(W) = 0$ imply $\frac{1}{q} = -x'(a^*)$. Hence, the risk neutral agent provides the socially optimal level a^s, with $\frac{1}{q} = -x'(a^s)$.

Moreover, the unavailability of liability insurance would have no effect on the demand for self-insurance of the risk-neutral agent as $\frac{\partial^2 EU}{\partial a \partial I} = 0$.

Concerning the demand for insurance, for $p = q$, we have $\forall I$, $\frac{\partial EU}{\partial I} = 0$. Consequently, the agent is indifferent to her level of insurance coverage, and $I \in [0; x(a)]$.

Risk-averse agent   The optimal level of self-insurance a^* of the risk-averse agent equalizes the marginal returns of insurance and self-insurance. Indeed, $\frac{\partial EU}{\partial a} = 0$ and $\frac{\partial EU}{\partial I} = 0$ induce an interior solution such that

$$\frac{1}{p} = -x'(a^*)$$

with $\frac{-x'(a^*)}{1}$ expressing the marginal decrease in harm generated by prevention at the optimal level of self-insurance a^* when buying an additional unit of self-insurance on the one hand, and $\frac{1}{p}$ expressing the increase in insurance coverage when buying an additional unit of insurance at price p. For an actuarial price of insurance $p = q$, the risk-averse agent provides the socially optimal level a^s, with $\frac{1}{q} = -x'(a^s)$.

Concerning the demand for insurance coverage, the risk-averse agent has a full coverage for an actuarial price of insurance, with $I^* = x(a^*)$.

Indeed, the first order condition on insurance demand states $(1-q)(-p)U'(W_N)+q(1-p)U'(W_A) = 0$. Thus, for $p = q$, this implies $I = x(a)$.

Insurance and self-insurance are substitutes. Indeed, the marginal value of self-insurance is decreasing in I, indeed

$$\frac{\partial^2 EU}{\partial a \partial I} = p(1-q)U''(W_N) + (-1-x'(a))(1-p)qU''(W_A) < 0$$

An increase in the insurance coverage I will decrease the demand for self-insurance a. Consequently, unavailability of liability-insurance would increase the level of care exercised by the risk-averse agent under the strict liability rule.

3.7.1.2   Negligence rule

Under the negligence rule, when an accident occurs, the agent is held liable if the investment in prevention a is below a given legal standard $\bar{a}$. Therefore the decrease in wealth in case of an accident is $h(-x(a) + I) = -x(a) + I$ if $a < \bar{a}$ and $h(-x(a) + I) = 0$ if $a \geqslant \bar{a}$. Thus, the expected utility can be written

$$EU(a, I) = \begin{cases} U(W_0 - a - pI) & \text{if } a \geqslant \bar{a} \\ (1-q)U(W_0 - a - pI) + qU(W_0 - a - pI - x(a) + I) & \text{if } a < \bar{a} \end{cases}$$

The purchase of liability coverage under the negligence rule could be problematic. Indeed, the possibility for the potential injurer to get an indemnity if held liable could induce an under-provision of care (Tunc, 1974). The standard model of civil liability shows that under reasonable hypothesis, potential injurers do not purchase insurance coverage under the negligence rule. Therefore, the opportunity to purchase liability coverage does not affect the deterrence function of this liability regime, and it is not problematic to assume the existence of insurance under this liability regime in a risky context.

For the record, under the negligence rule the agent is held liable if the investment in prevention a is below a given legal standard $\bar{a}$. Therefore, the expected utility can be written

$$EU(a, I) = \begin{cases} U(W_0 - a - pI) & \text{if } a \geqslant \bar{a} \\ (1-q)U(W_0 - a - pI) + qU(W_0 - a - pI - x(a) + I) & \text{if } a < \bar{a} \end{cases}$$

Risk neutral agent   A risk-neutral agent adopts a level of self-insurance $\bar{a}$ and has a null insurance coverage $I^* = 0$. Indeed, when maximizing the expression $(1 - q)U(W_0 - a - pI) + qU(W_0 - a - pI - x(a) + I)$, we obtain $\forall I$, $\frac{1}{q} = -x'(\bar{a})$, which corresponds to a level of self-insurance $\bar{a}$. Once again, when maximizing $U(W_0 - a - pI)$, the utility is maximum for $I = 0$.

Risk averse agent   For $p = q$, the risk averse agent chooses respectively $\bar{a}$ and $I = 0$ as levels of self-insurance and insurance under the negligence rule.

Indeed, when maximizing the expression $(1-q)U(W_0-a-pI)+qU(W_0-a-pI-x(a)+I)$, for $p = q$, the agent is willing to invest in a level a^* $s.t.$ $\frac{1}{p} = -x'(a^*)$. Now, in this chapter the legal standard is $\bar{a}$ $s.t.$ $\frac{1}{q} = -x'(\bar{a})$. It is straightforward to see that when maximizing $U(W_0 - a - pI)$, the agent is also willing to invest in a level of self-insurance $\bar{a}$. Therefore, the agent's expected utility is maximum at $\bar{a}$.

When maximizing $U(W_0 - a - pI)$, the level of expected utility for an amount of self insurance $a \geqslant \bar{a}$, the utility is maximum for $I = 0$.

3.7.2 Strict liability under ambiguity

3.7.2.1 Demand for self-insurance

Ambiguity-neutral agent Given a strict liability rule, the ambiguity-neutral agent invests in the same amount of self-insurance a and insurance I under risk and ambiguity.

Ambiguity-averse demand for self-insurance and availability of insurance The individual chooses a and I to maximize $E_F[\phi(EU(a, I; \pi))]$ with

$$EU(a, I; \pi) = (1 - \pi)U(W_0 - a - pI) + \pi U(W_0 - a - pI - x(a) + I)$$

Moreover, in the experimental setting the insurer is assumed to be risk-and-ambiguity neutral and to charge actuarial prices, hence $p = E_F(\pi) = q$.

Under this condition, the first derivative of the EU respective to a is

$$\frac{\partial EU}{\partial a} = (1 - \pi)(-1)U'(W_0 - a - qI) + \pi(-1 - x'(a)U'(W_0 - a - qI - x(a) + I)$$

The second derivative of the EU respective to a and π is

$$\frac{\partial^2 EU}{\partial a \partial \pi} = U'(W_0 - a - qI) + (-1 - x'(a))U'(W_0 - a - qI - x(a) + I)$$

We can see that $\forall \pi$, $\frac{\partial^2 EU}{\partial a \partial \pi}\big|_{(a^*, I^*)} > 0$. As a reminder, the notation (a^*, I^*) refers to the optimal decision of the agent under risk. Under the assumption $p = q$, we have for the risk-averse agent

$$(a^*, I^*) \ s.t. \begin{cases} \dfrac{1}{q} = -x'(a^*) \\ I^* = x(a^*) \end{cases}$$

For the record, we have for the risk-neutral agent

$$(a^*, I^*) \, s.t. \begin{cases} \dfrac{1}{q} = -x'(a^*) \\[2mm] I^* \in [0; x(a^*)] \end{cases}$$

As $\forall \pi$, $\frac{\partial^2 EU}{\partial a \partial \pi}|_{(a^*,I^*)} > 0$, an increase in a at point (a^*, I^*) results in a mean-preserving contraction in the distribution of the EU. This result holds both for the risk averse and the risk neutral agent. Therefore, $E_F[\phi\left(EU(a, I; \pi)\right))]$ increases in a at point (a^*, I^*) both for the risk averse and risk neutral agents. The agent is willing to increase her demand in self-insurance under ambiguity, compared to the risk context.

Ambiguity-loving demand for self-insurance and availability of insurance As previously, $\forall \pi$, $\frac{\partial^2 EU}{\partial a \partial \pi}|_{(a^*,I^*)} > 0$, an increase in a at point (a^*, I^*) results in a mean-preserving contraction in the distribution of the EU. This result holds both for the risk averse and the risk neutral agent. Therefore, $E_F[\phi\left(EU(a, I; \pi)\right))]$ decreases in a at point (a^*, I^*) both for the risk averse and risk neutral agents. The agent is willing to decrease her demand in self-insurance under ambiguity, compared to the risk context.

Ambiguity-averse demand for self-insurance and unavailability of insurance
When the insurance is unavailable, the agent chooses a to maximize $E_F[\phi(EU(a; \pi))]$ with

$$EU(a; \pi) = (1 - \pi)U(W_0 - a) + \pi U(W_0 - a - x(a))$$

The first derivative of the EU respective to a is

$$\frac{\partial EU}{\partial a} = (1 - \pi)(-1)U'(W_0 - a) + \pi(-1 - x'(a)U'(W_0 - a - x(a))$$

The second derivative of the EU respective to a and π is

$$\frac{\partial^2 EU}{\partial a \partial \pi} = U'(W_0 - a) + (-1 - x'(a))U'(W_0 - a - x(a))$$

We can see that $\forall \pi, \frac{\partial^2 EU}{\partial a \partial \pi}|_{(a^*)} > 0$. Under this condition, $E_F[\phi\left(EU(a;\pi)\right))]$ increases in a at point (a^*) both for the risk averse and risk neutral agents. The agent is willing to increase her demand in self-insurance under ambiguity, compared to the risk context.

Ambiguity-loving demand for self-insurance and unavailability of insurance As $\forall \pi, \frac{\partial^2 EU}{\partial a \partial \pi}|_{(a^*)} > 0$, $E_F[\phi\left(EU(a;\pi)\right))]$ increases in a at point (a^*) both for the risk averse and risk neutral agents. The agent is willing to decrease her demand in self-insurance under ambiguity, compared to the risk context.

3.7.2.2 Demand for liability insurance

Ambiguity-neutral agent The same results than under risk hold.

Ambiguity-averse agent Under the assumption of a risk-and-ambiguity neutral insurer who charges an actuarial price of insurance $p = q$, we have

$$\frac{\partial^2 EU}{\partial I \partial \pi} = qU'(W_N) + (1-q)U'(W_A) > 0$$

We know that under this condition, for $\pi = q$ the mean EU is unchanged and $\frac{\partial EU}{\partial I} = 0$. For high values of the EU ($\pi < q$), an increase in I evaluated at point I^* decreases the EU. For low values of the EU ($\pi > q$), an increase in I evaluated at point I^* increases the EU. Thus, we have mean-preserving contraction in the distribution of the EU. Consequently, the marginal value of insurance under ambiguity is

$$E_F[\phi'(EU(a, I; \pi)) \, EU'_I(a, I; \pi)] > 0$$

The agent is willing to increase her demand for insurance coverage under ambiguity. This

result holds both for the risk averse and the risk neutral agent.

Ambiguity-loving agent   As previously shown, an increase in I evaluated at point I^* results in a mean-preserving contraction in the distribution of the EU. The agent is willing to decrease her demand for insurance coverage under ambiguity. This result holds both for the risk averse and the risk neutral agent.

3.7.3   Negligence rule under ambiguity

Let $\bar{a}$ be the legal standard such that $-x'(\bar{a}) = \frac{1}{E_F[\pi]} = \frac{1}{q}$. we assume that the legal standard under ambiguity is set in order to minimize the expected value of the social cost given the second-order probability $F(\pi)$ and under the assumption that the social planner has unbiased beliefs $E_F[\pi] = q$. Nevertheless, it can be argued that the social planner or the judge has biased beliefs or ambiguity aversion, which would modify the setting of the legal standard. However, an identical $\bar{a}$ under risk and ambiguity allows to analyze the behavior of the potential injurer ceteris paribus.

Ambiguity neutral agent   Given the negligence rule, the ambiguity-neutral agent invests in the same amount of self-insurance a and insurance I under risk and ambiguity.

Ambiguity averse agent and availability of insurance   For any price of insurance, a risk-neutral agent invests in a amount of self-insurance $\bar{a}$ and a null insurance coverage $I = 0$ if they are ambiguity averse.

For an ambiguity averse agent, the expected utility evaluated under ambiguity is

$$
\begin{cases}
U(W_0 - a - pI) & \text{if } a \geqslant \bar{a} \\
E_F[\phi(EU(a, I; \pi))] & \text{if } a < \bar{a}
\end{cases}
$$

And we have

$$
\frac{\partial^2 EU}{\partial a \partial \pi} = U'(W_0 - a - qI) + (-1 - x'(a))U'(W_0 - a - qI - x(a) + I) > 0
$$

Therefore, when maximizing $E_F[\phi(EU(a, I; \pi))]$, the ambiguity averse agent is willing to invest in a level of self-insurance superior to a^* with $\frac{1}{q} = -x'(a^*) = -x'(\bar{a})$.[13] Thus, the utility is at the highest for a level of self-insurance $\bar{a}$ and a null insurance coverage. This result holds both for risk averse and risk neutral agent.

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13. See Appendix 3.7.2.1.

Ambiguity-loving agent and availability of insurance   When maximizing $E_F[\phi(EU(a, I; \pi))]$, the ambiguity-loving agent is willing to invest in a level of self-insurance lower than $a^* = \bar{a}$. Therefore, the demand for self-insurance is undetermined for the ambiguity-loving agent. Similarly, we cannot conclude on the demand for liability insurance.

Ambiguity averse agent and unavailability of insurance   For an ambiguity averse agent, the expected utility evaluated under ambiguity is

$$
\begin{cases}
U(W_0 - a) & \text{if } a \geqslant \bar{a} \\
E_F[\phi(EU(a; \pi))] & \text{if } a < \bar{a}
\end{cases}
$$

We have

$$
\frac{\partial^2 EU}{\partial a \partial \pi} = U'(W_0 - a) + (-1 - x'(a))U'(W_0 - a - x(a)) > 0
$$

Hence, it is straightforward to see that the agent is willing to invest in an amount $\bar{a}$.

Ambiguity-loving agent and unavailability of insurance   When maximizing $E_F[\phi(EU(a; \pi))]$, the ambiguity-loving agent is willing to invest in a level of self-insurance lower than $a^* = \bar{a}$. Therefore, the demand for self-insurance is undetermined for the ambiguity-loving agent.

3.7.4 Experimental protocol

The elicitation of attitudes towards risk and ambiguity is realized on the basis of a multiple price list procedure *à la Holt and Laury (2002 ; 2005)* and *Chakravarty and Roy (2009)*. The corresponding utility functions are $u(x) = -(-x)^s$ for $x < 0$ and $\phi(x) = -(-z)^b$ for $x < 0$

Scale value	AM	RK
1	]-∞ ; -0.4307]	]-∞ ;0]
...	...	...
6	[0.8614 ;1]	[0,7122 ;1]
7	[1 ; 1.1133]	[1 ;1,3826]
8	[1.1133 ; 1.2091]	[1,3826 ;1,9310]
...	...	...
11	[1.3652 ;+∞[	[4,5701 ;+∞[

TABLE 3.1 – Risk and Ambiguity attitudes

Possible urns	Urn A	Urn B	Urn C
Arrangement	1 Red	1 Red	1 Red
	7 Yellow	7 Yellow	7 Yellow
	2 Blue	1 Blue and 1 Black	2 Black
Accident probability if Blue chosen	20%	10%	0%
Accident probability if Black chosen	0%	10%	20%

TABLE 3.2 – Possible urns in the AM treatment

Investment	Losses in the event of an accident	ECU amount of secured wealth	Incremental increase of secured wealth for 1 precautionary ECU	Wealth without accident	Wealth in the event of an accident
0	10000	0	-	10000	0
100	8000	2000	20	9900	1900
200	6400	3600	16	9800	3400
300	5200	4800	12	9700	4500
400	4200	5800	10	9600	5400
500	3400	6600	8	9500	6100
600	2800	7200	6	9400	6600
700	2400	7600	4	9300	6900
800	2100	7900	3	9200	7100
900	1900	8100	2	9100	7200
1000	1800	8200	1	9000	7200

TABLE 3.3 – Self-insurance in the SL treatment

Investment	Damages in the event of an accident	Losses in the event of an accident	ECU amount of secured wealth	Incremental increase of secured wealth for 1 precautionary ECU	Wealth without accident	Wealth in the event of an accident
0	10000	10000	0	-	10000	0
100	8000	8000	2000	20	9900	1900
200	6400	6400	3600	16	9800	3400
300	5200	5200	4800	12	9700	4500
400	4200	0	10000	52	9600	9600
500	3400	0	10000	0	9500	9500
600	2800	0	10000	0	9400	9400
700	2400	0	10000	0	9300	9300
800	2100	0	10000	0	9200	9200
900	1900	0	10000	0	9100	9100
1000	1800	0	10000	0	9000	9000

TABLE 3.4 – Self-insurance in the NR treatment

Premium : P*I	Insurance Payment : I	Incremental increase of insurance payment for 1 premium ECU
0	0	-
100	1000	10
200	2000	10
300	3000	10
400	4000	10
500	5000	10
600	6000	10
700	7000	10
800	8000	10
900	9000	10
1000	10000	10

TABLE 3.5 – Insurance contracts

3.7.5 Experimental results

Variable	Obs	Mean	Std. Dev.	Min	Max
Female	122	.344	.477	0	1
Age	122	21.648	3.636	18	56
Risk attitude	122	5.844	1.42	2	11
Ambiguity attitude	122	5.672	1.434	0	11
Universalism	122	0	0.682	-2.663	0.813
Benevolence	122	0	0.786	-2.455	0.84
Ecocentrism	122	0	0.77	-2.582	0.831
Payoff	122	26.12	3.769	12.6	29.8
Field of study					
Econ./Management	76	62.29			
IT/Maths/Engineer.	27	22.13			
Natural sciences	6	4.92			
Other	13	10.66			

Table 3.6 – Summary statistics

	Risk att.			
Amb. att.	loving	Neutral	Averse	Total
Loving	42.31	46.15	11.54	100.00
Neutral	38.33	50.00	11.67	100.00
Averse	50.00	40.00	10.00	100.00
Total	40.98	47.54	11.48	100.00

Percentage of risk and ambiguity attitudes in the sample, with 122 subjects.

Table 3.7 – Attitudes towards risk and ambiguity
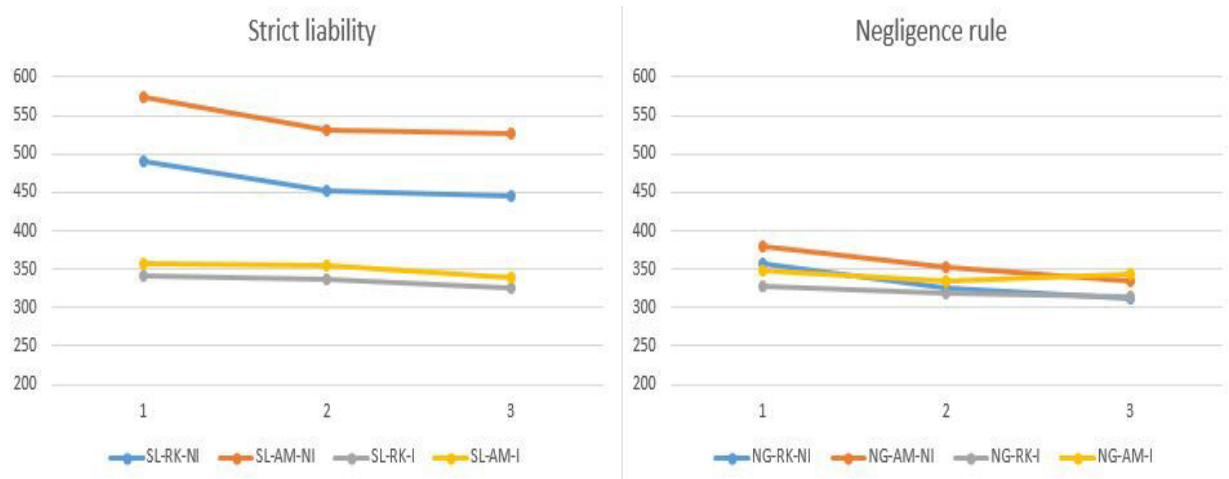
FIGURE 3.1 – Average demand for self-insurance

Average demand for self-insurance, by treatment, for the three decision periods of the experiment.

Treat.	Under-prov.	Optimum	Over-prov.	Total
SL-RK-NI	36.61	12.02	51.37	100.00
SL-AM-NI	25.68	10.38	63.93	100.00
SL-RK-I	54.64	17.21	28.14	100.00
SL-AM-I	48.63	22.40	28.96	100.00
NG-RK-NI	22.95	73.50	3.55	100.00
NG-AM-NI	19.95	75.96	4.10	100.00
NG-RK-I	27.87	69.95	2.19	100.00
NG-AM-I	26.23	69.40	4.37	100.00
Total	32.82	43.85	23.33	100.00

An investment choice is socially optimal if it equals 400 ECU.

TABLE 3.8 – Percentage of under-provision, over-provision and socially optimal level decisions per treatment
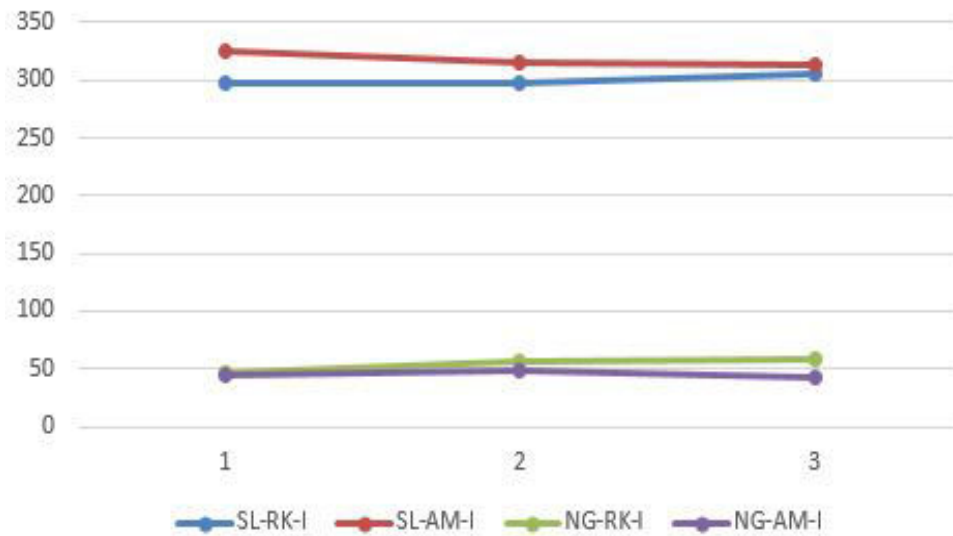
FIGURE 3.2 – Average demand for liability insurance

Average demand for insurance coverage, by treatment, for the three decision periods of the experiment. The vertical axis displays the premium $p * I$.
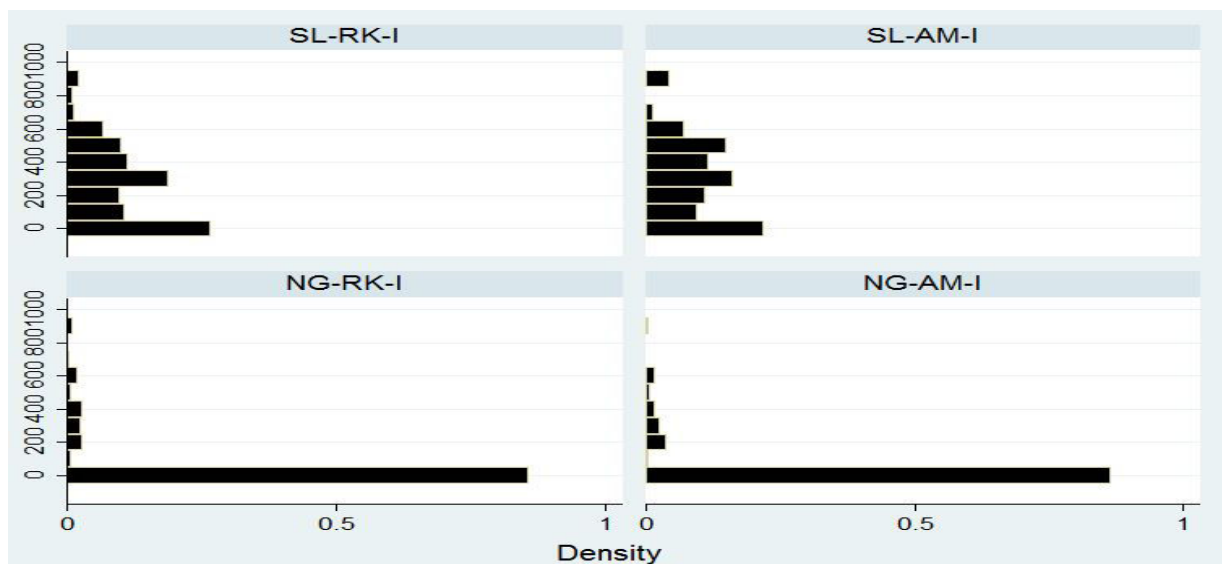
FIGURE 3.3 – Density of the demand for liability insurance

Density of the demand for insurance coverage, by treatment, over the three decision periods of the experiment. The vertical axis displays the premium $p * I$.

Treatment	H0 : Median=400 Ha : Median>400	H0 : Median=400 Ha : Median<400	H0 : Median=400 Ha : Median≠ 400
Risk-neutral			
SL-RK-NI	0.081*	0.941	0.162
SL-RK-I	1.000	0.000***	0.000***
NG-RK-NI	1.000	0.000***	0.000***
NG-RK-I	1.000	0.000***	0.000***
Risk-averse			
SL-RK-NI	0.000***	1.000	0.000***
SL-RK-I	0.148	0.919	0.296
NG-RK-NI	0.969	0.188	0.375
NG-RK-I	1.000	0.000***	0.001***
Risk-loving			
SL-RK-NI	0.131	0.903	0.261
SL-RK-I	1.000	0.000***	0.000***
NG-RK-NI	1.000	0.000***	0.000***
NG-RK-I	1.000	0.000***	0.000***

The table displays the p-value of the one-sided and two sided tests. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

TABLE 3.9 – Sign test of self-insurance demand conditional on treatment

	Mean	Std. Err.	[95% Conf. Interval]
Risk-neutral			
SL-RK-NI	0.149	0.027	[0.096 ; 0.203]
SL-RK-I	0.213	0.031	[0.152 ; 0.274]
NG-RK-NI	0.753	0.033	[0.689 ; 0.817]
NG-RK-I	0.730	0.034	[0.664 ; 0.796]
Risk-averse			
SL-RK-NI	0.048	0.033	[-0.018 ; 0.113]
SL-RK-I	0.214	0.064	[0.089 ; 0.340]
NG-RK-NI	0.881	0.051	[0.782 ; 0.980]
NG-RK-I	0.595	0.077	[0.445 ; 0.746]
Risk- loving			
SL-RK-NI	0.107	0.025	[0.057 ; 0.156]
SL-RK-I	0.113	0.026	[0.062 ; 0.164]
NG-RK-NI	0.673	0.038	[0.598 ; 0.749]
NG-RK-I	0.693	0.038	[0.619 ; 0.767]

TABLE 3.10 – Socially optimal decisions by risk-attitudes and treatments

	Mean	Std. Err.	[95% Conf. Interval]
Amb.-averse			
SL-AM-NI	0.067	0.046	[-0.024 ; 0.158]
SL-AM-I	0.033	0.033	[-0.032 ; 0.099]
NG-AM-NI	0.533	0.093	[0.352 ; 0.715]
NG-AM-I	0.567	0.092	[0.386 ;0.747]
Amb.-loving			
SL-AM-NI	0.096	0.024	[0.050 ;0.143]
SL-AM-I	0.244	0.034	[0.176 ;0.311]
NG-AM-NI	0.769	0.034	[0.703 ;0.836]
NG-AM-I	0.686	0.037	[0.613 ;0.759]

TABLE 3.11 – Socially optimal decisions by ambiguity-attitudes and treatments

Treatment	H0 : Median=400 Ha : Median>400	H0 : Median=400 Ha : Median<400	H0 : Median=400 Ha : Median≠ 400
Amb.-averse			
SL-AM-NI	0.044**	0.982	0.087*
SL-AM-I	0.229	0.868	0.458
NG-AM-NI	0.994	0.029**	0.057*
NG-AM-I	1.000	0.000***	0.000***
Amb.-loving			
SL-AM-NI	0.002***	0.999	0.004***
SL-AM-I	1.000	0.000***	0.000***
NG-AM-NI	1.000	0.000***	0.000***
NG-AM-I	1.000	0.000***	0.000***

The table displays the p-value of the one-sided and two sided tests. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 3.12 – Sign test of self-insurance demand conditional on treatment by ambiguity-attitudes

	Mean	Std. Err.	[95% Conf. Interval]
Risk-neutral			
SL-RK-I	0.764	0.032	[0.701 ; 0.828]
NG-RK-I	0.103	0.023	[0.058 ; 0.149]
Risk-averse			
SL-RK-I	0.881	0.051	[0.782 ; 0.980]
NG-RK-I	0.357	0.075	[0.210 ; 0.504]
Risk-loving			
SL-RK-I	0.653	0.039	[0.577 ; 0.730]
NG-RK-I	0.127	0.027	[0.073 ; 0.180]
Ambiguity-Averse			
SL-AM-I	0.600	0.091	[0.421 ; 0.779]
NG-AM-I	0.267	0.082	[0.105 ; 0.428]
Ambiguity-loving			
SL-AM-I	0.788	0.033	[0.724 ; 0.853]
NG-AM-I	0.141	0.028	[0.086 ; 0.196]

TABLE 3.13 – Propensity to buy insurance coverage by risk and ambiguity attitudes and treatments

Col Mean-Row Mean	SL-RK-I	SL-AM-I	NG-RK-I
Ambiguity-averse			
SL-AM-I	0.070		
NG-RK-I	1.889**	1.819**	
NG-AM-I	2.087**	2.017**	0.198
Ambiguity-loving			
SL-AM-I	-1.302*		
NG-RK-I	10.264***	11.565***	
NG-AM-I	9.736***	11.037***	-0.528

The table displays the Dunn's z-test statistics. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 3.14 – Dunn's Pairwise Comparison of insurance under ambiguity and risk

	(1) All	(2) Risk	(3) Ambiguity
SL	-4.080***	-4.433***	-4.149***
	(0.317)	(0.447)	(0.433)
I	-0.242	-0.432	-0.149
	(0.225)	(0.288)	(0.275)
AM	0.087		
	(0.139)		
Nb. Accid	0.423***	0.399**	0.517***
	(0.132)	(0.180)	(0.149)
Period	0.028	0.051	0.013
	(0.027)	(0.039)	(0.033)
Female	-1.047***	-1.096***	-1.118***
	(0.340)	(0.402)	(0.353)
Age	-0.037	-0.017	-0.072
	(0.035)	(0.040)	(0.055)
Univers.	-0.259	-0.293	-0.338
	(0.298)	(0.351)	(0.285)
Benevol.	-0.164	-0.164	-0.112
	(0.242)	(0.269)	(0.252)
Eco.	0.106	-0.009	0.097
	(0.236)	(0.265)	(0.252)
Order	Yes	Yes	Yes
Risk attitudes	No	Yes	No
Ambiguity attitudes	No	No	Yes
Constant	Yes	Yes	Yes
Observations	2,928	1,464	1,464

The table displays the coefficient estimates with ***
$p<0.01$, ** $p<0.05$, * $p<0.1$. Cluster robust standard
errors in parantheses.

TABLE 3.15 – Random effect logit estimation for the propensity to adopt the socially optimal level of care

Troisième partie

Corporate tort law and non legal sanctions

4 Corporate civil liability with morally concerned consumers

4.1 Introduction

This chapter inquires into the informational role of legal sanctions for the non-legal sanctions, and subsequently investigates the overall deterrence effect of both legal and non-legal sanctions. Indeed, lawsuits and convictions provide information on corporate behavior, and may subsequently affect corporate reputation. As underlined by Baker and Choi (2013), "*for certain kinds of behavior (securities fraud, for example), absent litigation, consumers are unlikely to be informed of the firm's wrongful behavior*".[1] Consequently, the public information provided by the courts may influence the consumers' beliefs about the targeted corporation, and may lead them to act upon this information. For instance, consumers may be interested in the level of effort provided by the firm, which can be represented by the effort to eliminate any type of fraud, or the level of care provided to avoid any harm to third parties during the production process. Then, messages delivered by the courts convey information about the past level of effort of the firm. On the basis of this information, consumers can infer future behavior, and accordingly, they can adjust their demand. In this setting, the decrease in the commercial revenue resulting from the consumers' reaction can be analyzed as a non-legal sanction for a wrongful behavior. Ne-

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1. Baker and Choi (2013,p.3)

vertheless, different liability regimes may induce different informational structures. Indeed, each liability regime has its own set of public signals on wrongful behavior. Accordingly, Cooter and Porat (2001) note that while the messages delivered by the civil liability regimes are simply summarized by two different statements, "the agent is liable" and "the agent is not liable", other messages could be sent by the courts, resulting in different informational structures. For instance, the Scottish courts deliver three different possible messages in their criminal judgements, which are that the agent is "guilty", "innocent" or that guilt is "unproved". This paper investigates the extent to which informational structures provided by the civil liability regimes sustain reputational mechanisms.

The study of the interactions between legal and non-legal sanctions is particularly important for the understanding of the overall deterrence effect of the liability regimes. About this matter Cooter and Porat (2001) indicate that when the legal and social norms align, the total sanctions suffered by the wrongdoer equals the non-legal sanctions plus the legal sanctions. Among the possible non-legal sanctions, Cooter and Porat mention consumer boycott. Indeed, boycotting a wrongdoer results in a loss in commercial revenues by transferring business to the competitors, and may protect the future potential victims by deterring other wrongdoers. Consequently, they emphasize that to design an optimal liability regime, the legal sanctions should take into account the potential non-legal sanctions. Indeed, ignoring the non-legal sanctions when tailoring legal sanctions may lead to over-deterrence.

This paper is primarily interested in settings where the legal sanctions alone give sub-optimal incentives to provide appropriate care. Indeed, the theoretical analysis developped in this paper investigates under which conditions the non-legal sanctions can compensate the imperfections of the tort rule. In this perspective, the paper questions the relevance of the so-called "corporate social responsibility" (hereafter "CSR"). CSR is often presented in the managerial literature as an effective tool to enhance social welfare.[2] CSR can be defined as "*a concept whereby companies integrate social and environmental concerns in*

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2. See Blowfield, 2005 ; Jenkins, 2005 ; Doane, 2005

their business operations and in their interaction with their stakeholders on a voluntary basis", according to the 2001 European Commission Green Paper.[3] More precisely, CSR means that at least the firm complies with the basic legal obligations, but also invests into human capital, the environment and the relations with stakeholders beyond the legal requirement. Particularly, CSR investments are presented to be driven by different economic advantages, among which is the stakeholders' willingness to pay (hereafter "WTP") for socially responsible behavior.[4] The "*myth of CSR*" is called into question by a sub-part of the managerial literature, and the emerging literature on the economics of CSR, with a particular emphasis on the inability of stakeholders to induce corporate socially responsible behavior.[5] One major drawback of the influence of stakeholders on corporate behavior is the need for accurate information on CSR investment.

Particularly, CSR investment is unobservable by the stakeholders of the firm. Hence, this imperfect information issue requires reliable auditing and signalling .[6] In this paper, judicial decisions can be considered as probabilistic audits which convey information on past CSR investments. Indeed, the court can observe the level of effort provided by the firm, but this judicial audit only takes place in the event of the occurence of a harmful accident. Judicial decisions may contain the information that one has not provided a level of effort equal or above the legal requirements and consequently does not correspond to the aforementioned CSR definition. Then, under this probabilistic audit by the courts, one can wonder the extent to which the stakeholders' WTP, and particularly the consumers' WTP, leads to a corporate socially responsible behavior.

In this theoretical model, assume that a firm can have a good or a bad type. The good-type always exercises a high level of effort, given the legal incentives, whereas the bad-type firm has no sufficient legal incentives to exercise a high level of effort. This difference of

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3. Green paper - Promoting a European framework for corporate social responsibility. COM/2001/0366 final

4. Valor, 2008 ; Vogel 2007

5. Doane, 2005

6. See Morimoto, Ash and Hope, 2005 and Servaes and Tamayo, 2013

behavior between the types can be interpreted as differences in cost efficiency or in the decision-makers' moral concerns. Let further assume that there are two periods of production, and at each beginning of the period, the firm decides whether it provides a high or a low level of effort. The higher the level of effort is, the lower is the probability of a harmful accident. When an accident occurs, the court assigns liability to the firm, depending on the past level of effort and the implemented tort rule. The court observes the level of effort but it cannot detect the type of the firm. Consumers receive the court's public signal on the level of effort, signals may differ depending on the implemented tort rule. Furthermore, in this model, the consumers are supposed to be homogeneously morally concerned. This simplifying assumption allows to derive results in the most favorable case to the so-called "*myth of CSR*", which is that the number of stakeholders with a positive WTP for CSR has reached a critical size. Morally-concerned consumers are supposed to trigger a punishment path, when they believe that the firm is not able to sustain high effort, i.e. if they believe that the firm belongs to the bad-type. In this two-period game, the question is whether the consumers' pressure induce the bad-type firm to adopt the high level of effort at least during the first period of the game.

The theoretical results indicate that the informational structure of the negligence rule gives better opportunities for the morally concerned-consumers to induce corporate socially responsible behavior. Indeed, under the negligence rule, if the consumers' WTP is sufficiently high, the equilibrium strategy of the bad-type firm is to provide a high level of effort at the first period of the game, while the level of effort is low at the second period. On the contrary, under the strict liability regime, the first-period investment in reputation is not a pure equilibrium of the game, even for high levels of morally-concerned consumers' WTP. Indeed, the results show that investment in a high level of effort at the first period of the game is a mixed strategy of the firm for high levels of WTP, while the level of effort is always low for low levels of WTP.

This paper contributes to the Law and Economics literature, by highlighting the deterrence effect of the liability regimes, when they combine legal and non-legal sanctions. In

this perspective, this study is close to Baker and Choi (2013, 2014), who examine the effect of both legal and non-legal sanctions in a long-term relational contract setting. They indicate that imposition of legal sanctions can produce information for the market participants, and can lead to reputational sanctions. However, in their setting, the buyer brings himself a lawsuit against the seller, in the event of a realized low quality of the product. In the following theoretical model, the consumer is not directly impacted by the provision of high or low level of effort, and the potential resulting accident. Indeed, the consumers are not the victims of the harmful accident, but rather external observers. In this perspective, this paper is close to the economics of CSR, for which stakeholders are third-party enforcers of social norms, and not the direct victims of the firm's wrongful behavior. Concerning this hypothesis, this paper is also similar to Cooter and Porat (2001), who present a situation where the firm commits a wrongful act that does not directly impact the consumer, with a third-party enforcement by the consumers, who incur a disutility from harm done to others. Building on this previous literature, this paper derives the market equilibrium on a market with morally-concerned consumers, and sheds light on the stakeholders' ability to sustain a socially responsible behavior.

This paper also contributes to the literature on the economics of CSR. Indeed, the engagement of firms in socially responsible actions is often explained by the willingness to attract morally-concerned consumers (Fleckinger and Glachant, 2011). Those consumers have effectively a higher willingness to pay for "green" products than for "brown" products (Arora and Gangopadhyay, 1995 ; Bagnoli and Watts, 2003 ; Baron et al., 2011). Nevertheless, the unobservability of CSR investments hinders the influence of this morally-concerned stakeholders. The contribution of the paper is to analyze what are the specificities of court decisions as information channel for morally concerned consumers. Therefore, this paper departs from a part of the literature which focus on other information channels, such as the media and the NGOs. [7] Moreover, there is a well developed empirical research on the effects of lawsuits on corporate value, while little has been said in the literature on the

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7. Baron et al.,2011 ; Vogel, 2007

effects of convictions. [8] This paper contributes to the literature by pointing out that the effects of convictions on corporate value depends on the structure of the liability regime. The following section introduces the characteristics of the players and the timing of the game (section 4.2). Sections 4.3 and 4.4 deal respectively with the information structure provided by the negligence rule on one hand, and by the strict liability regime on the other hand. Finally, section 4.5 concludes the paper.

4.2 The model

4.2.1 Characteristics of the firm and consumers

Heterogeneity in costs of precaution

Assume an unilateral accident model, with a monopolistic firm i, which is engaged in a risky activity. Indeed, this activity may impose an accident loss of amount L on third parties. The risk of causing harm for this firm is $p(e_i)$ with e_i the level of care exercised by the firm i. There are two levels of efforts in prevention available in this economy which are $\{e_H, e_L\}$ with $e_H > e_L \geq 0$. The total accident loss generated by the corporation is also determined by its activity level q_i. The higher the activity level q_i is, the larger are the damages in case of an accident. The marginal cost of production is constant and normalized to zero. Precaution devices have a unit cost τ_i. There are two types of firm in this setting, which are the good and the bad types, respectively denoted G and B, with $\tau_B > \tau_G$, i.e. the costs of precaution provided by the bad type are higher than the good type. The type of the monopolistic firm is private information, although the probability of the types are common knowledge with $Pr(G) = \beta$ and $Pr(B) = 1 - \beta$, and $\beta \in]0; 1[$.

Liability regime and total costs of the firm

The model considers two different legal environments, which are the negligence rule and the strict liability. The legal environment directly influences the total costs of the firm,

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8. Bhagat et. al., 1998 ; Atanasov et. al., 2012

because depending on the prevention decisions of the firm and the sanctioning rule, the firm may have to compensate the victims of the accident.

Under the negligence rule, the firm does not pay damages if it has provided a level of care at least equal to the legal standard e_{std}. The total expected cost of the firm becomes

$$C(e_i, q_i) = \begin{cases} q_i(\tau_i e_i + p(e_i)L) & \text{if } e_i < e_{std} \\ q_i(\tau_i e_i) & \text{if } e_i \geqslant e_{std} \end{cases}$$

As the model considers only two available level of efforts in the economy, this becomes

$$C(e_i, q_i) = \begin{cases} q_i(\tau_i e_L + p(e_L)L) & \text{if } e_i = e_L \\ q_i(\tau_H e_H) & \text{if } e_i = e_H \end{cases}$$

Under the strict liability regime, the firm has to compensate the victims for the damages that its activity caused, no matter its level of prevention. The total cost of the firm becomes

$$C(e_i, q_i) = q_i(\tau_i e_i + p(e_i)L)$$

Assumption 1. Good-type's legal incentives

Let assume that the legal sanctions both in the negligence and the strict liability regime are high enough to make the good-type firm adopt the high level of prevention, in absence of a premium from the morally concerned consumers. Given the costs of prevention of the good type firm and the potential legal sanctions, it is costlier for the good-type firm to provide the low effort level e_L than the high effort level e_H.

$$\tau_G e_L + p(e_L)L > \tau_G e_H \qquad \text{Incentives under the negligence rule}$$
$$\tau_G e_L + p(e_L)L > \tau_G e_H + p(e_H)L \quad \text{Incentives under strict liability}$$

Assumption 2. Bad-type's legal incentives

Let assume that the bad-type firm has a cost structure such that it is costlier to provide

the high level of prevention e_H than the low level of prevention e_L. That means that the legal sanctions are not sufficient to make the bad type firm adopt a high level of prevention.

$$\tau_B e_L + p(e_L)L < \tau_B e_H \qquad \text{Incentives under the negligence rule}$$
$$\tau_B e_L + p(e_L)L < \tau_B e_H + p(e_H)L \quad \text{Incentives under strict liability}$$

Notations

From now on, the probabilities of accident will be noted p_H and p_L with

$$p_H = p(e_H)$$
$$p_L = p(e_L)$$

In the negligence rule regime, the costs of the bad type firm will be noted c_H and c_L with

$$c_H = \tau_B e_H$$
$$c_L = \tau_B e_L + p(e_L)L$$

In the strict liability regime, the costs of the bad type firm will be noted c_H and c_L with

$$c_H = \tau_B e_H + p(e_H)H$$
$$c_L = \tau_B e_L + p(e_L)L$$

Consumer preferences

In this setting, the monopolistic firm has the possibility to serve a homogenous set of morally concerned consumers. These consumers have a positive WTP σ_H for a product which has been produced with a high level of effort e_H, and a null WTP otherwise. Therefore, it is not the occurence of a harmful accident that induces consumer's disutility, but the fact that the firm did not provide sufficient effort to decrease the risks linked to the production process. This hypothesis on consumer's preferences is in line with Falk and Fischbacher's theory of reciprocity (Falk and Fischbacher, 2005). They highlight, based on a wide range of experimental games, that people may reward kind actions and punish

unkind ones. More particularly, people may evaluate the kindness of an action not only by its consequences but also by its underlying intention. Hence, facing a harmful accident, consumers may punish the firm in the event of a low level of preventive measures.

4.2.2 Timing of the game

Let assume a two-period game, involving two rounds of production and consumption. At the first period, denoted $t = 1$, the monopolistic firm decides its precaution level e_i for the first period. Accidents occur during the production cycle but are not known yet by the consumers. Consumers have to make their consumption choice without any knowledge of the level of care e_i exercised by the firm. At the end of the period $t = 1$ justice decisions are made and publicized. The amount of the fine is defined on the basis of the precaution and activity levels at $t = 1$.

At the beginning of period $t = 2$, the consumers are now informed of the court decisions. They update their beliefs on the type of the firm and its probability to provide a high effort e_H on the basis of the publicized court decisions. Consumers choose if they buy the product or not. The monopolistic firm decides its precaution level e_i for the second period. Accidents occur during the production cycle but are not known by the consumers. A second round of court decisions takes place, the total amount of fines depend on the precaution and activity levels at $t = 2$. The game ends at the end of this period.

4.3 Negligence rule

4.3.1 Consumers' beliefs on the firm's behavior

The good type firm is always expected to provide the high level e_H, as it is costlier for this type to provide the low level e_L. Concerning the bad-type firm, consumers anticipate that there is a chance that she invests in e_H in first period, and they expect that the firm always provide e_L in second period. Indeed, choosing e_H in period 1 increases the beliefs

that the firm belongs to the good-type and this induces a higher willigness to pay for the products of the firm. Meanwhile the investment in prevention in period 2 has no effect on the reputation of the firm, which leads the firm to minimize his costs of production and to choose e_L in period 2.

The expectation on the bad-type's probability of adopting e_H in first period is noted $\hat{\alpha}$. The actual strategy of the firm is noted α, with $0 \leqslant \alpha \leqslant 1$, and $\alpha = 1$ if the firm adopts the strategy $\{e_{t=1}, e_{t=2}\} = \{e_H, e_L\}$, $\alpha = 0$ if the firm adopts the strategy $\{e_{t=1}, e_{t=2}\} = \{e_L, e_L\}$. The belief of the consumers on the firm's adopting a high level of effort in period 1 is

$$Pr(e_{i,t=1} = e_H) = \beta + \hat{\alpha}\,(1 - \beta)$$

At the beginning of the period 2, one of three signals can be sent to the consumers. The first one is "good news", which is defined as "there has been an accident and the court decision says that the firm is not held liable". This means that an accident occurred and that the court observed that $e_{i,t=1} = e_H$. Consumers update their beliefs on the probability to buy a product with a high level of effort e_H on the basis of this new information. As they expect the bad type to not provide e_H in second period, this is equivalent to compute their belief on the firm being a good type.

$$Prob(e_{i,t=2} = e_H; Good\,news) = \frac{Prob(\,Good\,news\,|\,Good\,type)\,Prob(\,Good\,type)}{Prob(\,Good\,news)}$$
$$= \frac{\beta\,p_H}{\beta\,p_H + \hat{\alpha}\,(1-\beta)\,p_H}$$

The second possible signal is "bad news", which is the following message "there has been an accident and the court decision says that the firm is liable". This means that an accident occurred and the court found that $e_{i,t=1} = e_L$. As the good type always comply with the legal standard, the consumers are certain that the firm is a bad type in case of bad news, and they know that in second period the level of effort provided by this firm will be e_L.

$$Prob(e_{i,t=2} = e_H; Bad\, news) \quad = \frac{Prob(\,Bad\,news\,|\,Good\,type)\,Prob(\,Good\,type)}{Prob(\,Bad\,news)}$$
$$= 0$$

The third possible signal is "no news", which means "there has been no accident". The belief on buying a product with a high effort e_H in second period is now

$$Prob(e_{i,t=2} = e_H; No\, news) \quad = \frac{Prob(\,No\,news\,|\,Good\,type)\,Prob(\,Good\,type)}{Prob(\,No\,news)}$$
$$= \frac{\beta\,(1-p_H)}{(1-\hat{\alpha})\,(1-\beta)\,(1-p_L)+\beta\,(1-p_H)+\hat{\alpha}\,(1-\beta)\,(1-p_H)}$$

4.3.2 Market prices

The market prices depend on the beliefs on the consumers on the efforts provided by the firm. The corresponding market price for the first period can be written

$P_1(\hat{\alpha}) = (\beta + (1 - \beta)\,\hat{\alpha})\,\sigma_H$

In the second period, in the case of good news, bad news or no news at the beginning of the period, the corresponding market prices are respectively

$\mathrm{P_{2,GN}}(\hat{\alpha}) = \dfrac{p_H\,\beta}{p_H\,\beta + (1 - \beta)\,\hat{\alpha}\,p_H}\,\sigma_H$

$P_{2,BN}(\hat{\alpha}) = 0$

$\mathrm{P_{2,NN}}(\hat{\alpha}) = \dfrac{(1 - p_H)\,\beta}{(1 - p_H)\,\beta + (1 - p_H)\,\hat{\alpha}\,(1 - \beta) + (1 - p_L)\,(1 - \hat{\alpha})\,(1 - \beta)}\,\sigma_H$

4.3.3 Profit of the bad-type firm

In first period, the profit of the firm is $(P_1(\hat{\alpha}) - \alpha c_H - (1 - \alpha)c_L)$. The costs of the firm depend on its strategy α. In second period, the commercial revenue in case of good news is $\alpha\,p_H\,\delta\,P_{2,GN}(\hat{\alpha})$, with $\alpha\,p_H$ the probability of having good news for the bad type firm. The commercial revenue in case of bad news is zero, and the firm does not produce in this case because the demand is null. In case of no news, the commercial revenue is $(\alpha(1-p_H) + (1-\alpha)(1-p_L))\,\delta\,P_{2,NN}(\hat{\alpha})$, with $(\alpha(1-p_H) + (1-\alpha)(1-p_L))$ the probability of having no news for the bad type firm.

In the second period, the firm produces and incurs costs with a probability $Prob(Good\,news)+$ $Prob(No\,news) = (\alpha + (1 - \alpha)(1 - p_L))$.

The expected profit of the bad type firm is [9]

$$\Pi(\alpha) = (P_1(\hat{\alpha}) - \alpha c_H - (1 - \alpha)c_L + \alpha p_H \delta P_{2,GN}(\hat{\alpha}) + (\alpha(1 - p_H) + (1 - \alpha)(1 - p_L))\delta P_{2,NN}(\hat{\alpha}) - (\alpha + (1 - \alpha)(1 - p_L))\delta c_L)$$

The profit is linear with α, as it it shown in the above expression. The first derivative of the profit function indicates if the profit is increasing or decreasing in α.

$$\frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha}} = \frac{\beta\,\delta\,(1 - p_H)^2\,\sigma_H}{(1 - \hat{\alpha})\,(1 - \beta)\,(1 - p_L) + \beta\,(1 - p_H) + \hat{\alpha}\,(1 - \beta)\,(1 - p_H)} + \frac{\beta\,\delta\,p_H{}^2\,\sigma_H}{\beta\,p_H + (1 - \beta)\,\hat{\alpha}\,p_H} - \delta\,c_L\,p_L + c_L - c_H$$

4.3.4 Results under the negligence rule

Investment in a high level of prevention

If $\frac{\partial \Pi(\alpha)}{\partial \alpha}\big|_{\hat{\alpha}}$ is positive, the profit is increasing in α, the firm has incentives to adopt α as high as possible ie. $\alpha = 1$. The sequential equilibrium requires that the actions of the firms are consistent with the consumers' beliefs, which means that at equilibrium $\hat{\alpha} = \alpha = 1$. Therefore, the condition for $\alpha = 1$ to be a sequential equilibrium is $\frac{\partial \Pi(\alpha)}{\partial \alpha}\big|_{\hat{\alpha}=1} > 0$.

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9. For simplicity in the notations, ϕ will be omitted in the following computations. This does not qualitatively change the results

Investment in a low level of prevention

If $\frac{\partial \Pi(\alpha)}{\partial \alpha}|_{\hat{\alpha}} < 0$, the profit is decreasing in α, and there is a corner solution $\alpha = 0$. For this to be an equilibrium, it is required that $\hat{\alpha} = \alpha = 0$, and $\frac{\partial \Pi(\alpha)}{\partial \alpha}|_{\hat{\alpha}=0} < 0$ has to be verified.

Result 1.

$\hat{\alpha} = \alpha = 1$ *is a sequential equilibrium for any* $\sigma_H > \sigma^*$

$$\sigma^* = \frac{\delta\, c_L\, p_L - c_L + c_H}{\beta\, \delta} > 0$$

Proof. *See Appendix.*

Result 2.

$\hat{\alpha} = \alpha = 0$ *is a sequential equilibrium for any* $\sigma_H < \sigma^{**}$

$$\sigma^{**} = \frac{(\beta\, p_L - p_L - \beta\, p_H + 1)\,(\delta\, c_L\, p_L - c_L + c_H)}{\delta\,(\beta\, p_H\, p_L - p_H\, p_L - 2\,\beta\, p_H + p_H + \beta)} > 0$$

Proof. *See Appendix.*

Result 3.

For $\sigma^{**} \leqslant \sigma_H \leqslant \sigma^*$, *the firm randomizes between* $\{e_H, e_L\}$ *and* $\{e_L, e_L\}$. *She chooses the probability* $\bar{\alpha}$ *to adopt the strategy profile* $\{e_H, e_L\}$ *such that :*

$$\begin{cases} \frac{\partial \Pi(\alpha)}{\partial \alpha}|_{\hat{\alpha}=\bar{\alpha}} = 0 \\ \alpha = \hat{\alpha} = \bar{\alpha} \end{cases}$$

Proof. *See Appendix.*

4.3.5 Remarks

The equilibrium strategy depends on the parameter σ_H, which is the willingness to pay of the morally driven consumers for a high level of effort e_H.
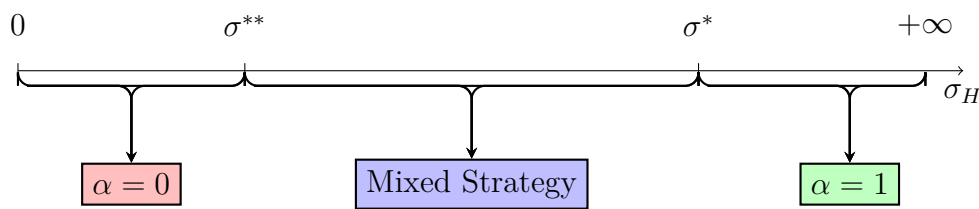

FIGURE 4.1 – Optimal strategy of the bad type firm - Negligence rule.

The negligence rule induces compliance in first period only for high levels of willingness to pay. This is easily explained by the fact that the marginal benefit from reputation has to be sufficiently high to make the bad type firm invest in safety devices.

4.4 Strict liability

4.4.1 Consumers'beliefs

The beliefs in first period are similar to the beliefs in the negligence rule system.

$Pr(e_{i,t=1} = e_H) = \beta + \hat{\alpha}\,(1-\beta)$

In the second period, one of two informations can be sent to the consumers. First, they can receive "bad news", which means that "there has been an accident". However, in the strict liability regime, there is no legal standard. One can suppose that the exact level of prevention of the firm is not necessarily given in the court decisions. Thus, the probability of buying a product with a high level of effort e_H in the second period becomes

$$Prob(e_{i,t=2} = e_H; Bad\,news) = \frac{\beta\,p_H}{(1-\hat{\alpha})\,(1-\beta)\,p_L + \beta\,p_H + \hat{\alpha}\,(1-\beta)\,p_H}$$

Consumers can also receive "no news", which means that "there has been no accident". In this case, the model gives

$$Prob(e_{i,t=2} = e_H; No\,news) = \frac{\beta\,(1-p_H)}{(1-\hat{\alpha})\,(1-\beta)\,(1-p_L) + \beta\,(1-p_H) + \hat{\alpha}\,(1-\beta)\,(1-p_H)}$$

4.4.2 Market prices

The market prices depend on the beliefs on the consumers on the efforts provided by the firm. The corresponding market prices can be written

$$P_1(\hat{\alpha}) = (\beta + (1-\beta)\,\hat{\alpha})\,\sigma_H$$

$$P_{2,\text{NN}}(\hat{\alpha}) = \frac{(1-p_H)\,\beta}{(1-p_H)\,\beta + (1-\beta)\,\hat{\alpha}\,(1-p_H) + (1-\beta)\,(1-\hat{\alpha})\,(1-p_L)}\,\sigma_H$$

$$P_{2,\text{BN}}(\hat{\alpha}) = \frac{p_H\,\beta}{p_H\,\beta + (1-\beta)\,\hat{\alpha}\,p_H + (1-\beta)\,(1-\hat{\alpha})\,p_L}\,\sigma_H$$

4.4.3 Profit of the bad-type firm

In the first period, the profit of the firm is $(P_1(\hat{\alpha}) - \alpha c_H - (1-\alpha)c_L)$. Only the morally concerned consumers are willing to buy the product (non morally concerned have a zero willingness to pay), their proportion in the population is ϕ. The costs of the firm depend on its strategy α. In the second period, the commercial revenue in the case of of bad news is now non-null, contrary to the negligence rule. It equals $(\alpha p_H + (1-\alpha)p_L)\delta P_{2,BN}(\hat{\alpha})$, with $(\alpha p_H + (1-\alpha)p_L)$ the probability of having an accident. In the case of no news, the commercial revenue is $\phi(\alpha(1-p_H) + (1-\alpha)(1-p_L))\,\delta\,P_{2,NN}(\hat{\alpha})$, with $(\alpha(1-p_H) + (1-\alpha)(1-p_L))$ the probability of having no news for the bad type firm. In the second period, the firm produces and engage costs with a probability $Prob(Bad\,news) + Prob(No\,news) = 1$. The expected profit of the bad type firm is

$$\Pi(\alpha) = (P_1(\hat{\alpha}) - \alpha c_H - (1-\alpha)c_L(\alpha p_H + (1-\alpha)p_L)\delta P_{2,BN}(\hat{\alpha})(\alpha(1-p_H)$$

$$+ (1-\alpha)(1-p_L))\delta P_{2,NN}(\hat{\alpha}) - \delta c_L)$$

The first derivative of the profit function indicates if the profit is increasing or decreasing in α. It equals

$$\frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha}} = \frac{\beta \, \delta \, p_H \, (p_H - p_L) \, \sigma_H}{(1 - \hat{\alpha}) \, (1 - \beta) \, p_L + \beta \, p_H + \hat{\alpha} \, (1 - \beta) \, p_H} +$$
$$\frac{\beta \, \delta \, (1 - p_H) \, (p_L - p_H) \, \sigma_H}{(1 - \hat{\alpha}) \, (1 - \beta) \, (1 - p_L) + \beta \, (1 - p_H) + \hat{\alpha} \, (1 - \beta) \, (1 - p_H)} + c_L - c_H$$

The profit is linear with α, as it it shown in the above expressions.

4.4.4 Results under the strict liability regime

Result 4.

In the strict liability regime, $\hat{\alpha} = \alpha = 1$ is not an equilibrium of the game.

Proof. *See Appendix.*

Result 5.

$\alpha = \hat{\alpha} = 0$ *is an equilibrium for $\sigma_H < \sigma^{***}$ with*

$$\sigma^{***} = -\frac{(c_L - c_H) \, (\beta \, p_L - p_L - \beta \, p_H) \, (\beta \, p_L - p_L - \beta \, p_H + 1)}{(\beta - 1) \, \beta \, \delta \, (p_L - p_H)^2} > 0$$

Proof. *See Appendix*

Result 6.

For $\sigma_H > \sigma^{***}$, the firm randomizes between $\{e_H, e_L\}$ and $\{e_L, e_L\}$. She chooses the probability $\bar{\alpha}$ to adopt the strategy profile $\{e_H, e_L\}$ such that :

$$\begin{cases} \frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha} = \bar{\alpha}} = 0 \\ \alpha = \hat{\alpha} = \bar{\alpha} \end{cases}$$

Proof. *See Appendix.*

4.4.5   Remarks

The strategy of the firm depends on the willingness to pay σ_H of the morally concerned consumers. However, the market sanctions in case of a low effort e_L are never sufficient to make the firm adopt the strategy $\alpha = 1$.
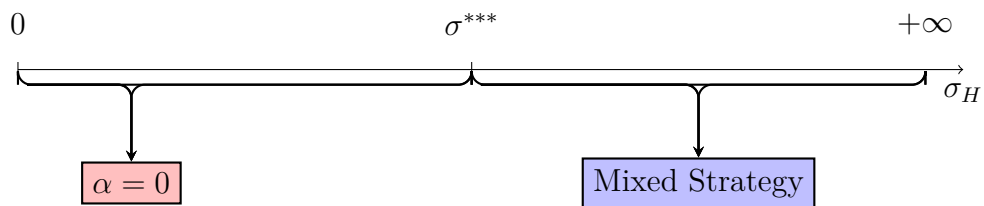
FIGURE 4.2 – Optimal strategy of the bad type firm - Strict liability.

Contrary to the negligence rule, the information provided by the courts' decision in the strict liability regime do not give rise to compliance in first period. The reason is that there is no "good news" in the strict liability regime. For the record, the negligence rule gives three kind of signals which are "good news", bad news" and "no news" versus only two signals for the strict liability regime which are "no news" and "bad news". The absence of good news in the strict liability regime decreases the premium for pooling with the good type ie. the marginal benefit from reputation. Therefore, the difference in signals in the two liability regimes give rise to different set of incentives for the firm.

4.5   Concluding remarks

In presence of moral concerns, there is no equivalence between the negligence rule and the strict liability regarding their deterrence effects. This paper focus on the case of a firm

which has a lack of legal sanctions to exercise care, but which may suffer from market sanctions triggered by morally concerned consumers. The court's decisions have been studied as a system of imperfect public monitoring, which provide signals on the behavior of the firm.

The model has demonstrated that the information structure of the court's decisions in the negligence rule is such that for high levels of consumers' willingness to pay for care, the bad type firm has incentives to exercise a high level of prevention in the first period of the game. Meanwhile the strict liability regime is not successful on that matter. Even for high levels of willingness to pay, the firm at best randomizes between the high and the low level of prevention under the strict liability regime. This result is explained by the difference in the set of signals available in each liability regime, with the negligence rule having a richer set than the strict liability.

One possible drawback of this model is the hypothesis on the information delivered in courts' decisions in the strict liability regime. The model assumes that the court's decision omits the actual level of prevention of the firm, such that the consumers cannot assess if the likelihood of the accident was increased by a lack of prevention. One could say that this information is released somehow by the court. This hypothesis remains realistic if one considers that customers have a limited access to the details of the decisions or if one makes the assumption that consumers are time constrained for the information search, and that they focus on the final decision of the courts.

Moreover, the model assumes a homogeneous set of morally concerned consumers, while it can be suggested that consumers are in fact heterogeneously morally motivated. Notwithstanding this strong behavioral assumption, the model achieves to demonstrate that the consumers' pressure may be insufficient to remedy the lack of legal sanctions, even if all consumers are equally morally motivated. Hence, the theoretical results of this model cast into doubt the "*myth of CSR*", i.e. the ability of stakeholders to sustain a corporate socially responsible behavior.

4.6 Appendices

4.6.1 Negligence rule

4.6.1.1 Investment in a high level of prevention

$$\frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha}=1} = \frac{\beta\,\delta\,p_H{}^2\,\sigma_H}{\beta\,p_H + (1-\beta)\,p_H} + \frac{\beta\,\delta\,(1-p_H)^2\,\sigma_H}{\beta\,(1-p_H) + (1-\beta)\,(1-p_H)} - \delta\,c_L\,p_L + c_L - c_H$$

$\frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha}=1}$ is equal to zero for σ_H equal to the following threshold

$$\sigma^* = \frac{\delta\,c_L\,p_L - c_L + c_H}{\beta\,\delta}$$

$\frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha}=1}$ increases with σ_H. Indeed the first derivative of this function is positive and equals

$$\frac{\beta\,\delta\,p_H{}^2}{\beta\,p_H + (1-\beta)\,p_H} + \frac{\beta\,\delta\,(1-p_H)^2}{\beta\,(1-p_H) + (1-\beta)\,(1-p_H)}$$

Thus, $\frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha}=1} > 0$ for $\sigma_H > \sigma^*$. Therefore, $\hat{\alpha} = \alpha = 1$ is a sequential equilibrium for any $\sigma_H > \sigma^*$ with $\sigma^* = \frac{\delta\,c_L\,p_L - c_L + c_H}{\beta\,\delta}$.

4.6.1.2 Investment in a low level of prevention

$$\frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha}=0} = \frac{\beta\,\delta\,(1-p_H)^2\,\sigma_H}{(1-\beta)\,(1-p_L) + \beta\,(1-p_H)} + \delta\,p_H\,\sigma_H - \delta\,c_L\,p_L + c_L - c_H$$

$\frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha}=0}$ is equal to zero for σ_H equal to the following threshold

$$\sigma^{**} = \frac{(\beta\,p_L - p_L - \beta\,p_H + 1)\,(\delta\,c_L\,p_L - c_L + c_H)}{\delta\,(\beta\,p_H\,p_L - p_H\,p_L - 2\,\beta\,p_H + p_H + \beta)}$$

$\frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha}=0}$ increases with σ_H. Indeed the first derivative of this function is positive and equals

$$\frac{\beta\,\delta\,(1-p_H)^2}{(1-\beta)\,(1-p_L) + \beta\,(1-p_H)} + \delta\,p_H$$

Therefore, $\hat{\alpha} = \alpha = 0$ is a sequential equilibrium for any $\sigma_H < \sigma^{**}$ with σ^{**}.

The following condition ensures that $\sigma^{**} > 0 : 1 > p_H(2 - p_L)$

4.6.1.3 Mixed Strategy

First, let show that $\sigma^* > \sigma**$

$$\sigma^* - \sigma** = \frac{(\beta - 1)\,(\delta\,c_L\,p_L - c_L + c_H)\,(p_H\,p_L - \beta\,p_L + \beta\,p_H - p_H)}{\beta\,\delta\,(\beta\,p_H\,p_L - p_H\,p_L - 2\,\beta\,p_H + p_H + \beta)}$$

$\sigma^* - \sigma** = 0$ for $\beta \in \{\frac{p_H\,p_L - p_H}{p_L - p_H}, 1\}$. However, $\frac{p_H\,p_L - p_H}{p_L - p_H} < 0$.

$\lim_{\beta=0^+}(\sigma^* - \sigma**) = +\infty$ Therefore, the difference in thresholds is positive for any $\beta \in]0; 1[$.

If neither the first inequality $\sigma_H > \sigma^*$ or the second $\sigma_H < \sigma^{**}$ are satisfied, we cannot have an equilibrium complying with the standard in first period ($\alpha = 1$) or an equilibrium with the firm not complying ($\alpha = 0$). Therefore, we must have $\frac{\partial\Pi(\alpha)}{\partial\alpha}|_{\hat{\alpha}=\bar{\alpha}} = 0$ ie. the firm is indifferent between the levels of α, adn α is such that :

$$\begin{cases} \frac{\partial\Pi(\alpha)}{\partial\alpha}|_{\hat{\alpha}=\bar{\alpha}} = 0 \\ \alpha = \hat{\alpha} = \bar{\alpha} \end{cases}$$

4.6.2 Strict liability

4.6.2.1 Investment in e_H in first period

$\frac{\partial\Pi(\alpha)}{\partial\alpha}|_{\hat{\alpha}}$ indicates if the profit is increasing or decreasing in α. If $\frac{\partial\Pi(\alpha)}{\partial\alpha}|_{\hat{\alpha}}$ is positive, the profit is increasing in α, the firm has incentives to adopt α as high as possible ie. $\alpha = 1$. The sequential equilibrium requires that the actions of the firms are consistent with the consumers'beliefs, which means that at equilibrium $\hat{\alpha} = \alpha = 1$. Therefore, the condition for alpha =1 to be a sequential equilibrium is $\frac{\partial\Pi(\alpha)}{\partial\alpha}|_{\hat{\alpha}=1} > 0$.

$$\frac{\partial\Pi(\alpha)}{\partial\alpha}|_{\hat{\alpha}=1} = \frac{\beta\,\delta\,(1 - p_H)\,(p_L - p_H)\,\sigma_H}{\beta\,(1 - p_H) + (1 - \beta)\,(1 - p_H)} + \frac{\beta\,\delta\,p_H\,(p_H - p_L)\,\sigma_H}{\beta\,p_H + (1 - \beta)\,p_H} + c_L - c_H$$

which equals

$$\frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha}=1} = c_L - c_H$$

Under the assumptions of the model, this expression has a negative value. The consumers' beliefs and the actions of the firm are not consistent. $\alpha = \hat{\alpha} = 1$ is not a sequential equilibrium.

4.6.2.2 Investment in e_L in first period

For the strategy $\alpha = 0$ to be an equilibrium, the beliefs $\hat{\alpha}$ and the strategy are required to be consistent.

$$\frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha}=0} = \frac{\beta\,\delta\,p_H\,(p_H - p_L)\,\sigma_H}{(1-\beta)\,p_L + \beta\,p_H} + \frac{\beta\,\delta\,(1-p_H)\,(p_L - p_H)\,\sigma_H}{(1-\beta)\,(1-p_L) + \beta\,(1-p_H)} + c_L - c_H$$

There is a positive value of $\sigma_H = \sigma^{***}$ for which $\frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha}=0} = 0$:

$$\sigma^{***} = -\frac{(c_L - c_H)\,(\beta\,p_L - p_L - \beta\,p_H)\,(\beta\,p_L - p_L - \beta\,p_H + 1)}{(\beta - 1)\,\beta\,\delta\,(p_L - p_H)^2}$$

$\frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha}=0}$ is increasing in σ_H. Indeed the following derivative is positive

$$\frac{(\beta - 1)\,\beta\,\delta\,(p_L - p_H)^2}{(\beta\,p_L - p_L - \beta\,p_H)\,(\beta\,p_L - p_L - \beta\,p_H + 1)}$$

Therefore, $\frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha}=0} < 0$ for any $\sigma_H < \sigma^{***}$

4.6.2.3 Mixed strategy

$$\frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha}} = P_1(\hat{\alpha}) + \delta\,(p_L - p_H)\,(P_{2,NN}(\hat{\alpha}) - P_{2,BN}(\hat{\alpha})) + c_L - c_H$$

Whereas $c_L - c_H$ is negative, $\delta\,(p_L - p_H)\,(P_{2,NN}(\hat{\alpha}) - P_{2,BN}(\hat{\alpha}))$ is positive. Therefore, there is a value $\bar{\alpha}$ such as $\frac{\partial \Pi(\alpha)}{\partial \alpha}\Big|_{\hat{\alpha}=\bar{\alpha}} = 0$.

5   Consumer Boycott : The Role of Institutional Trust [1]

5.1   Introduction

Building upon previous research on consumer boycott, this study shows the specific effects of trust in institutions on the individual decision to join a consumer boycott. The literature shows instances of consumer boycotts triggered by political or ethical issues, that could have been treated by appealing to political or judicial institutions. Thereby, this paper investigates two competing effects of institutional trust. Firstly, it may be wondered if boycott is a substitute to the appeal to legal institutions in situations where they are

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1. This chapter is based on a paper presented at the 2014 conferences of the European Association of Law and Economics and the International Society for New Institutional Economics

not trusted.[2] This suggests a negative association between institutional trust and boycott. Secondly, it could be that boycott is rather a mean to alert those institutions and exert pressure on them, implying a positive association between institutional trust and boycott.

It is important to understand the determinants of consumer boycott given the possible effects of this phenomenon on corporate strategies and market outcomes. Concerning the corporate strategies for instance, in the case a multinational company decides to relocate subsidiaries, a consumer boycott can be called, especially in the subsidiary's homeland to change this corporate decision (see Hoffmann and Müller, 2008).

Similarly, consumer boycotts can affect market outcomes by leading to loss of reputation and to financial implications (see Putnam and Muck, 1991; Koku et al., 1997 and Teoh et al., 1999). For instance, Davidson, Worrell and El-Jerry (1995) show that boycott announcements are associated with significant negative stock market reactions, and that one third of companies experiencing a boycott consequently change their behavior. Consumer boycotts can also have non-market outcomes. For example, Friedman (1999) explains that boycotts can serve political objectives of various special interest groups. Thus, he defines consumer boycotts as "*attempts to use marketplace means to secure what may or may not be marketplace ends*".

Sometimes, boycotts are an attempt to influence the actions of a government. For instance, French wine has been boycotted in Norway around the time of French nuclear testing in 1995-1996 (see Bentzen and Smith, 2002). Similarly, the French opposition to the war in Iraq in 2003 has triggered a boycott of French wine in the US resulting in 26 % lower weekly sales at its peak (see Chavis and Leslie, 2009).

An empirical analysis is run to test the effect of institutional trust on consumer boycott. In this study, institutional trust is decomposed between trust in political and judicial institutions. Indeed, judicial institutions monitor and enforce the legal rules, which violation can trigger boycott (see Cooter and Porat, 2000). For instance, Delacote and Montagné-Huck

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2. In this paper, the legal institutions refer to the law-making and law-enforcement institutions which are the parliament, political parties and the courts.

(2012) report a boycott launched because of corporate illegal action : in 2004, WALHI, the Indonesia's largest environmental group, and several other environmental groups, have called for a boycott of timber from Indonesia, Malaysia, Singapore and China, countries where illegal logging plagues local development and environmental indicators. Moreover, judicial trust makes trust in other public institutions possible by providing protection against their possible misbehavior. Thus, there is a relationship between political and judicial trust. Consequently, one can wonder if they have distinct or homogeneous effects on consumer boycott.

The analysis relies on micro- and macro-level data from the round 2010 of the European Social Survey (hereafter "ESS5"). ESS5 makes it possible to test the effect of institutional trust on individual boycott participation, controlling for other relevant micro-level factors and for the quality of institutions at the macro-level. The European Social Survey (ESS) is an academically driven cross-national survey, which is conducted every two years across Europe since 2001. ESS5 is particularly relevant for the analysis of trust in the political and judicial institutions. Indeed, ESS5 offers a path breaking comparative study of public perceptions of justice in Europe on 27 countries and 52,458 individuals. It is an original dataset, which asks the respondents questions measuring information on trust, legitimacy, cooperation and compliance in relation to the police and courts. Hence, the dataset allows to construct a solid measure of trust in judicial institutions both at the individual and country level. Likewise, it includes data on trust in political institutions such as the parliament. Moreover, ESS5 contains micro-level data on individual consumer boycott participation, social capital and socio-demographic variables. This allows to make an extensive analysis of the individual determinants of boycott participation in Europe. Additionally, ESS5 gathers data on country level characteristics such as the economic and social development, and the quality of institutions. Consequently, ESS5 enables to investigate how differences in trust and quality of institutions can result in differences in boycott participation.

The empirical analysis relies on a novel econometric model : the two-step IV method proposed by Shang and Lee (2011), which relies on the seminal contribution by Manski

(1993) and developments by Brock and Durlauf (2001, 2007) on binary choice models with social interactions. This method underlies that while individuals' decisions are influenced by individual characteristics, the context of the decision also matters. Therefore, this methodology is particularly interesting for controlling both for micro- and macro-level factors, when one studies an individual behavior across different groups. Hence, the first step of the analysis is a probit regression which explains the individual choice to engage in consumer boycott by individual characteristics such as individual institutional trust and other micro-level factors. The second step controls for macro-level factors, such as the country's quality of institutions and socio-economic development. The second step also enables to control for the endogenous group effect. The endogenous group effect corresponds to the influence of group behavior on the individual behavior. The basic idea behind this effect is that the more one is surrounded by individuals who boycott, the more likely one is willing to boycott. This effect generates endogeneity problem in the regression which are handled by the IV method.

Controlling for micro- and macro-level factors, the empirical analysis confirms the negative association between individual trust in political institutions and boycott participation. However, the relationship between judicial trust and consumer boycott is U-shaped. Additionally, at the macro-level the results show that the quality of institutions increases the propensity to boycott. At the macro-level, the analysis validates the presence of an endogenous effect. That means that one's expectations about the use of boycott by other individuals in one's geographic area increase one's propensity to boycott.

This article contributes to the literature in several aspects. First, this paper is related to the Law and Economics debate on the relationship between legal rules and nonlegal sanctions.[3] The results indicate that for given legal rules and cultural context, higher beliefs in the performance of law-making institutions negatively associates with the propensity to use a nonlegal sanction such as boycott, whereas the beliefs in the performance

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3. See Carbonara and al., 2010 ; Deffains and Demougin, 2008 ; Deffains and Fluet, 2009 ; Kübler, 2001 ; Cooter 1998, Kahan, 1998 ; Bohnet and Cooter, 2011

of law-enforcement institutions have a U-shaped association. Hence, the paper completes the literature which investigates how a change in legal obligations or sanctions increases or decreases the level of nonlegal sanctions triggered by individuals. The main finding of this paper is that law-making and law-enforcement institutions have to be taken into account in the study of the interactions between legal and nonlegal sanctions. These institutions can reinforce or hinder the effects of legal rules on nonlegal sanctions. Moreover, the results show that the level of analysis matter for the understanding of these relationships, as the micro- and macro-level measures of trust and quality of institutions have different effects on consumer boycott.

Moreover, this paper contributes to the literature on consumer boycott. Even if consumer boycott is an increasing phenomenon, there are still few papers which empirically analyze its determinants (see Bozonnet, 2010 ; Neilson, 2010 ; Neilson and Paxton, 2010). Previous research emphasizes the influence of social capital and sociodemographic variables on consumer boycott participation. This literature takes into account the possible differences of behavior across countries by using multilevel data analysis. This method allows a set of micro-level explaining factors to have different coefficients across countries, which means that a same variable can have a different effect depending on the geographic area. The present paper completes this previous analysis with an estimation strategy that disentangles the effects of the micro- and macro-level factors on the individual decision to join a consumer boycott.

The remainder of the paper is organized as follows. Section 5.2 reviews the determinants of consumer boycotts. Section 5.3 presents the data and estimation strategy. The results are displayed and discussed in section 5.4. Section 5.5 concludes the paper.

5.2   Review of the literature

The very existence of boycotts is puzzling from a standard economics perspective. Under a utilitarian approach, boycotts should not occur. Indeed, if boycott is considered as either a mean to punish corporate and governmental misbehaviors, or to trigger social change, there is a small-agent problem : each individual taken separately has a very small impact. Moreover, there is a free-rider problem, because of the possibility of enjoying the benefits without bearing the costs of boycott (see Klein, Smith and John ; 2004). Two competing theories can be applied to explain consumer boycott : explanations based on institutional characteristics on the one hand (5.2.1), and explanations based on social preferences on the other hand (5.2.2).

5.2.1   Institutional determinants of consumer boycotts

Scholars argue that distrust in political institutions leads to a more critical attitude towards politicians, and extends towards distrust in basic democratic institutions and procedures. As Dalton (2004), Putnam (2000) and Stolle and al. (2005) show, the perceived inability of the political system to trigger social change induces an increase in alternative forms of political participation, such as boycott. In this context, boycotts are analyzed as a form of political consumerism, which is the use of individual consumption choices as a form of civic engagement and a means of inducing social change (see Neilson and Paxton (2010)). In this perspective, social capital is shown to be a strong determinant of alternative forms of political participation. For instance, involvement in associations and social trust makes it easier for citizens to feel free to express political opinions and to overcome collective action problems, which facilitates recruitment for political participatory acts (see Hooghe and Stolle, 2003 ; Putnam, 2000 ; Newman and Bartels, 2011). Therefore, low level of political trust combined to a high level of social capital may induce a higher propensity to use boycott as a form of political expression.

Hence, the effect of political trust is well documented in the literature. For instance,

Neilson (2010) indicates a negative association of political trust and boycott participation. The present study completes this analysis by investigating whether judicial trust has a positive or negative effect on consumer boycott. It is known that boycott can interact with the justice decisions (see Baker and Choi, (2013, 2014)). For instance Cooter and Porat (2000) indicate that social and legal norms often regulate the same behavior. This implies that when the legal and social norms align, the total sanction suffered by the wrongdoer equals the non-legal sanction plus the legal sanctions. Among the possible non-legal sanctions, Cooter and Porat mention the boycott. Indeed, boycotting a wrongdoer may transfer business to his competitors, and this act protects potential victims by deterring other wrongdoers. They illustrate this idea with the example of a company which aggressively interprets a contract with a supplier and eventually breaches. Although consumers who buy from the company are not at risk, the news of the court's finding outrage them and they boycott the company, which causes it to lose a proportion of its profits. Building upon Cooter and Porat, the present article argues that the credibility of the informations conveyed by the courts are important for explaining boycott behavior. Therefore, trust in courts can reinforce or hinder the message delivered by the courts. If the courts' finding lacks of credibility, consumers would be less likely to act on the basis of judicial decisions.

5.2.2   Social preferences

Social preferences are also well documented determinants of consumer boycott, and particularly altruism. Altruism can be defined as a form of unconditional kindness (see Andreoni, 1989; Andreoni and Miller, 2002; Fehr and Schmidt, 2006). Altruistic individuals have a willingness to pay to improve the well being of others. However, this social preference is not homogeneous in the population, and different degrees of altruism can be observed. Altruism can partly explain the expected utility from boycott. While restraining consumption is costly, an altruistic individual benefits from the expected increase in utility

of third-parties affected by a firm's misconduct.

Similarly, internalization of norms of behavior can induce participation to consumer boycott. Cooter (1998) indicates that a third-party enforcement is realized by punishing violators of norms through social sanctions, for instance with dirty looks, disparaging remarks, stigma or boycott. Third-party observers enforce a norm because they have internalized the norm. This phenomena means that an individual is willing to pay a net price to uphold the norm. Concerning boycott, that would mean that customers are willing to bear the disutility of not buying a good, if the firm which produces it is known to not comply with a given norm. This norm can be related to the fairness of the prices chosen by the firm, the social and environmental quality of the production, etc.

Image concerns also matters for boycott decision. The literature on conspicuous consumption shows that the purchase decisions can be aimed at signaling a characteristic which is valued in society, when individuals have status concerns (see Bernheim, 1994 ; Corneo and Jeanne, 1995). With boycotts, individuals may signal their level of altruism, if this characteristic is valued in the society. This intuition has been investigated by Bénabou and Tirole (2006) for the prosocial behavior spoken generally. Therefore, boycott allows to signal one's type, and especially one's degree of altruism or moral concerns.

5.3   Data and estimation strategy

5.3.1   Data

This paper uses micro- and macro-level data from the 2010 European Social Survey, a cross-national survey which measures the characteristics, beliefs and behavior patterns of 52,458 individuals in 27 countries. The survey covers Western Europe (Belgium, France, Germany, Ireland, Netherlands, Portugal, Spain, Switzerland and the UK), Eastern Europe (Czech Republic, Hungary, Russia, Slovakia and Ukraine), the Scandinavian countries (Denmark, Finland, Norway, Sweden), the Baltic countries (Estonia, Lithuania), the Balkan states (Bulgaria, Croatia, Cyprus, Greece and Slovenia) and Israel. [4] The survey provides information on consumer boycott participation and its potential micro- and macro-level explaining variables. The summary statistics of these factors are displayed in table 5.1 and correlation tables can be found in appendix 5.6.1.

5.3.1.1   Boycott participation

Boycott participation is measured by a binary variable, noted Bct_{ij} hereafter. Bct_{ij} takes the value 1 if the individual has taken part to a consumer boycott during the last 12 months preceding the interview, and 0 otherwise. It corresponds to the answer to the following question : "*There are different ways of trying to improve things in [country] or help prevent things from going wrong. During the last 12 months, have you done any of the following ? (...) Have you boycotted certain products ?*".

Consumer boycott is an important phenomenon in Europe. Indeed table 5.1 shows that 19.2% of the respondents in the dataset declare their participation to a consumer boycott. However, this phenomenon differs greatly between European countries. For instance, boycott participation is at the highest in the Scandinavian countries, where 30.36 % of the individuals declare to have taken part to a consumer boycott. The lowest level of boycott

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4. Listwise deletion of observations with missing values has been made to obtain the final dataset. It contains 25,500 individuals and the aforementioned countries, except Portugal

| Variable	Obs	Mean	Std. Dev.	Min	Max
Bct_{ij}	25500	0.192	0.394	0	1
Pol_{ij}	25500	-0.196	2.671	-4.728	7.765
Crt_{ij}	25500	0	0.829	-3.025	2.392
$Getr_{ij}$	25500	-0.273	2.369	-7.026	6.17
Inv_{ij}	25500	0.18	0.384	0	1
$Sclmeet_{ij}$	25500	0.002	0.999	-2.521	1.388
Rlg_{ij}	25500	-0.141	2.576	-3.418	6.61
$Polint_{ij}$	25500	0.024	1.009	-1.69	1.707
Fem_{ij}	25500	0.504	0.5	0	1
Age_{ij}	25500	46.291	17.187	14	96
Inc_{ij}	25500	5.679	2.769	1	10
Edu_{ij}	25500	13.126	3.748	0	50
Lrs_{ij}	25500	5.008	2.069	0	10
$Postco_j$	26	0.328	0.479	0	1
GDP_j	26	30286.56	16440.7	3034.998	84588.7
HDI_j	26	0.831	0.067	0.71	0.938
$Fhpr_j$	26	1.861	1.79	1	6
CPI_j	26	5.833	2.228	2.1	9.3

TABLE 5.1 – Summary statistics
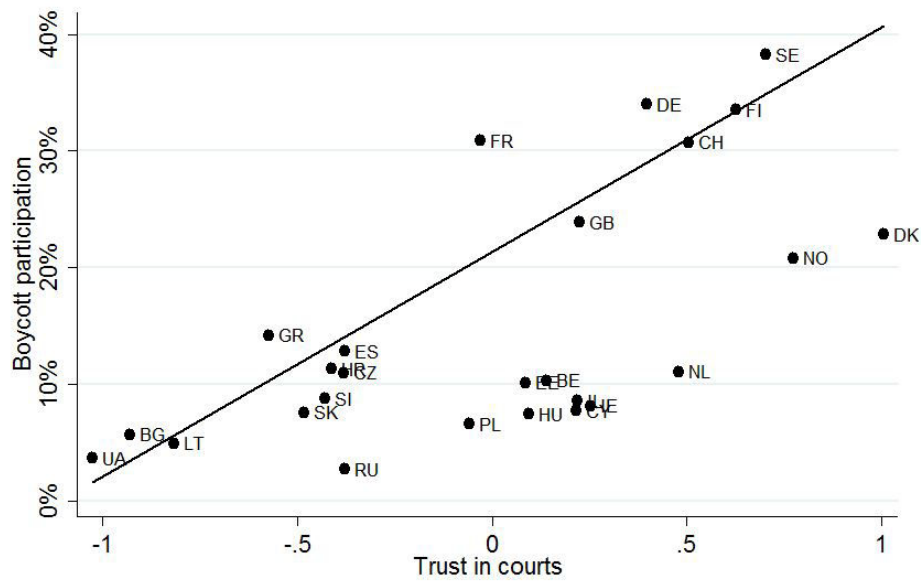
FIGURE 5.1 – Boycott participation by trust in courts at country level

participation can be found in the Eastern European countries, with 4.45%. In between, we have by decreasing level of participation Western Europe (25.57%), the Balkan states (10.73%), Israel (8.60%) and the Baltic countries (7.06%). This heterogeneity between European regions could be explained by differences in institutional or cultural characteristics. For example, post-communist countries have a lower rate of boycott participation than other countries, with a percentage of 4.71%, whereas the others have a participation rate of 25.88%. These differences in boycott participation are more striking on figure 5.1, which displays the national percentage of boycott participation by country level of trust in courts. Figure 5.1 indicates heterogeneity in both boycott participation and judicial trust between European countries. It also shows that higher trust in the judicial institutions at the country level correlates with higher boycott participation.[5] Nevertheless, this correlation is computed on the aggregate level of boycott participation and trust. One can wonder if trust has the same effect at the micro- and macro-level.

5.3.1.2   Trust and quality of institutions

This study distinguishes how trust at the micro-level and the quality of institutions at the macro-level influence boycott participation. Indeed, figure 5.1 indicates a positive association between boycott and the country's average trust in courts. However, at the aggregate level, institutional trust is close to objective measures of the quality of institutions, as table 5.5 shows. Hence, figure 5.1 possibly reveals the positive relationship between the quality of institution and consumer boycott, while leaving the effect of individual trust hidden. Moreover, the measurement of institutional trust differs from the measurement of the quality of institutions to some extent. For instance, Voigt (2013) indicates that objective measures of institutions are generally preferable over subjective measures (see also Glaeser et al., 2004). Particularly, subjective evaluations are more likely to be tainted by

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5. The fitted regression line corresponds to the regression of boycott participation at country level on trust in courts at country level, with 26 observations, R-squared is 0.4169, the coefficient of judicial trust is significant at a 1% level and equals 0.127

the theories, ideologies and prejudices of the respondent, and can consequently bias the resulting indicators. Thus, this paper uses subjective measures of trust at the individual level, and controls for objective measures of the quality of institutions at the macro-level.

Measuring political and judicial trust raises the question of how to define, operationalize and measure institutional trust.[6] In this dataset, trust in the domestic political institutions is measured by summing the standardized items related to trust in parliament, politicians and political parties. These items correspond to the answer to the following question : " *(...) please tell me on a score of 0-10 how much you personally trust each of the institutions I read out. 0 means you do not trust an institution at all, and 10 means you have complete trust(...).*". The internal reliability of this scale is high with a Cronbach's alpha of 0.919. The higher the value of this index is, the more the individual trust the political institutions of his country. This scale is noted Pol_{ij}. The squared measure Pol_{ij}^2 is also included as a control variable.

Trust in domestic judicial institutions is a scale constructed by factor analysis based on 11 items from the dataset, described in table 5.6. More particularly, this scale, noted Crt, measures the individual trust in the effectiveness, fairness and political independence of the courts. The higher the scale is, the higher is the individual trust in courts. The internal reliability of this scale is good with a Cronbach's alpha of 0,745. The squared measure Crt_{ij}^2 is also included as a control variable. This factor analysis departs from previous conceptualizations and measurements of courts perceptions based on ESS5 (see Jackson et al., 2011 ; Hough et al., 2013). In this previous literature, trust in court effectiveness is measured for instance with a unique question (item d27 in table 5.6). It seems however that using only one item to measure such perceptions could lack of reliability. Indeed, some of the variables measure different aspects of the same underlying factor. The details of the factor analysis implemented in this study are displayed in appendix 5.6.2.

At the macro-level, ESS5 provides data from Freedom House and Transparency In-

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6. Discussions on the dimensions of institutional trust can be found in Barber, 1983 ; Butler, 1991 ; Metlay, 1999 and Peters et al., 1997

ternational to measure the quality of institutions. Freedom House offers a comparative assessment of global political rights. The political rights index $Fhpr_j$ contains values between 1 and 7 for each country j, with 1 representing the highest degree of freedom and 7 the least free. Transparency International produces a composite index, the Corruptions Perceptions Index CPI_j, that ranks countries in terms of the degree of corruption among public officials and politicians. The study also controls for the fact that a country j is part of the former communist bloc with a dummy variable noted $Postco_j$, the GDP per capita at current prices in 2010 US Dollars noted GDP_j and the Human Development Index noted HDI_j.

5.3.1.3 Social capital and sociodemographic variables

The analysis includes social capital and sociodemographic variables, micro-level factors that influence individual decision to join consumer boycott (see Bozonnet, 2010 ; Neilson, 2010 ; Neilson and Paxton, 2010). Social capital variables include $Getr_{ij}$, a measure of generalized trust ; Inv_{ij}, a binary variable which equals 1 if the individual works in an association, a political party, an action group or another organization, and equals 0 otherwise ; $Sclmeet_{ij}$, the frequency of social meeting ; Rlg_{ij}, the degree of religiosity and $Polint_{ij}$, the level of political interest. Generalized trust, $Getr_{ij}$, is the addition of three standardized 10-point Likert scale variables. The first one is "ppltrst", which asks if "*most people can be trusted or you can't be too careful*". The second is "pplfair", which asks if "*most people try to take advantage of you, or try to be fair*". The third one, "pplhlp" asks whether "*most of the time people are helpful or mostly looking out for themselves*". The higher the index is, the more one trusts other people. A summated scale that measures degree of religiosity (Rlg_{ij}) is constructed by adding together the following variables, after standardization, as they have different Likert-scales : "rlgdgr" which aks "*how religious are you ?*", "rattend" which asks "*how often do you attend religious services apart from special occasions ?*", and "rpray" which asks "*how often do you pray apart from at religious services ?*". Frequency

of social meeting ($Sclmeet_{ij}$) results from the standardization of the 6-point Likert scale asking how often one socially meets with friends, relatives or colleagues. Measure of political interest results from the standardization of a 7-point Likert scale, which is the answer to the question asking "*how interested would you say you are in politics*".

Sociodemographic variables contains Fem_{ij} a binary variable equal to 1 if the individual is a woman and 0 otherwise, Age_{ij} the age of the individual, Inc_{ij} the household net income (in decile), Edu_{ij} the number of years of education (including compulsory education), and Lrs_{ij} a left-right political self-location scale.

5.3.2 Estimation strategy

To investigate how trust at the micro-level and the quality of institutions at the macro-level influence individual boycott participation, this study uses a two-step regression. The first step is a probit regression measuring the effect of the micro-level factors and controlling for the country fixed effects. The corresponding econometric model is

$$Bct_{ij}^* = Trst_{ij}\,\delta_1 + X_{ij}\delta_2 + \alpha_j + \epsilon_{ij} \tag{5.1}$$

with Bct_{ij} the boycott participation of individual i in country j, Bct_{ij}^* the latent dependent variable, $Trst_{ij}$ a matrix of variables for individual trust in political and judicial institutions, X_{ij} a matrix of control variables, including social capital and sociodemographic characteristics, and α_j the country fixed effect. The error term ϵ_{ij} is normally distributed (N(0,1)) and i.i.d.

Even if social preferences have an effect on boycott participation, the estimation of δ_1 and δ_2 should not be biased in their absence in the model under the hypothesis that $\text{Cov}(\text{SocPref}_{ij}, Trst_{ij}) = 0$ and $\text{Cov}(\text{SocPref}_{ij}, X_{ij}) = 0$. That means that the social preferences of individual i in country j are assumed to be orthogonal to other individual characteristics.

The second step is a linear regression of the country fixed effect on the macro-level

factors, which gives

$$\alpha_j = Qual_j\,\beta_1 + E_j(Y_{ij})\beta_2 + S_j\,\beta_3 + u_j \tag{5.2}$$

with $Qual_j$ a matrix of the measures of the quality of institutions, $E_j(Y_{ij})$ the expectations of boycott participation at the country level, S_j a matrix of control variables including measures of the socioeconomic development, and u_j represents the unobserved country characteristics. $E(u_j) = 0$, u_j is i.i.d. across groups, and u_j and ϵ_{ij} are independent. This modelling of individual participation to boycott allows to disentangle the effect of national practices of boycott $E_j(Y_{ij})$ and the effect of other observable country characteristics such as $Qual_j$ and S_j, as well as unobservable country characteristics u_j.

In practice, the second step requires to regress $\hat{\alpha}_j$ (computed in the first step) on the country level variables, which gives the following equation

$$\hat{\alpha}_j = Qual_j\,\beta_1 + \hat{E}_j(Y_{ij})\beta_2 + S_j\,\beta_3 + u_j + v_j \tag{5.3}$$

Concerning the approximation of the expected average behavior, noted $\hat{E}_j(Y_{ij})$, Shang and Lee (2011) indicate that with large group size, the observed average behavior in the group may be used as an approximation of the endogenous effect variable $E_j(Y)$. Moreover, potential problems of endogeneity arise in presence of u_j. Unobserved characteristics of the country like unobserved institutional and cultural features can have an effect on the expected average behavior in the country. Therefore $cov(E_j(Y_{ij}), u_j) \neq 0$, which induces $cov(\hat{E}_j(Y_{ij}), u_j) \neq 0$.[7] This latter problem leads to the issue of selecting good instrument variables. To instrument $E_j(Y_{ij})$, Shang and Lee propose two types of instruments, based on the nonlinearity of the probit model, which are

$$w_{1,j} = \frac{1}{N_j}\sum_{i=1}^{N_j}\phi(x_{ij}\hat{\delta} + \hat{\hat{\alpha}}) \tag{5.4}$$

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7. We have $v_j = (\hat{\alpha}_j - \alpha_j) - (\hat{E}_j(x) - E_j(x))\beta - (\hat{E}_j(Y) - E_j(Y))\beta_4$, which is the measurement error. As group size tends to infinity, v_j tends to zero

$$w_j(x_1) = (\bar{x}_{1,j} - \bar{\bar{x}}_1)\frac{1}{N_j}\sum_{i=1}^{N_j}\phi(x_{ij}\hat{\delta} + \hat{\alpha}) \tag{5.5}$$

with x_1 a micro-level factor which country level is not included in the second step of the regression. As the specification of the second step in this paper does not include the country level average of micro-level factors, we can use $w_{1,j}$ and any micro-level factor transformed by the relation (5.5).

5.4   Results

Table 5.2 displays the results of the first-step regression ie. the effects of micro-level factors with robust standard errors in parentheses.[8] Four different specifications of the model are tested. Equations (1) and (2) on the one hand, and equations (3) and (4) on the other hand correspond to two different content of the matrix $Trst_{ij}$. Indeed, the squared measures of political and judicial trust are included in (3) and (4). Each specification controls for the country fixed effect.

Both political and judicial trusts are significant in the complete model (4). The results confirm a negative effect of political trust on boycott participation at the individual level. Indeed, the marginal effect at means of political trust is significant at a 1% level and negative for each specifications. Therefore, a higher level of trust in political institutions corresponds to a lower propensity to boycott. Concerning judicial trust, the results show that both Crt_{ij} and Crt_{ij}^2 are significant when the control variables are included, with a negative effect of Crt_{ij} and a positive effect of Crt_{ij}^2. This result indicates that the relationship between judicial trust and boycott participation is U-shaped. Judicial trust decreases the propensity to boycott until a given threshold, then for a higher level of

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8. The model is estimated with Huber-White robust standard errors, rather than with cluster robust standard errors. Indeed, the model test with clustered data is distributed as $F(k, c - k + 1)$ where k is the number of constraints and c the number of clusters. At most $c - 1$ constraints can be tested, so k must be less than c. In our model with country fixed effects, including cluster robust standard errors leads to a model that does not meet this requirement

Estimation	(1)	(2)	(3)	(4)
Pol_{ij}	-0.005***	-0.010***	-0.005***	-0.010***
	(0.002)	(0.002)	(0.002)	(0.002)
Crt_{ij}	0.002	-0.017***	0.002	-0.017***
	(0.006)	(0.006)	(0.006)	(0.006)
Pol_{ij}^2			0.000	0.001
			(0.000)	(0.000)
Crt_{ij}^2			0.020***	0.012**
			(0.005)	(0.005)
$Getr_{ij}$		0.003		0.003
		(0.002)		(0.002)
Inv_{ij}		0.095***		0.094***
		(0.009)		(0.009)
$Sclmeet_{ij}$		0.015***		0.015***
		(0.005)		(0.005)
Rlg_{ij}		0.000		0.000
		(0.002)		(0.002)
$Polint_{ij}$		0.045***		0.045***
		(0.004)		(0.004)
Fem_{ij}		0.031***		0.032***
		(0.008)		(0.008)
Age_{ij}		0.000		0.000
		(0.000)		(0.000)
Inc_{ij}		0.006***		0.006***
		(0.001)		(0.001)
Edu_{ij}		0.011***		0.010***
		(0.001)		(0.001)
Lrs_{ij}		-0.009***		-0.009***
		(0.002)		(0.002)

Marginal effects at means for probit regressions on 25,500 observations. Country fixed effects are included in each specification for the 26 countries of the dataset. Huber-White heteroscedasticity-consistent standard errors in parentheses. Results are significantly different from zero at *** 1%, ** 5% and * 10% .

TABLE 5.2 – First-step regression. Dependent variable : boycott participation

judicial trust, boycott participation increases. Hence, the beliefs in law-making and law-enforcement institutions do not have the same effect on consumer boycott.

Regarding the control variables, social capital increases the propensity to boycott. Indeed, involvement in organizations, frequency of social meetings and political interest have a significant and positive effect. Conversely, generalized trust is not significant. Therefore, the probability to boycott does not depend on trust in others, given the specifications of the model. Concerning the sociodemographic variables, the gender, the income, the education and the self-location on the political left-right scale display a significant impact on consumer boycott. Hence, women tend to have a higher boycott participation, and higher income and education levels also increase the propensity to boycott. Moreover, being located on the political right wing is likely to decrease the propensity to boycott.

Table 5.3 displays the results of the regression of the country fixed effects on the macro-level factors. The country fixed effects are estimated using the specification (4). Globally, table 5.3 shows that the quality of institution is positively correlated with individual participation to boycott, even after controlling for the socioeconomic development and the estimated expected boycott behavior $\hat{E}_j(Bct_{ij})$. Several specifications are tested using OLS (estimation (5)) and IV methods (estimations (6), (7), (8)). Although the value of the coefficients cannot be directly interpreted, their sign indicate how each macro-level factor influence the individual decision to take part to a consumer boycott. Each regression is realized on 26 observations, which corresponds to the number of countries in the dataset. IV regressions use $w2Inv_j$ and $w2Sclmeet_j$ as instruments. These variables are constructed with variables Inv_{ij} and $Sclmeet_{ij}$ on the basis of equation (5.5). They were selected among other possible instruments for their high correlation with the endogenous variable $\hat{E}_j(Bct_{ij})$.

The OLS and IV estimates indicate a positive relationship between the country fixed effect and the quality of institutions. Indeed, $Fhpr_j$ is the political rights index from the Freedom House dataset. It measures the quality of the electoral process, the political pluralism and participation, the functioning of government and other discretionary political

| | (5) | (6) | (7) | (8) |
| | OLS | IV | IV | IV |
Estimation				
$Fhpr_j$	-0.087***	-0.089***		-0.086***
	(0.029)	(0.023)		(0.025)
CPI_j	-0.023	0.010		-0.010
	(0.020)	(0.023)		(0.025)
$Postco_j$	0.019	-0.071		-0.004
	(0.092)	(0.067)		(0.083)
GDP_j	0.000		0.000	0.000
	(0.000)		(0.000)	(0.000)
HDI_j	0.712		2.510**	0.618
	(1.251)		(0.994)	(1.068)
$\hat{E}_j(Bct_{ij})$	3.802***	3.394***	2.937***	3.299***
	(0.248)	(0.524)	(0.595)	(0.546)
Constant	-3.010**	-2.445***	-4.566***	-2.940***
	(1.065)	(0.126)	(0.756)	(0.887)
Adjusted R^2	0.948	0.941	0.915	0.940
P-value		0.392	0.412	0.212

Linear regression on 26 country-level observations. IV estimation is made by 2LS technique using $w2Inv_j$ and $w2Sclmeet_j$ as instruments. Other exogenous variables in the regression act as instruments. Huber-White heteroscedasticity-consistent standard errors in parentheses. The P-value corresponds to Wooldridge's robust score test of over-identifying restrictions, performed to test the validity of instruments in presence of 2LS and robust standard errors. Results are significantly different from zero at *** 1%, ** 5% and * 10% .

TABLE 5.3 – Second-step regression. Dependent variable : country fixed effect

rights. The higher $Fhpr_j$ is, the lower is the level of political rights in country j. The coefficient of $Fhpr_j$ is negative and significant at a 1% level in each specification. Therefore, better quality of institutions are associated with a higher individual propensity to join boycott. This result differs from the micro-level effect of trust in institutions. Whereas individual trust in political institutions decrease the propensity to boycott, better political institutions have a positive effect. This result could be explained by the fact that a minimum level of political rights is required for boycott having an impact on institutions and firms, while high level of political trust increases the relative cost of boycott. Other variables measuring the characteristics of institutions, which are the dummy variable for post-communist countries $Postcom_j$ and the Corruption Perception Index CPI_j are non significant.

The GDP per capita GDP_j is non significant. The Human Development Index HDI_j is significant only in the IV regression (7) at a 5% level of confidence. In (7), HDI has a positive association with the country fixed effect, suggesting that a better socioeconomic development increases the individual propensity to boycott. Nevertheless, the estimates concerning this variable are inconsistent.

The estimated expected boycott behavior $\hat{E}_j(Bct_{ij})$ is consistently positive and significant at a 1% level of confidence in each specification. In the IV regressions, the instruments for this endogenous variables meet the over-identifying restrictions as the P-value of the Wooldrige's robust score test shows. Thus, the boycott behavior in the geographic area of an individual increases her individual propensity to boycott. Hence the paper confirms the existence of an endogenous effect at the country level for boycott participation.

5.5   Conclusion

Consumer boycotts can influence corporate strategies, market and non-market outcomes. This paper improves the understanding of the determinants of this important phenomenon by studying the effects of trust in both political and judicial institutions. The data

analysis is based on a strong estimation strategy, which allows to disentangle micro- and macro-level factors. The precision of the estimation could be improved in further studies by increasing the number of available countries in the dataset. The results show that political trust and judicial trust at the micro-level have different effects on the individual propensity to boycott. Whereas the association is negative between political trust and boycott, the relationship between judicial trust and the individual propensity to join consumer boycott is U-shaped. The paper also confirms significant effects of social capital and of some sociodemographic characteristics. Meanwhile, at the macro-level, the quality of institutions positively correlates with the individual propensity to boycott. The paper also documents an endogenous group effect : the country average behavior regarding consumer boycott influences the individual behavior.

This study confirms the previous findings in the literature on consumer boycott on the effects of political trust, social capital and sociodemographic variables. Besides, it extends this literature by addressing the specific effect of judicial trust. Indeed, the Law and Economics literature shows that the justice decisions can influence the individual decision to trigger boycott. Building upon this idea, this study tests the proposition that judicial trust shapes the credibility of the courts findings and through this channel, impacts the boycott decision. The empirical results show that this relationship between judicial trust and consumer boycott is significant but not linear. Further research on this effect is needed to solve this puzzle. One possible interpretation is that for high levels of judicial distrust, one's lack of confidence in law-enforcement institutions can induce one to use nonlegal third-party enforcement such as boycott to ensure compliance with norms. Similarly, high levels of judicial trust increase the credibility of courts' findings, and could encourage one to boycott on the basis of these judicial informations. The paper also completes the existing literature by including measures for the quality of institutions in the empirical analysis, demonstrating that countries with well developed political rights have higher boycott levels of boycott participation. Hence, this paper discuss the need for the inclusion of judicial trust and quality of institutions in the study of consumer boycott, as judicial trust and

quality of institutions have a separate effect from political trust.

5.6 Appendices

5.6.1 Correlation tables

Variables	Pol_{ij}	Crt_{ij}	$Getr_{ij}$	Inv_{ij}	$Sclmeet_{ij}$	Rlg_{ij}	$Polint_{ij}$	Fem_{ij}	Age_{ij}	Inc_{ij}	Edu_{ij}	Lrs_{ij}
Pol_{ij}	1.000											
Crt_{ij}	0.496	1.000										
$Getr_{ij}$	0.443	0.400	1.000									
Inv_{ij}	0.170	0.176	0.144	1.000								
$Sclmeet_{ij}$	0.153	0.145	0.174	0.126	1.000							
Rlg_{ij}	-0.015	-0.063	-0.046	0.009	-0.058	1.000						
$Polint_{ij}$	0.269	0.159	0.153	0.209	0.062	-0.009	1.000					
Fem_{ij}	-0.030	-0.066	0.014	-0.081	-0.010	0.177	-0.137	1.000				
Age_{ij}	0.007	-0.039	0.029	0.009	-0.215	0.170	0.154	0.002	1.000			
Inc_{ij}	0.141	0.155	0.145	0.115	0.101	-0.121	0.165	-0.081	-0.200	1.000		
Edu_{ij}	0.101	0.162	0.147	0.160	0.099	-0.102	0.203	0.009	-0.240	0.331	1.000	
Lrs_{ij}	0.116	0.046	0.046	-0.003	0.009	0.120	0.008	-0.035	0.024	0.069	-0.014	1.000

TABLE 5.4 – Cross-correlation table of micro-level factors

Variables	$\hat{E}_j(Bct_{ij})$	$\hat{E}_j(Crt_{ij})$	$\hat{E}_j(Pol_{ij})$	GDP_j	HDI_j	$Fhpr_j$	CPI_j	$Postco_j$
$\hat{E}_j(Bct_{ij})$	1.000							
$\hat{E}_j(Crt_{ij})$	0.646	1.000						
$\hat{E}_j(Pol_{ij})$	0.585	0.896	1.000					
GDP_j	0.665	0.814	0.777	1.000				
HDI_j	0.618	0.745	0.609	0.852	1.000			
$Fhpr_j$	-0.332	-0.340	-0.158	-0.350	-0.623	1.000		
CPI_j	0.708	0.882	0.822	0.841	0.830	-0.548	1.000	
$Postco_j$	-0.627	-0.684	-0.568	-0.793	-0.793	0.349	-0.723	1.000

TABLE 5.5 – Cross-correlation table of macro-level factors

5.6.2 Trust in judicial institutions

The measure of judicial trust relies on the items of ESS5 described in table 5.6. A factor analysis is realized to study the pattern of correlations between these variables in order to explain the variance in the observed variables in terms of underlying latent factors. Indeed, the factors constructed using principal factor analysis correspond to statistically valid sub-divisions of the perceptions of justice.

Table 5.7 displays the decomposition of the total variance of the items of table 5.6 between the different possible factors. The results show that only the first factor can be retained. This factor is noted Crt in the paper. Table 5.8 displays the factor loadings and unique variances for factors with positive eigenvalues, obtained after an orthogonal varimax rotation. This matrix shows the relevance of each variable in the factor. Hence, the table indicates that Crt is mostly defined by items defining trust in courts effectiveness (d26, d27), trust in courts fairness (d28, d32) and beliefs in courts independence of political and external pressure (d31, d37).

Table 5.6: Courts

Number	Question
d26	Courts doing good or bad job in country
d27	How often the courts make mistakes that let guilty people go free
d28	How often the courts make fair, impartial decisions based on available evidence
d29	More likely to be found guilty : rich or poor falsely accused of crime
d30	More likely to be found guilty : two people from different race/ethic groups falsely accused of crime
d31	How often judges in country take bribes
d32	Courts protect rich and powerful over ordinary people
d34	Everyone's duty to back the court's final verdict

Factor	Variance	Difference	Proportion	Cumulative
Factor 1	2.037	1.137	0.724	0.7243
Factor 2	0.901	0.298	0.320	1.0444
Factor 3	0.603	0.404	0.214	1.2586
Factor 4	0.199	0.193	0.0707	1.3294
Factor 5	0.006	.	0.002	1.332
Observations	25,500			
Retained factors	5			
Nb. of parameters	45			

The table displays the total variance accounted by each factor, obtained after an orthogonal varimax rotation on 25,500 observations.

TABLE 5.7 – Factor analysis - Courts

Number	Question
d35	All laws should be strictly obeyed
d36	Doing the right thing sometimes means breaking the law
d37	The courts' decisions are unduly influenced by political pressure

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Uniqueness
d26	0.608	0.110	0.131	-0.075	0.034	0.594
d27	0.569	0.084	0.052	0.000	-0.035	0.665
d28	0.526	0.118	0.095	-0.014	0.055	0.698
d29	0.285	0.578	0.046	0.033	0.004	0.582
d30	0.141	0.512	0.069	-0.006	-0.005	0.713
d31	0.632	0.178	0.016	0.042	-0.029	0.566
d32	0.565	0.403	-0.062	0.192	0.002	0.477
d34	0.137	0.028	0.487	-0.039	0.004	0.742
d35	-0.010	0.043	0.529	0.054	-0.001	0.716
d36	0.102	0.134	0.216	0.278	-0.007	0.848
d37	0.467	0.238	0.002	0.268	0.003	0.653

The table displays the factor loadings and unique variances for factors with positive eigenvalues, obtained after an orthogonal varimax rotation on 25,500 observations.

TABLE 5.8 – Factor loadings - Courts

Conclusion générale

La responsabilité civile des entreprises a été l'objet d'études détaillées en analyse économique du droit. Pourtant, la question de l'efficacité des règles de responsabilité civile n'a pas encore trouvé toutes ses réponses. Si d'après Ulrich Beck, sociologue allemand, les sociétés contemporaines peuvent être qualifiées de sociétés du risque, c'est bien pour souligner qu'aujourd'hui, les activités productives, par leurs évolutions technologiques, sont susceptibles de produire des effets négatifs, dont la probabilité d'occurrence et la gravité des conséquences peuvent être difficiles à évaluer. Parler de société du risque, c'est aussi insister sur le fait que ce risque généré par les entreprises fait l'objet d'une appréciation sociale, et que ce jugement sur le comportement des entreprises peut être, dans une certaine mesure, accompagnée d'effets. Il est nécessaire de prendre en considération cette double dimension de l'imprévisibilité et de l'évaluation sociale des risques productifs dans l'analyse de la responsabilité civile des entreprises. Cette thèse contribue à cette démarche d'approfondissement de l'étude des règles de responsabilité délictuelle.

Dans un premier chapitre, nous avons exposé, par une revue de littérature, l'évolution de l'analyse économique de la responsabilité légale des entreprises. Les firmes peuvent faire l'objet, selon la nature des actes commis, à une responsabilité civile ou pénale ; et la responsabilité peut porter sur les employés ou sur la personne morale de l'entreprise. Nous avons mis en évidence comment ce double arbitrage est abordé dans le cadre d'analyse de l'économie du droit, et quels sont les effets attendus des arbitrages rendus sur le comportement des entreprises. Nous avons également souligné l'existence de sanctions non légales dans le système de contraintes qui façonne les décisions des entreprises. Nous avons, à ce propos, fourni plusieurs exemples de sanctions monétaires qui peuvent émaner des parties prenantes, lorsque l'entreprise dévie de leurs attentes sociales. Ainsi, ce premier chapitre montre que des sanctions légales et non légales peuvent peser sur les firmes lorsque celles-ci dévient des prescriptions des règles de droit ou des normes sociales. Néanmoins, les sanctions non légales peuvent être de trop faible ampleur pour servir d'incitations aux entreprises, ou les conditions nécessaires à leur expression - comme l'observabilité du

comportement des firmes - peuvent ne pas être réunies. De ce fait, des politiques d'accompagnement sont mises en oeuvre afin d'accroître le rôle de cette régulation par les acteurs du marché. Nous nous sommes attelés à décrire les différentes politiques mises en oeuvre, et les conséquences possibles de ces politiques sur le marché. En nous appuyant sur des travaux théoriques existants, nous avons identifié que les politiques d'accompagnement des sanctions non légales peuvent, contrairement à leurs objectifs, en réduire l'impact. Dans ce chapitre, nous défendons donc l'idée qu'il existe des interactions entre le droit et les sanctions non légales, et que la compréhension de ces deux éléments normatifs est nécessaire pour une meilleure régulation des activités productives. C'est dans cette démarche que nous inscrivons les chapitres suivants de cette thèse, qui se partagent entre l'approfondissement de l'analyse traditionnelle des règles de responsabilité d'une part, et l'étude du rôle des sanctions non légales aux côtés de la responsabilité civile d'autre part.

Dans le second chapitre, nous avons donc approfondi l'analyse standard de la responsabilité délictuelle, en mettant en évidence les effets incitatifs de la notion juridique de causalité. La causalité est un des éléments qui permet d'attribuer la responsabilité à l'auteur d'un dommage. En effet, lorsqu'une victime demande la réparation d'un dommage, trois conditions doivent être réunies qui sont : le fait générateur, l'existence d'un dommage, et le lien de causalité entre ces deux précédents éléments. Toutefois, nous avons montré qu'il existe de multiples manières de définir la causalité. Il est donc nécessaire de comprendre quels sont les effets incitatifs potentiels de la causalité sur le comportement des entreprises. Notre modèle a comme particularité de montrer l'imprévisibilité qui caractérise les activités productives. En effet, dans ce modèle, la mise en oeuvre d'un niveau élevé de prévention ne garantit pas l'absence d'accident. Le risque zéro n'existe pas, et, l'occurrence d'un accident dépend certes du niveau de prévention engagé, mais aussi de l'état de la nature, qu'on ne peut connaitre au moment des décisions de production et de prévention. C'est dans ce cadre que notre analyse théorique examine dans quelle mesure la notion de causalité a un effet dissuasif sur le comportement des auteurs de délits, en particulier dans les situations où la

responsabilité délictuelle peut fournir des incitations sous-optimales. En particulier, nous analysons les situations caractérisées par (i) les problèmes de responsabilité limitée ou, (ii) l'incertitude sur le niveau réel de prévention adopté par l'entreprise. Dans des situations simples, tels que décrits dans le modèle standard, notre analyse montre que l'exigence du lien de causalité conduit à des incitations efficaces. Cependant, dans les situations où il y a des incitations sous-optimales, la réponse est plus complexe. Tout d'abord, dans le cas de la responsabilité limitée, éliminer la condition de causalité induit de plus grandes incitations à investir dans des dispositifs de prévention. Enfin, lorsque l'observabilité du niveau de prévention est imparfaite, afin de maximiser les effets dissuasifs fournis par le régime de responsabilité civile, l'exigence de causalité devrait se décomposer en deux dimensions : d'une part, la responsabilité doit être attribuée si le niveau d'activité est une condition sine qua non de l'accident, et d'autre part, le niveau de prévention doit être évalué avec une notion probabiliste de la causalité.

Dans le chapitre 3, nous avons mis en évidence les effets des difficultés d'évaluation des risques sur la fonction de dissuasion des régimes de responsabilité. Nous avons d'abord présenté un modèle théorique d'accident unilatéral où l'entreprise, génératrice de risque, doit décider du niveau de prévention qu'elle souhaite mettre en oeuvre pour diminuer l'ampleur des dommages potentiels d'un accident, ainsi que la couverture d'assurance en responsabilité civile pour les dommages et intérêts éventuels auxquels elle pourrait faire face. C'est dans ce cadre théorique que nous avons comparé l'effet dissuasif des responsabilités pour faute et objective. Nous avons rappelé que lorsque la probabilité d'occurrence d'un accident est parfaitement connue, conformément à l'analyse standard de la responsabilité délictuelle, les responsabilités pour faute et objective fournissent des incitations équivalentes à adopter le niveau de prévention socialement optimal. Puis, nous avons démontré qu'en présence d'ambiguïté sur la probabilité de l'accident, cette équivalence entre les deux régimes de responsabilité est rompue. Les prédictions théoriques indiquent que la responsabilité pour faute continuerait à fournir des incitations optimales, tandis que

le comportement des agents serait plus erratique en présence de responsabilité objective. Puis, nous avons testé ces prédictions théoriques au moyen d'un protocole expérimental original, qui reproduit fidèlement les caractéristiques de notre modèle. Notre analyse des résultats expérimentaux confirme que la responsabilité pour faute permet de mieux orienter le comportement des entreprises dans des contextes caractérisés par des connaissances imprécises sur les risques d'accident. Néanmoins, nos résultats indiquent, pour la première fois dans la littérature, que la responsabilité pour faute permet aussi, de façon significative, d'atteindre l'optimum social dans un contexte d'informations précises sur les risques, alors que la responsabilité objective peine à faire atteindre un niveau de prévention socialement désirable.

Ces deux premiers chapitres invitent à développer l'analyse économique standard de la responsabilité délictuelle des entreprises, au regard des évolutions technologiques qui peuvent être caractérisées par une imprévisibilité de leurs conséquences. Nous avons montré que l'élaboration d'un régime de responsabilité optimal ne pouvait se penser comme étant la rédaction d'un régime unique, valable pour toutes les entreprises et en toutes situations. Par exemple, des préconisations différentes sont émises dans le chapitre 2, selon que l'on fasse face à un problème de responsabilité limitée ou un problème d'observabilité du niveau de prévention. Il est donc nécessaire de développer l'analyse théorique de la responsabilité délictuelle, en prenant en considération les éléments qui caractérisent le contexte de décision des entreprises. Cependant, l'approche expérimentale développée dans le chapitre 3 nous indique qu'il faut rester mesuré quant aux recommandations de politiques publiques que l'on pourrait faire à partir de ces analyses théoriques. En effet, même dans le cadre contrôlé des expériences de laboratoire, les individus ne semblent pas réagir en tout point conformément à ce que prédisent nos modèles théoriques. Une démarche alliant approches théoriques et expérimentales nous semble alors cruciale pour mieux cerner les effets régulateurs du droit.

Dans le chapitre 4, nous avons mis en évidence le rôle limité que peuvent avoir les sanctions non légales aux côtés de la responsabilité civile, pour la régulation des risques issus des activités productives. Nous nous sommes concentrés sur une sanction monétaire particulière, qui est le boycott des consommateurs. Nous avons construit un modèle théorique, où nous avons supposé que l'ensemble des consommateurs étaient dotés de motivations morales. Ils ont intériorisé une norme sociale, selon laquelle un niveau de prévention élevé doit être mis en oeuvre, afin d'éviter au maximum d'occasionner des accidents. Bien que forte, cette hypothèse nous a permis d'élaborer une analyse dans le cas le plus favorable à l'émergence de sanctions monétaires. Dans ce modèle, le niveau de prévention n'était pas directement observable par les consommateurs. Des informations sur le comportement des entreprises pouvaient toutefois être délivrées par les décisions de justice rendues après l'occurence d'accidents. Nous nous sommes interessés aux comportements des consommateurs et des entreprises, en fonction des signaux publics émis par les cours de justice. Le modèle montre que les signaux émis par un régime de responsabilité pour faute favorisent l'émergence de hauts niveaux de prévention, mais seulement pour des niveaux élevés de dispositions à payer des consommateurs pour un comportement socialement responsable. La responsabilité objective ne parvient, au mieux, qu'à faire émerger un équilibre en stratégie mixte d'investissement dans des niveaux de prévention élevés. Ainsi, nous avons montré que les sanctions non légales n'ont un effet réellement dissuasif que si les sanctions monétaires sont suffisamment élevées d'une part, et si le dispositif de signaux publics reflète les caractéristiques du régime de responsabilité pour faute d'autre part.

Le dernier chapitre a mis en évidence l'ampleur réelle des sanctions non légales qui émanent des consommateurs. En utilisant les données de l'"*European Social Survey*" (2010), nous avons montré qu'en Europe, un individu sur cinq déclare avoir participé à un boycott de consommateur. Néanmoins, nous avons vu que cette propension à boycotter varie grandement d'un pays à l'autre. Par une étude économétrique, nous avons voulu comprendre si cette hétérogénéité émanait de différences de caractéristiques individuelles, ou

des différences au niveau pays. Plus particulièrement, nous nous sommes interrogés sur le rôle de la confiance dans les institutions au niveau individuel, et de la qualité des institutions au niveau macro-économique. En effet, nous avons montré dans notre revue de la littérature, que la confiance individuelle dans les institutions politiques est reconnue comme un facteur explicatif de la propension à boycotter. Cependant, à notre connaissance, aucune recherche n'a distingué le rôle des croyances individuelles d'une part et de la qualité objective des institutions d'autre part. Par ailleurs, à côté de la confiance dans les institutions politiques, nous avons souhaité explorer le rôle des institutions judiciaires. En effet, nous voulions tester l'intuition selon laquelle le boycott est un substitut à l'appel à des institutions judiciaires dans des situations où elles ne sont pas jugées dignes de confiance par la société civile. Les résultats montrent que la confiance dans les institutions politiques et la confiance dans les institutions judiciaires ont des effets différents au niveau micro-économique sur la propension individuelle à boycotter. Alors que l'association est négative entre la confiance politique et le boycott, le relation entre la confiance judiciaire et la propension individuelle à se joindre au boycott des consommateurs est en forme de U. L'analyse de données confirme également des effets significatifs du capital social et de certaines caractéristiques socio-démographiques au niveau individuel. Par ailleurs, au niveau macro-économique, la qualité des institutions est corrélée positivement avec la propension individuelle à boycotter. L'étude économétrique documente également un effet de groupe endogène. En effet, le comportement moyen du pays en matière de boycott des consommateurs influence la décision individuelle de participation.

L'objectif de cette thèse était de mettre en évidence les effets de la responsabilité délictuelle sur le comportement des entreprises, en utilisant les outils traditionnels de l'analyse économique du droit. Si nous avons pu étudier les mécanismes de la responsabilité dans deux contextes qui sont l'imprévisibilité des risques et la présence de sanctions non légales, d'autres pistes de recherche restent à explorer dans le futur.

Tout d'abord, il nous semble opportun d'explorer l'analyse expérimentale des règles de res-

ponsabilité, qu'elles concernent le domaine pénal ou civil. En effet, notre chapitre 3 nous a montré que les prédictions théoriques que nous développons ne reflètent pas toujours le comportement observé en laboratoire. Nous souhaitons faire le pont entre analyse théorique et expérimentale afin d'améliorer le pouvoir prédictif des modèles théoriques en analyse économique du droit. En particulier, l'élaboration d'expérimentations contrôlées nous permettrait de mieux cerner les interactions entre règles légales et sanctions non légales, à l'image des études qui ont déjà été réalisées sur les jeux de contribution au bien public. Par ailleurs, sans introduire les sanctions non légales, on sait aussi qu'il n'y a encore que peu de tests expérimentaux des règles de responsabilité. Nous pouvons alors, sur la base du protocole que nous avons élaboré pour cette thèse, évaluer comment la modification du contexte de décision vient modifier les incitations fournies par les régimes de responsabilité. Nous souhaitons notamment tester, expérimentalement, comment les problèmes de responsabilité limitée affectent le comportement des agents. Toutefois, même si ces expérimentations en laboratoire contribueraient à améliorer notre connaissance des mécanismes de responsabilité par un aller-retour entre preuves empiriques et théorie, il nous faut rester attentif à ce que l'on peut en déduire, ou non, en termes de politiques publiques. La validité externe d'expérimentations sur des règles de droit, telles que celles menées dans cette thèse, n'est pas assurée, tant le contexte de décision des agents économiques est complexe. Par ailleurs, cette thèse a mis l'accent sur les sanctions négatives qui peuvent émaner des consommateurs, avec un focus particulier sur le phénomène de boycott. Nous savons cependant que des sanctions positives peuvent aussi émaner des parties prenantes, via notamment le phénomène de "*buycott*", qui consiste à promouvoir l'achat d'un produit pour des raisons éthiques, environnementales ou sociales. Nous avons donc écarté de notre thèse les questions relatives au commerce équitable et à la certification écologique par exemple. Afin d'approfondir notre réflexion sur le rôle des sanctions non légales, il nous semble aussi important d'apporter un éclairage à la fois théorique et empirique sur ces caractéristiques de la qualité des biens et des services.

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Bibliographie

[1] Mohammed Abdellaoui, Aurelien Baillon, Laetitia Placido, and Peter Wakker. The rich domain of uncertainty : Source functions and their experimental implementation. *American Economic Review*, 101(2) :695–723, 2011.

[2] Steffen Altmann, Thomas Dohmen, and Matthias Wibral. Do the reciprocal trust less ? *Economics Letters*, 99(3) :454–457, June 2008.

[3] James Andreoni. Giving with impure altruism : Applications to charity and ricardian equivalence. *The Journal of Political Economy*, 97(6) :1447–1458, December 1989.

[4] James Andreoni and John Miller. Giving according to garp : An experimental test of the consistency of preferences for altruism. *Econometrica*, 70(2) :737–753, 2002.

[5] Vera Angelova, Olivier Armantier, Giuseppe Attanasi, and Yolande Hiriart. Relative performance of liability rules : experimental evidence. *Theory and Decision*, 77(4) :531–556, December 2014.

[6] Jennifer Arlen. The potentially perverse effects of corporate criminal liability. *The Journal of Legal Studies*, 23(2) :833–867, June 1994.

[7] Jennifer Arlen and Reinier H. Kraakman. Controlling corporate misconduct : An analysis of corporate liability regimes. *NYU Law Review*, 72 :687, 1997.

[8] Seema Arora and Shubhashis Gangopadhyay. Toward a theoretical model of voluntary overcompliance. *Journal of Economic Behavior & Organization*, 28(3) :289–309, December 1995.

[9] Vladimir Atanasov, Vladimir Ivanov, and Kate Litvak. Does reputation limit opportunistic behavior in the vc industry ? evidence from litigation against vcs. *The Journal of Finance*, 67(6) :2215–2246, 2012.

[10] Mark Bagnoli and Susan G. Watts. Selling to socially responsible consumers : Competition and the private provision of public goods. *Journal of Economics & Management Strategy*, 12(3) :419–445, 2003.

[11] Mark Bagnoli and Susan G Watts. Selling to socially responsible consumers : Competition and the private provision of public goods. *Journal of Economics & Management Strategy*, 12(3) :419–445, 2003.

[12] Scott Baker and Albert Choi. Managing reputation with litigation : Why legal sanctions can work better than market sanctions ? *Virginia Law and Economics Research Paper*, 2, 2013.

[13] Scott Baker and Albert Choi. Reputation and litigation : Using formal sanctions to control informal sanctions. 2013.

[14] Scott Baker and Albert Choi. Crowding in : How formal sanctions can facilitate informal sanctions. *Virginia Law and Economics Research Paper*, (2014-01), 2014.

[15] Scott Baker and Albert Choi. Promoting long-term relationships through costly litigation. *Virginia Law and Economics Research Paper*, (2013-02), 2014.

[16] Bernard Barber. *The Logic and Limits of Trust.* 1983.

[17] David P. Baron. Private politics, corporate social responsibility, and integrated strategy. *Journal of Economics & Management Strategy*, 10(1) :7–45, 2001.

[18] David P. Baron. Corporate social responsibility and social entrepreneurship. *Journal of Economics & Management Strategy*, 16(3) :683–717, 2007.

[19] David P. Baron. Managerial contracting and corporate social responsibility. *Journal of Public Economics*, 92(1-2) :268–288, February 2008.

[20] David P. Baron. Morally motivated self-regulation. *The American Economic Review*, 100(4) :1299–1329, 2010.

[21] David P. Baron, Maretno Agus Harjoto, and Hoje Jo. The economics and politics of corporate social performance. *Business and Politics*, 13(2), 2011.

[22] Cesare Beccaria. *Des délits et des peines.* Les livres qui ont changé le monde. Flammarion, 2010.

[23] Gary S. Becker. Crime and punishment : An economic approach. *Journal of Political Economy*, 76(2) :169–217, March 1968.

[24] David Beetham. *The legitimation of power.* Macmillan, 1991.

[25] Omri Ben-Shahar. Causation and foreseeability. In *Encyclopedia of Law and Economics, Vol.1, Second Edition*, pages 83–108. 2009.

[26] Roland Bénabou and Jean Tirole. Incentives and prosocial behavior. *The American Economic Review*, 96(5) :1652–1678, 2006.

[27] Roland Bénabou and Jean Tirole. Individual and corporate social responsibility. *Economica*, 77(305) :1–19, 2010.

[28] Roland Bénabou and Jean Tirole. Laws and norms. Working Paper 17579, National Bureau of Economic Research, November 2011.

[29] Jeremy Bentham and Étienne Dumont. *Théorie des peines et des récompenses : ouvrage extrait des manuscrits de M. Jérémie Bentham, jurisconsulte anglais*. Bossange, Paris, France, 1825.

[30] Jan Bentzen and Valdemar Smith. French nuclear testings and consumption of french wine in denmark. *International Journal of Wine Marketing*, 14(3) :20–36, 2002.

[31] B. Douglas Bernheim. A theory of conformity. *The Journal of Political Economy*, 102(5) :841–877, October 1994.

[32] Sanjai Bhagat, John Bizjak, and Jeffrey L Coles. The shareholder wealth implications of corporate lawsuits. *Financial Management*, pages 5–27, 1998.

[33] Thomas Bue Bjorner, Lars Garn Hansen, and Clifford S. Russell. Environmental labeling and consumers' choice – an empirical analysis of the effect of the nordic swan. *Journal of Environmental Economics and Management*, 47(3) :411–434, May 2004.

[34] Mariana Blanco, Dirk Engelmann, and Hans Theo Normann. A within-subject analysis of other-regarding preferences. *Games and Economic Behavior*, 72(2) :321–338, June 2011.

[35] Michael Blowfield. Corporate social responsibility : reinventing the meaning of development ? *International Affairs*, pages 515–524, 2005.

[36] Iris Bohnet and Robert D. Cooter. Expressive law : Framing or equilibrium selection ? *UC Berkeley Public Law Research Paper*, No. 138.

[37] Jean-Paul Bozonnet. Boycott et «buycott» en europe. écocitoyenneté et culture libérale. *Sociologies pratiques*, 20 :37–50, 2010.

[38] Kjell Arne Brekke and Karine Nyborg. Attracting responsible employees : Green production as labor market screening. *Resource and Energy Economics*, 30(4) :509–526, December 2008.

[39] William A. Brock and Steven N. Durlauf. Discrete choice with social interactions. *The Review of Economic Studies*, 68(2) :235–260, January 2001.

[40] William A. Brock and Steven N. Durlauf. Identification of binary choice models with social interactions. *Journal of Econometrics*, 140(1) :52–75, September 2007.

[41] John Prather Brown. Toward an economic theory of liability. *The Journal of Legal Studies*, 2(2), June 1973.

[42] John Prather Brown. Toward an economic theory of liability. *The Journal of Legal Studies*, 2(2) :pp. 323–349, 1973.

[43] John K. Butler. Toward understanding and measuring conditions of trust : Evolution of a conditions of trust inventory. *Journal of management*, 17(3) :643–663, 1991.

[44] Laure Cabantous and Denis Hilton. De l'aversion à l'ambiguïté aux attitudes face à l'ambiguïté : Les apports d'une perspective psychologique en économie. *Revue économique*, 57(2) :259, 2006.

[45] Guido Calabresi. *The costs of accidents : a legal and economic analysis.* Yale University Press, 1970.

[46] Guido Calabresi. Concerning cause and the law of torts : An essay for harry kalven, jr. *The University of Chicago Law Review*, pages 69–108, 1975.

[47] Colin Camerer. *Behavioral Game Theory : Experiments in Strategic Interaction.* Princeton University Press, March 2003.

[48] Colin Camerer and Richard H. Thaler. Anomalies : Ultimatums, Dictators and Manners. *The Journal of Economic Perspectives*, 9(2) :209–219, April 1995.

[49] Colin Camerer and Martin Weber. Recent developments in modeling preferences : Uncertainty and ambiguity. *Journal of Risk and Uncertainty*, 5(4) :325 – 370, 1992.

[50] E. Carbonara and A. Ogus. Self-regulation. In *Encyclopedia of Law and Economics.* Edward Elgar.

[51] Emanuela Carbonara, Francesco Parisi, and Georg von Wangenheim. Inexpressive law. text No 201010, Philipps-Universität Marburg, 2010.

[52] Jean Carbonnier. *Droit Civil. Tome 4, Les Obligations, 22ème édition.* Presses Universitaires de France - PUF, Paris, January 2000.

[53] J. Carson, K. McCullough, and D. Poose. Deciding whether to invest in mitigation measures : Evidence from florida. *The Journal of Risk and Insurance*, 80(2) :309–327, 2013.

[54] Sujoy Chakravarty and Jaideep Roy. Recursive expected utility and the separation of attitudes towards risk and ambiguity : an experimental study. *Theory and Decision*, 66(3) :199–228, 2009.

[55] Surajeet Chakravarty and David Kelsey. Ambiguity and Accident Law. 2011.

[56] Larry Chavis and Phillip Leslie. Consumer boycotts : the impact of the iraq war on french wine sales in the us. *QME*, 7(1) :37–67, 2009.

[57] R. H. Coase. The problem of Social Cost. *Journal of Law & Economics*, 3 :1, 1960.

[58] Robert Cooter. Expressive law and economics. *Journal of Legal Studies*, 27(2) :585–608, 1998.

[59] Robert Cooter and Ariel Porat. Should courts deduct nonlegal sanctions from damages ? *The Journal of Legal Studies*, 30(2) :401–422, 2001.

[60] Robert D. Cooter. Three effects of social norms on law : Expression, deterrence, and internalization. *Oregon Law Review*, 79 :1, 2000.

[61] Giacomo Corneo and Olivier Jeanne. Conspicuous consumption, snobbism and conformism. *Journal of Public Economics*, 66(1) :55–71, October 1997.

[62] C. Courbage. Self-insurance, self-protection and market insurance within the dual theory of choice. *The Geneva Papers on Risk and Insurance*, 26(1) :43–56, 2001.

[63] Maurice Cusson. *Pourquoi punir ?* Dalloz, impr. 1987, Paris, France, 1987.

[64] Russell Dalton. J.(2004) : Democratic challenges, democratic choices : the erosion of political support in advanced industrial democracies.

[65] Wallace N. Davidson, Dan L. Worrell, and Abuzar El-Jelly. Influencing managers to change unpopular corporate behavior through boycotts and divestitures a stock market test. *Business & Society*, 34(2) :171–196, 1995.

[66] Bruno Deffains and Dominique Demougin. Class actions, compliance and moral cost.

[67] Bruno Deffains and Claude Fluet. Legal liability when individuals have moral concerns. Cahiers de recherche 0951, CIRPEE, 2009.

[68] Philippe Delacote and Claire Montagné-Huck. Political consumerism and public policy : Good complements against market failures ? *Ecological Economics*, 73 :188–193, 2012.

[69] Deborah Doane and N Abasta-Vilaplana. The myth of csr. *Stanford Social Innovation Review*, 3(3) :22–29, 2005.

[70] Nicholas Dopuch, Daniel E. Ingberman, and Ronald R. King. An experimental investigation of multi-defendant bargaining in "joint and several" and proportionate liability regimes. *Journal of Accounting and Economics*, 23(2) :189 – 221, 1997.

[71] Nicholas Dopuch and Ronald R. King. Negligence versus strict liability regimes in auditing : An experimental investigation. *Accounting Review*, 67(1) :97 – 120, 1992.

[72] Henry W. Edgerton. Legal cause. *University of Pennsylvania Law Review and American Law Register*, pages 211–244, 1924.

[73] Daniel Ellsberg. Risk, Ambiguity, and the Savage Axioms. *The Quarterly Journal of Economics*, 75(4) :643, November 1961.

[74] Richard A. Epstein. A theory of strict liability. *The Journal of Legal Studies*, pages 151–204, 1973.

[75] Armin Falk and Urs Fischbacher. A theory of reciprocity. *Games and economic behavior*, 54(2) :293–315, 2006.

[76] Ernst Fehr and Klaus M. Schmidt. *Handbook on the Economics of Giving, Reciprocity and Altruism.* 2006.

[77] Daniel R. Fischel and Alan O. Sykes. Corporate crime. *The Journal of Legal Studies*, 25(2) :319–49, 1996.

[78] Pierre Fleckinger and Matthieu Glachant. Negotiating a voluntary agreement when firms self-regulate. *Journal of Environmental Economics and Management*, 62(1) :41–52, 2011.

[79] Pierre Fleckinger and Matthieu Glachant. Negotiating a voluntary agreement when firms self-regulate. *Journal of Environmental Economics and Management*, 62(1) :41–52, 2011.

[80] Robert Forsythe, Joel L. Horowitz, N. E. Savin, and Martin Sefton. Fairness in Simple Bargaining Experiments. *Games and Economic Behavior*, 6(3) :347–369, May 1994.

[81] Luigi A. Franzoni. Liability Law and Uncertainty Spreading. *Available at SSRN 2432861*, 2014.

[82] Monroe Friedman. *Consumer boycotts : effecting change through the marketplace and the media.* Routledge, 1999.

[83] Deborah Frisch and Jonathan Baron. Ambiguity and rationality. *Journal of Behavioral Decision Making*, 1(3) :149–157, 1988.

[84] Edward L Glaeser, Rafael La Porta, Florencio Lopez-de Silanes, and Andrei Shleifer. Do institutions cause growth ? *Journal of economic Growth*, 9(3) :271–303, 2004.

[85] Gneezy and Rustichini. A fine is a price. *The Journal of Legal Studies*, 2000.

[86] Mark F. Grady. A new positive economic theory of negligence. *Yale Law Journal*, pages 799–829, 1983.

[87] Mark F. Grady. Proximate cause and the law of negligence. *Iowa L. Rev.*, 69 :363, 1983.

[88] Mark F. Grady. Untaken precautions. *The Journal of Legal Studies*, pages 139–156, 1989.

[89] Leon Green. Duties, risks, causation doctrines. *Tex. L. Rev.*, 41 :42, 1962.

[90] Werner Güth, Rolf Schmittberger, and Bernd Schwarze. An experimental analysis of ultimatum bargaining. *Journal of Economic Behavior & Organization*, 3(4) :367–388, December 1982.

[91] Scott E. Harrington and Patricia M. Danzon. The economics of liability insurance. In Georges Dionne, editor, *Handbook of Insurance*, number 22 in Huebner International Series on Risk, Insurance, and Economic Security, pages 277–313. Springer Netherlands, 2000.

[92] Glenn W. Harrison, Eric Johnson, Melayne M. McInnes, and E. Elisabet Rutström. Risk aversion and incentive effects : Comment. *American Economic Review*, 95(3) :897 – 901, 2005.

[93] Herbert Lionel Adolphus Hart and Tony Honoré. *Causation in the Law.* Oxford University Press, 1985.

[94] Robert Heinkel, Alan Kraus, and Josef Zechner. The effect of green investment on corporate behavior. *Journal of Financial and Quantitative Analysis*, 36(04) :431–449, 2001.

[95] Edward Adamson Hoebel. *The law of primitive man : a study in comparative legal dynamics.* Harvard University Press, Cambridge (Mass.), Etats-Unis d'Amérique, 1954.

[96] Stefan Hoffmann and Stefan Müller. Consumer boycotts due to factory relocation. *Journal of Business Research*, 62(2) :239–247, 2009.

[97] Charles A Holt and Susan K Laury. Risk aversion and incentive effects. *American economic review*, 92(5) :1644–1655, 2002.

[98] Marc Hooghe and Dietlind Stolle. *Generating Social Capital : Civil Society and Institutions in Comparative Perspective.* Palgrave Macmillan, May 2003.

[99] Mike Hough, Jonathan Jackson, and Ben Bradford. *Legitimacy, trust and compliance : an empirical test of procedural justice theory using the European social survey.* Yale University Press, 2013.

[100] Keith N. Hylton and Haizhen Lin. Negligence, causation, and incentives for care. *International Review of Law and Economics*, 35 :80–89, 2013.

[101] Jonathan Jackson, Ben Bradford, Mike Hough, Jouni Kuha, Sally Stares, Sally Widdop, Rory Fitzgerald, Maria Yordanova, and Todor Galev. Developing european indicators of trust in justice. *European Journal of Criminology*, 8(4) :267–285, January 2011.

[102] Maarten C. W. Janssen and Ewa Mendys-Kamphorst. The price of a price : on the crowding out and in of social norms. *Journal of Economic Behavior & Organization*, 55(3) :377–395, November 2004.

[103] Rhys Jenkins. Globalization, corporate social responsibility and poverty. *International affairs*, 81(3) :525–540, 2005.

[104] Jennifer Arlen. Economic analysis of corporate criminal liability : Theory and evidence. In *Research Handbook on Criminal Law*, pages 144–203. Edward Elgar, 2012.

[105] Robert H. Jerry and Douglas R. Richmond. *Understanding Insurance Law.* LexisNexis, 2012.

[106] Dan M. Kahan. Social meaning and the economic analysis of crime. *The Journal of Legal Studies*, 27(2) :609–22, 1998.

[107] Marcel Kahan. Causation and incentives to take care under the negligence rule. *J. Legal Stud.*, 18 :427, 1989.

[108] Immanuel Kant. *Fondements de la métaphysique des moeurs.* Les Intégrales de philo, ISSN 0754-4537 ; 8. Nathan, Paris, France, 2004.

[109] Robert E. Keeton. Basic text on insurance law. 1971.

[110] W. Page Keeton, Dan B. Dobbs, Robert E. Keeton, and David G. Owen. *Prosser and Keeton on the Law of Torts.* St Paul, Minn : West Publishing Co, 1984.

[111] V. S. Khanna. Corporate criminal liability : What purpose does it serve. *Harvard Law Review*, 109 :1477, 1995.

[112] V. S. Khanna. Corporate liability standards : When should corporations be held criminally liable. *American Criminal Law Review*, 37 :1239, 2000.

[113] Ronald R. King and Rachel Schwartz. Legal penalties and audit quality : An experimental investigation. *Contemporary Accounting Research*, 16(4) :685 – 710, 1999.

[114] Ronald R. King and Rachel Schwartz. An experimental investigation of auditors' liability : Implications for social welfare and exploration of deviations from theoretical predictions. *Accounting Review*, 75(4) :429, 2000.

[115] Jill Gabrielle Klein, N. Craig Smith, and Andrew John. Why we boycott : consumer motivations for boycott participation. *Journal of Marketing*, 68(3) :92–109, 2004.

[116] Peter Klibanoff, Massimo Marinacci, and Sujoy Mukerji. A smooth model of decision making under ambiguity. *Econometrica*, 73(6) :1849–1892, 2005.

[117] Paul Sergius Koku, Aigbe Akhigbe, and Thomas M Springer. The financial impact of boycotts and threats of boycott. *Journal of Business Research*, 40(1) :15–20, 1997.

[118] K. Konrad and S. Skaperdas. Self-insurance and self-protection : A non-expected utility analysis. *The Geneva Papers on Risk and Insurance Theory*, 18 :131–146, 1993.

[119] Lewis Kornhauser and Andrew Schotter. An experimental study of single-actor accidents. *The Journal of Legal Studies*, 19(1) :pp. 203–233, 1990.

[120] Lewis A. Kornhauser. An economic analysis of the choice between enterprise and personal liability for accidents. *California Law Review*, 70(6) :1345–1392, December 1982.

[121] Reinier H. Kraakman. Vicarious and corporate civil liability. In *Encyclopedia of Law and Economics*. Boudewijn Bouckaert and Gerrit De Geest.

[122] Dorothea Kübler. On the regulation of social norms. *Journal of Law, Economics, and Organization*, 17(2) :449 –476, October 2001.

[123] William M. Landes and Richard A. Posner. Causation in tort law : An economic approach. *The Journal of Legal Studies*, pages 109–134, 1983.

[124] William M. Landes and Richard A. Posner. *The economic structure of tort law*. Harvard University Press, 1987.

[125] Jean-Philippe Lévy and André Castaldo. *Histoire du droit civil*. Dalloz, Paris, France, 2010.

[126] Gerard E. Lynch. The role of criminal law in policing corporate misconduct. *Law and Contemporary Problems*, 60(3) :23–65, July 1997.

[127] Wex S. Malone. Ruminations on cause-in-fact. *Stanford Law Review*, pages 60–99, 1956.

[128] Pierre Manent. *Cours Familier de Philosophie Politique*. 2001.

[129] Charles F. Manski. Identification of endogenous social effects : The reflection problem. *The Review of Economic Studies*, 60(3) :531–542, January 1993.

[130] Stephen Marks. Discontinuities, causation, and grady's uncertainty theorem. *J. Legal Stud.*, 23 :287, 1994.

[131] Richard H. McAdams. The origin, development, and regulation of norms. *Michigan Law Review*, 96(2) :338–433, November 1997.

[132] Richard H. McAdams and Eric B. Rasmusen. Norms in law and economics. Technical report, Indiana University, Kelley School of Business, Department of Business Economics and Public Policy, 2004.

[133] Mary Coate McNeely. Illegality as a factor in liability insurance. *Columbia Law Review*, 41(1) :26–60, January 1941.

[134] Daniel Metlay. Institutional trust and confidence : A journey into a conceptual quagmire. *Social trust and the management of risk*, pages 100–116, 1999.

[135] Taciano L. Milfont and John Duckitt. The environmental attitudes inventory : A valid and reliable measure to assess the structure of environmental attitudes. *Journal of Environmental Psychology*, 30(1) :80 – 94, 2010.

[136] Charles-Louis de Secondat Montesquieu. *De l'esprit des lois. 1.* Classiques Garnier, ISSN 0750-2176. Garnier, Paris, France, 1973.

[137] Michael Moore. Causation in the criminal law. In *The Oxford Handbook of Philosophy of Criminal Law*, pages 168–193. 2011.

[138] Sally Falk Moore. Legal Liability and Evolutionary Interpretation. In *The Allocation of Responsibility.* Manchester university press edition, 1972.

[139] Risako Morimoto, John Ash, and Chris Hope. Corporate social responsibility audit : From theory to practice. *Journal of Business Ethics*, 62(4) :315–325, 2005.

[140] Wallace P. Mullin and Christopher M. Snyder. Targeting employees for corporate crime and forbidding their indemnification. *SSRN eLibrary*, April 2005.

[141] Lisa A. Neilson. Boycott or buycott ? understanding political consumerism. *Journal of Consumer Behaviour*, 9(3) :214–227, 2010.

[142] Lisa A. Neilson and Pamela Paxton. Social capital and political consumerism : A multilevel analysis. *Social Problems*, 57(1) :5–24, February 2010.

[143] Benjamin J. Newman and Brandon L. Bartels. Politics at the checkout line explaining political consumerism in the united states. *Political Research Quarterly*, 64(4) :803–817, December 2011.

[144] Karine Nyborg and Tao Zhang. Is corporate social responsibility associated with lower wages ? Memorandum 01/2011, Oslo University, Department of Economics, January 2011.

[145] Sharon Oded. Inducing corporate compliance : A compound corporate liability regime. *International Review of Law and Economics*, August 2011.

[146] F. Pannequin, A. Corcos, and C. Montmarquette. Insurance and self-insurance : Beyond substitutability, the mental accounting of losses ? *ARIA 2014 Annual Meeting, Seattle.*

[147] Richard G. Peters, Vincent T. Covello, and David B. McCallum. The determinants of trust and credibility in environmental risk communication : An empirical study. *Risk analysis*, 17(1) :43–54, 1997.

[148] Arthur Cecil Pigou. *The economics of welfare (1920).* Palgrave Macmillan, 2013.

[149] Jean Claude Planque. *La détermination de la personne morale pénalement responsable.* Thèse de doctorat, [s.n.], [S.l.], France, 2000.

[150] A. Mitchell Polinsky and Steven Shavell. The economic theory of public enforcement of law. *Journal of Economic Literature*, 38(1) :45–76, 2000.

[151] A. Mitchell Polinsky and Steven Shavell. Chapter 6 the theory of public enforcement of law. In *Handbook of Law and Economics*, volume Volume 1, pages 403–454. Elsevier, 2007.

[152] Richard A. Posner. Economic theory of the criminal law, an. *Columbia Law Review*, 85 :1193, 1985.

[153] Richard A Posner. Social norms, social meaning, and economic analysis of law : A comment. *Journal of Legal Studies*, 27 :553, 1998.

[154] Fabio Privileggi, Carla Marchese, and Alberto Cassone. Agent's liability versus principal's liability when attitudes toward risk differ. *International Review of Law and Economics*, 21(2) :181–195, 2001.

[155] Robert D. Putnam. *Bowling Alone : The Collapse and Revival of American Community.* Simon and Schuster, 2000.

[156] Todd Putnam and Timothy Muck. Wielding the boycott weapon for social change. 1991.

[157] Matthew Rabin. Incorporating fairness into game theory and economics. *The American Economic Review*, 83(5), December 1993.

[158] Michèle-Laure Rassat. *Droit pénal général*. Ellipses, impr. 2014, Paris, France, 2014.

[159] Ritva Reinikka and Jakob Svensson. Working for god ? *SSRN eLibrary*, January 2004.

[160] A. E. Roth. Bargaining Experiments. In *Handbook of Experimental Economics*, pages 253–348. John Kagel and Alvin E. Roth, princeton university press edition, 1995.

[161] Alvin E. Roth, Michael W. K. Malouf, and J. Keith Murnighan. Sociological versus strategic factors in bargaining. *Journal of Economic Behavior & Organization*, 2(2) :153–177, June 1981.

[162] Michael Rothschild and Joseph E Stiglitz. Increasing risk : I. a definition. *Journal of Economic theory*, 2(3) :225–243, 1970.

[163] Norbert Rouland. *Les modes juridiques de solution des conflits chez les Inuit*. Dép. d'anthropologie, Université Laval, 1979.

[164] H.B. Schafer and A. Schonenberger. Strict Liability versus Negligence. In *Encyclopedia of Law and Economics*. 1999.

[165] Kathleen Segerson and Tom Tietenberg. The structure of penalties in environmental enforcement : An economic analysis. *Journal of Environmental Economics and Management*, 23(2) :179–200, 1992.

[166] Henri Servaes and Ane Tamayo. The impact of corporate social responsibility on firm value : The role of customer awareness. *Management Science*, 59(5) :1045–1061, 2013.

[167] Qingyan Shang and Lung-fei Lee. Two-step estimation of endogenous and exogenous group effects. *Econometric Reviews*, 30(2) :173–207, 2011.

[168] Steven Shavell. An analysis of causation and the scope of liability in the law of torts. *The Journal of Legal Studies*, pages 463–516, 1980.

[169] Steven Shavell. Strict liability versus negligence. *The Journal of Legal Studies*, 9(1) :pp. 1–25, 1980.

[170] Steven Shavell. On the social function and the regulation of liability insurance. *The Geneva Papers on Risk and Insurance. Issues and Practice*, 25(2) :166–179, April 2000.

[171] Steven Shavell. Chapter 2 Liability for Accidents. In *Handbook of Law and Economics*, volume 1, pages 139–182. Elsevier, 2007.

[172] Steven Shavell. *Economic Analysis of Accident Law*. Harvard University Press, 2007.

[173] Steven Shavell. *Economic analysis of accident law.* Harvard University Press, 2009.

[174] Arthur Snow. Ambiguity aversion and the propensies for self-insurance and self-protection. *Journal of Risk and Uncertainty*, 42(1) :27–43, December 2010.

[175] Dietlind Stolle, Marc Hooghe, and Michele Micheletti. Politics in the supermarket : Political consumerism as a form of political participation. *International Political Science Review*, 26(3) :245–269, January 2005.

[176] Ivan Tchotourian. Aspects environnementaux et sociaux de la R.S.E. et management des entreprises : une éthique au centre et autour de l'entreprise. *Management & Avenir*, 10(4) :57–77, December 2006.

[177] Joshua C. Teitelbaum. A unilateral accident model under ambiguity. *The Journal of Legal Studies*, 36(2) :431–477, 2007.

[178] Siew Hong Teoh, Ivo Welch, and C. Paul Wazzan. The effect of socially activist investment policies on the financial markets : Evidence from the south african boycott. *The Journal of Business*, 72(1) :35–89, 1999.

[179] André Tunc. *Fault a common name for different misdeeds.* [S.l.], 1975.

[180] Jean-Robert Tyran and Dirk Engelmann. To buy or not to buy ? an experimental study of consumer boycotts in retail markets. *Economica*, 72(285) :1–16, February 2005.

[181] Carmen Valor. Can consumers buy responsibly ? analysis and solutions for market failures. *Journal of Consumer Policy*, 31(3) :315–326, 2008.

[182] Raymond Verdier. *La vengeance, 1ère partie, La vengeance dans les sociétés extra-occidentales, Livre 1.* Paris, France, editions cujas edition, 1980.

[183] Scott J. Vitell and Joseph G. P. Paolillo. A cross-cultural study of the antecedents of the perceived role of ethics and social responsibility. *Business Ethics : A European Review*, 13(2-3) :185â199, 2004.

[184] David Vogel. *The market for virtue : The potential and limits of corporate social responsibility.* Brookings Institution Press, 2007.

[185] Stefan Voigt. How (not) to measure institutions. *Journal of Institutional Economics*, 9(01) :1–26, 2013.

[186] Yoshinobu Zasu. Sanctions by Social Norms and the Law : Substitutes or Complements ? *The Journal of Legal Studies*, 36(2) :379–396, June 2007.

Résumé :

L'accélération du rythme des innovations technologiques et les pressions exercées par la société civile constituent deux défis majeurs pour le droit de la responsabilité civile. Cette thèse étudie les effets incitatifs de la responsabilité civile sur le comportement de prévention des entreprises dans ce contexte. Notre contribution vise, en particulier, à approfondir l'analyse traditionnelle de la responsabilité civile des entreprises d'une part, et d'autre part à évaluer dans quelle mesure les sanctions non légales jouent un rôle au côté de ce cadre juridique. D'abord, nous mettons en évidence l'évolution de l'analyse économique de la responsabilité. Puis nous étudions la responsabilité civile dans un modèle théorique, avec pour contribution d'évaluer les effets incitatifs du concept juridique de causalité. Ensuite, nous examinons comment les difficultés de prévision des risques d'accident affectent les incitations fournies par la responsabilité civile, par un modèle théorique d'une part, et par une expérimentation en laboratoire d'autre part. Nous développons dans un modèle théorique une analyse du rôle des sanctions non légales, émanant de la société civile, aux côtés de la responsabilité délictuelle. Nous montrons que les incitations fournies par le boycott des consommateurs sur le comportement de prévention des entreprises sont limitées. Enfin, nous complétons ce modèle par une étude empirique, et nous étudions l'ampleur et les déterminants du phénomène de boycott des consommateurs en Europe.

Mots-clés :

Ambiguïté, boycott, causalité, confiance institutionnelle, prévention, responsabilité civile, responsabilité sociale de l'entreprise

Abstract :

The accelerating pace of technological innovations and pressures from civil society provide tort law with new challenges. This thesis studies the incentive effects of tort law on corporate investment in prevention in this context. Particularly, this study deepens the traditional economic analysis of corporate civil liability and assess the effects of the combination of non legal sanctions and the legal framework. First, we highlight the evolution of the economic analysis of liability and responsibility. Then, we study the incentive effects of civil liability in a theoretical model, with a particular emphasis on the role of the legal notion of causality. Next, we examine to what extent the difficulties of predicting accident risks affect incentives provided by liability with both a theoretical model and with a lab experiment. In a theoretical model, we develop an analysis of the role of non-legal sanctions, from civil society, alongside the tort law. We show that the incentive effects of consumer boycott on corporate investment in prevention are limited. Finally, through an empirical study, we complete this analysis by studying the magnitude and determinants of consumer boycott in Europe.

Keywords :

Ambiguity, boycott, causality, care, institutional trust, civil liability, corporate social responsability