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THÈSE

Pour obtenir le grade de Docteur en Finance

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External Sources of Information, Managerial Learning and Investment Decisions of Firms

JURY

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WHAT WE OBSERVE IS NOT NATURE ITSELF; BUT NATURE EXPOSED TO OUR METHOD OF QUESTIONING

WERNER HEISENBERG

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ACKNOWLEDGEMENT

One of the biggest decisions I have taken up in my life is to pursue my PhD. To give up my comfort zone and a potential job in the corporate world to do a PhD in a foreign country was a big decision for me. The decision has been a turning point in my life and to get to this point I have gone through a lot of emotions and experiences. It would simply have not been possible for me to complete my thesis without encouragement, suggestion, words of advice and wisdom from a lot of people.

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CHAPTER ONE: INTRODUCTION TO THESIS (IN FRENCH AND ENGLISH)

REVUE DE LITTÉRATURE ET MOTIVATION DE RECHERCHE

L'un des sujets les plus pertinents en finance d'entreprise est l'utilisation optimale des ressources sous la forme de décisions d'investissement. Cependant, pour utiliser au mieux ces ressources, un responsable a besoin de différentes sources d'informations qui pourraient l'aider dans sa prise de décision. Le dirigeant d'une entreprise peut apprendre de sources d'information internes avant de prendre des décisions d'investissement. Les sources internes peuvent être les informations privées dont dispose le responsable sur la base des investissements antérieurs qu'il avait réalisées. Par exemple, si un détenteur de bloc investit dans une autre entreprise, il peut être utilisé comme source d'informations permettant au responsable du détenteur de bloc de décider si une entreprise potentielle vaut la peine d'être investi. En outre, grâce à un réseau de tels investissements, le responsable d'un bloc détenteur pourrait développer de nombreux liens sociaux, tels que des conseils d'administration (Cai et Sevilir, 2012; Renneboog et Zhao, 2013), des auditeurs (Cai et al, 2016) et d'autres PDG (El-Khatib et al, 2014). Ces liens sociaux pourraient s'ajouter à la source d'informations dont dispose le gestionnaire, ce qui pourrait l'aider à prendre davantage de décisions d'investissement. Ces décisions d'investissement pourraient prendre la forme de fusions et d'acquisitions.

Le gestionnaire pourrait également tirer des enseignements d'une autre source d'information importante, à savoir le prix des actifs sur les marchés financiers (Hayek, 1945). Hayek developpe son raisonnement à l'aide d'un exemple relatif à la production d'étain. Si les producteurs d'étain réalisent qu'il existe une nouvelle utilisation très rentable d'étain, la demande d'étain augmentera automatiquement, ce qui se traduira par un prix plus élevé de ce dernier, ce qui améliorera leur propre rentabilité. En outre, si seuls les producteurs d'étain connaissent cette nouvelle utilisation, ils risquent de manipuler la production et l'approvisionnement afin de maximiser leur propre rentabilité. D'autre part, il est également possible qu'un substitut moins cher à l'étain soit trouvé et utilisé à ces fins uniques, ce qui pourrait avoir une incidence sur la rentabilité des producteurs d'étain. Il existe également d'autres facteurs pouvant influer sur le prix de l'étain, tels que les coûts de transport, les coûts de stockage impliqués pendant le processus de production. Cependant, tout le système fonctionne comme un seul et un responsable peut obtenir toutes les informations qu'il souhaite auprès d'un seul vecteur, c'est le prix de l'étain sur le marché. Ainsi, Hayek résume en disant que toutes les informations pertinentes dont un gestionnaire a besoin pour prendre une décision sont condensées sous la forme d'un indice numérique unique représenté par un prix. Ce prix ne se limite pas au prix des produits de base ou au prix d'un produit, mais pourrait également être étendu à d'autres prix tels que le prix des actions ou d'autres actifs financiers. Ainsi, du point de vue de la finance d'entreprise, le cours de l'action de son entreprise peut être une des sources d'informations les plus pertinentes pour le dirigeant d'une entreprise cotée (Hayek, 1945, Chen et al, 2006, Bond et al, 2012).

Les gestionnaires peuvent également tirer des informations des comportements stratégiques de leurs concurrents (Foucault et Fresard, 2018) au cas où ils ne pourraient pas tirer des leçons du prix de leurs actions. Ceci est particulièrement pertinent dans le cas d'entreprises privées qui n'ont pas de marché secondaire pour leurs actions à partir duquel les gestionnaires pourraient apprendre. Ils peuvent toutefois apprendre en imitant les stratégies de leurs concurrents qui ont réussi et ainsi accroître la corrélation entre leurs rendements et les leurs. Ainsi, les gestionnaires ont à leur disposition de nombreuses sources d'information pour les aider dans leurs décisions d'investissement. L'importance de ces différentes sources dans le processus de décision prises par les gestionnaires constitue le thème principal de cette thèse.

La question de recherche à laquelle nous nous confrontons dans cette thèse est la suivante: «Comment les gestionnaires utilisent-ils les différentes sources d'information qui sont à leur disposition?». Notre question de recherche est motivée par le fait que les gestionnaires jouent un rôle très important et influencent massivement l'avenir d'une entreprise. Les décisions qu'ils prennent ont une incidence majeure sur plusieurs aspects de l'entreprise, parmi lesquels, la création de valeur pour les actionnaires intéresse particulièrement la recherche en sciences de gestion. Leur prise de décision impacte également l'économie d'un pays dans des domaines tels que la création d'emplois et la stimulation des investissements. Si les gestionnaires des entreprises souhaitent utiliser efficacement les ressources mises à leur disposition, ils doivent tirer le meilleur parti des informations auxquelles ils ont accès.

Foucault et Fresard (2012) suggèrent que les gestionnaires qui maximisent la valeur utilisent toutes les sources d'informations à leur disposition. La justification fournie est que, pour allouer le capital de manière efficace, ils doivent prévoir leurs flux de trésorerie avec précision, et c'est là que chaque source d'informations est utile. De plus, les signaux informatifs plus puissants devraient recevoir une plus grande pondération dans ces prévisions. Dans cette optique, nous approfondissons dans ce travail la manière dont les gestionnaires utilisent les diverses sources d'information dont ils disposent.

Nous répondons à notre question de recherche par le biais de trois articles: 1. Les réseaux de détenteurs de blocs ont-ils un impact sur les résultats des fusions et acquisitions? 2. Les politiques monétaires non conventionnelles de la Réserve fédérale américaine sont-elles été bénéfiques aux entreprises contraintes? 3. Les acquéreurs privés apprennent-ils des acquéreurs publics et particulièrement dans le cas des opérations de fusions-acquisitions?

Le premier article de la thèse étudie l'impact du réseau social d'entreprise, composé des détenteurs de blocs, sur les résultats des opérations de croissance externe. À travers ce travail, nous étudions les décisions d'investissement externe prises par les entreprises détentrices d'un bloc d'actions dans une autre entité. Ce chapitre étudie plus particulièrement l'impact de ceux-ci sur la probabilité de réaliser une opération, sa probabilité d'achèvement et la création de valeur qui en découle. En outre, la présence d'entreprises financières dans ces réseaux est particulièrement étudiée. Le document donne

également un bref aperçu de la topologie du réseau, ainsi qu'une explication et une interprétation des principales mesures de réseaux utilisées dans le chapitre.

Le deuxième article examine l'impact des politiques monétaires non conventionnelles mises en place par la Réserve fédérale américaine au cours de la période qui a suivi la crise financière de 2007-08. Si les prix sont bien l'un des vecteurs les plus importants d'informations (Hayek, 1945) pour les décisions d'investissement des entreprise, l'impact de la crise financière et la forte baisse des actifs dans la période qui a suivi, ont dû avoir un impact conséquent sur celles-ci. La littérature a montré que la crise était plus susceptible d'entraver les entreprises aux contraintes financières que les entreprises non contraintes. Les politiques monétaires non conventionnelles annoncées par la Réserve fédérale visaient, entre autres, à atténuer les contraintes financières de ces entreprises. Par conséquent, nous analysons si ces mesures ont été efficaces pour alléger cette contrainte et si elles ont eu un impact sur l'informativité des prix des actions des entreprises contraintes. Le chapitre analyse également si la sensibilité de l'investissement des entreprises contraintes aux prix de leurs actions a évolué au cours de la période suivant ces politiques monétaires non conventionnelles.

Enfin, le troisième article fournit une analyse de l'apprentissage des entreprises privées en matière de décisions d'investissement auprès des entreprises publiques. Il étudie également l'impact de la révélation sur les marchés d'opportunité de croissance sur les stratégies d'acquisition des acquéreurs privés. Nous analysons, par exemple, dans ce but si la réaction des investisseurs aux annonces de fusions d'entreprises cotées a une influence sur les stratégies d'acquisition des entreprises privées.

Chapitre 2: Les réseaux de détenteurs de blocs ont-ils un impact sur la réalisation et les performances des fusions et acquisitions?

Pour notre premier article, nous testons si les liens sociaux acquis par le dirigeant d'une entreprise influencent la probabilité de reprise des entreprises dans lesquelles il a investi via la détention d'un bloc d'actions. La principale source d'information permettant aux dirigeants de prendre des décisions, dans le cadre de cet article, est la propriété et le contrôle inhérent à la détention de ce bloc. Lorsque les entreprises investissent dans d'autres entreprises, par le biais de la propriété et du contrôle qu'elles en obtiennent, elles peuvent en apprendre davantage sur l'entreprise dans laquelle elles investissent. Quelles sont les motivations des entreprises à investir dans d'autres entreprises et ainsi devenir des détenteurs de blocs ? Retenu (2003) dans son enquête sur les détenteurs de blocs, écrit que les entreprises sont motivées pour devenir détenteurs de blocs à deux fins: les avantages partagés du contrôle et les avantages privés du contrôle. Les avantages partagés du contrôle consistent principalement à partager les flux de trésorerie et les bénéfices générés par l'entreprise avec les actionnaires minoritaires en raison de l'accroissement de la propriété des détenteurs de blocs.

Les avantages privés du contrôle pourraient inclure quelque chose de pécuniaire comme un salaire excédentaire pour un représentant du détenteur du bloc dans l'entreprise. Ils pourraient également

inclure des synergies de production pour le détenteur du bloc, ce qui entraînerait des économies d'échelle ou de gamme (Retenu, 2003). Les avantages privés non pécuniaires pour le détenteur de bloc pourraient être l'utilisation de l'espace d'entreprise, un accès facile aux souscriptions des entreprises, etc.

Par exemple, Dupont, une des plus grandes entreprises chimiques américaines, a acquis une participation de 20% dans Pioneer Hi-Bred International, une entreprise de semences, afin de concurrencer Monsanto dans le secteur en forte croissance des cultures transgéniques, en 1997. Les deux sociétés ont ensuite créé Optimum Qualité Grains, qui a contribué à créer une synergie entre l'expertise de Dupont en matière de recherche agricole et le groupe de technologie de la nutrition de Pioneer. Ainsi, cela a conduit à la plus grande collaboration de recherche en agriculture au monde à cette époque. Cette collaboration a finalement contribué de manière significative aux parts de revenus et aux bénéfices de Dupont à cette époque. Dupont avait acquis une participation dans Pioneer Hi-Bred en tant que manœuvre défensive pour l'aider à contourner Monsanto, mais cette participation les avait aidés à dépasser Monsanto dans leurs propres affaires à ce moment-là. Cette performance remarquable a probablement convaincu la direction de Dupont de reprendre éventuellement la participation restante dans Pioneer Hi-Bred lorsqu'elle a accepté de racheter les 80% restants en 1999 pour 7.8 milliards.

Dans une affaire similaire, Nestlé et Hagen-Daas (filiale de Pillsbury) ont annoncé la création d'Ice Cream Partners (ICP) dans une coentreprise 50/50 en 1999. Nestlé avait le processus de fabrication, tandis que Hagen-Daas utilisait sa marque supérieure pour donner à ICP des deux mondes. Cela les a aidés à dépasser Unilever, qui était le leader du marché à ce moment-là. Constatant la performance de la coentreprise, Nestlé a obtenu une option sur la participation de Hagen-Daas au cas où Hagen-Daas serait acquise. Lors de l'acquisition de Pillsbury par General Mills, Nestlé a exercé son option sur l'acquisition de la participation de Hagen-Daas dans ICP pour un montant de 650 millions d'euros en 2001. Cela a permis à Nestlé de dépasser Unilever en tant que leader du marché des glaces.

Ces deux exemples illustrent l'avantage pécuniaire que le détenteur de bloc reçoit en contrepartie de son investissement dans une certaine entité. Alors que l'un est une affaire de participation minoritaire menant à une acquisition, l'autre est un cas de joint-venture qui a finalement conduit l'un des partenaires à racheter la participation de l'autre. Néanmoins, il montre les éventuelles décisions de suivi qu'un gestionnaire pourrait prendre sur la base des informations qu'il détient, en fonction de la propriété et du contrôle en vertu de ses investissements dans d'autres sociétés ou entités. Cela montre également que les gestionnaires détenteurs de blocs ont tendance à tirer des leçons de leurs investissements (qu'il s'agisse d'une participation minoritaire ou d'une coentreprise) et à en tenir compte dans leurs décisions d'investissement potentielles relatives aux fusions et acquisitions. Cependant, lorsque le dirigeant d'une entreprise décide d'investir dans un grand nombre d'entreprises en tant que détenteurs de blocs, il en résulte une formation de réseau de détenteurs de blocs qui constitue une source d'informations permettant au gestionnaire de prendre des décisions plus éclairées en fonction des investissements.

La littérature dans le domaine des réseaux indique un consensus sur le fait qu'ils ont un impact positif sur la performance des entreprises (Dyer et Singh, 1998; Geletkanycz et Boyd, 2011; Larcker et al. 2013). La raison sous-jacente du phénomène ci-dessus est que les liens sociaux fournissent aux dirigeants des entreprises une source d'informations qui les aident à prendre des décisions (Larcker et Tayan, 2010; Omer et al, 2012). Certains exemples cités dans la littérature montrent que les entreprises affichant des scores de réseau social plus élevés affichent des rendements boursiers corrigés du risque plus élevés grâce à un meilleur accès à l'information et à l'influence qu'elles jouent dans la prise de décision des dirigeants (Larcker et al, 2013).

Cependant, dans le contexte des décisions d'investissement des dirigeants grâce à leurs réseaux sociaux, la littérature montre qu'il existe une corrélation positive entre les différents aspects des fusions et acquisitions et les réseaux sociaux de formes diverses. Cai et al (2016) montrent que les entreprises qui partagent un auditeur commun ont une probabilité plus élevée de fusionner les unes avec les autres. Renneboog et Zhao (2013) montrent que les entreprises mieux connectées ont une probabilité plus grande d'être acquéreur en raison de leurs liens sociaux entre les conseils d'administration. Ils montrent également que la probabilité d'achèvement de la transaction entre l'acquéreur et la cible augmente lorsqu'ils partagent un conseil d'administration et que les périodes de négociation sont plus courtes. Ils trouvent également des preuves que les cibles connectées ont tendance à choisir des offres impliquant une proportion plus importante d'action dans leurs transactions. El Khatib et al. (2014) ont pu montrer que les entreprises ayant des PDG fortement liés ont une probabilité plus élevée d'être un acquéreur. Ces documents suggèrent clairement que les réseaux sociaux sous diverses formes (dirigeants, conseil d'administration, auditeurs, détenteurs de blocs, etc.) constituent une source d'informations pour les gestionnaires afin qu'ils puissent prendre des décisions d'investissement, en particulier dans le contexte de fusions et acquisitions.

Les gestionnaires des détenteurs de blocs sont finalement en contact avec ces différentes formes de réseaux sociaux quand ils acquièrent des participations dans de nombreuses entreprises. Ils vont éventuellement puiser dans ces réseaux sociaux pour acquérir des informations qui les aideront à prendre leurs propres décisions. Par conséquent, dans la littérature sur les détenteurs de blocs et sur les réseaux sociaux, nous avons compris qu'il existait une corrélation entre les décisions d'investissement prises par les gestionnaires des détenteurs de blocs et les réseaux sociaux grâce aux investissements qu'ils avaient réalisés. Ceci conduit à la formulation de la première question de recherche qui constitue le thème sous-jacent de notre premier article de recherche: «Les réseaux de détenteurs de blocs ont-ils un impact sur les opérations de fusions-acquisitions et leurs performances?

Nous obtenons les liens d'investissement entre les détenteurs de blocs et les entreprises dans lesquelles ils ont investi à l'aide de la base de données Orbis du Bureau Van Dijk (BVD) durant la période allant de 2007 à 2012. À l'aide de ces liens d'investissement et de la méthodologie d'étude des réseaux, nous mesurons l'importance d'un détenteur de bloc ou de leur cible d'investissement dans ce réseau.

Ces mesures ont été choisies en fonction de leur pertinence et de leur utilisation dans la littérature (Renneboog et Zhao, 2013; El-Khatib et al, 2014). À l'aide de ces variables, nous étudions l'influence des réseaux sociaux sur la probabilité qu'un détenteur de bloc soit un acquéreur. Nous étudions également l'influence des réseaux sociaux sur la probabilité que les entreprises investies deviennent une cible. Enfin, nous analysons l'influence des réseaux sociaux sur les résultats des prises de contrôle d'un acquéreur. Nous observons également l'impact de ces réseaux du point de vue de la cible finalisant la transaction avec un éventuel acquéreur.

Nos analyses présentées dans ce chapitre montrent que les détenteurs de blocs bien connectés ont une probabilité plus élevée d'être acquéreur en raison des liens sociaux qu'ils acquièrent grâce à leur participation dans plusieurs entreprises. Nous constatons également que les entreprises qui sont importantes en raison des liens sociaux acquis grâce aux entreprises qui investissent dans celles-ci ont une probabilité plus élevée d'être ciblées. Les acquéreurs et les cibles qui sont mieux connectés et qui ont une plus grande importance dans les réseaux sociaux ont une probabilité plus élevée d'achèvement des transactions avec les entreprises avec lesquelles ils négocient. Grâce à ces résultats, nous contribuons à la littérature sur les réseaux sociaux avec un type d'effet de réseau différent, à savoir l'impact du réseau de détenteurs de blocs sur les fusions et acquisitions. Essentiellement, les différents liens qu'un gestionnaire d'un block peuvent se développer viales conseils d'administration (Renneboog et Zhao, 2013), les auditeurs (Cai et al, 2016) ou les autres firmes présentes dans le réseau. Nous comprenons également mieux le rôle des entreprises financières dans ces réseaux et contribuons à la littérature de ce point de vue.

Dans cet article, nous mesurons l'impact de l'information sur les décisions d'investissement au niveau de l'entreprise. En d'autres termes, nous analysons si l'achat d'un bloc d'action dans une autre entreprise influence la probabilité ou les autres aspects d'un investissement via une opération de fusion-acquisition. Dans l'article suivant, nous abordons l'impact des facteurs macroéconomiques sur les décisions d'investissement au niveau des entreprises. Lorsqu'un organisme de régulation tel que la Réserve fédérale américaine prend des décisions visant à atténuer les frictions auxquelles l'économie est confrontée en période de crise financière, il souhaite également envoyer des signaux d'information aux dirigeants d'entreprise. Le travail présenté dans le chapitre 3 de cette thèse étudie l'impact de ces signaux par les dirigeants d'entreprises cotées et plus particulièrement celles dont les contraintes financières sont importantes.

Chapitre 3: Les politiques monétaires non conventionnelles de la Réserve fédérale américaines ont-elles aidé à alléger les contraintes financières des entreprises cotées?

Pour notre deuxième article, nous nous intéressons à la politique monétaire non conventionnelle annoncée par la Réserve fédérale à la suite de la crise financière de 2007-08 et si elle a réellement permis d'atténuer les contraintes financières des entreprises. Un des canaux de cet action peut se résumer par l'intuition suivante la crise financière de 2007-08 a pu considérablement entravé le caractère

informatif du prix des actifs, et si ces prix sont bien utilisés par les dirigeants comme source d'information pour leur décision, cela a dû entraîner une réduction de l'investissement des entreprises. La Federal Reserve a explicitement évoqué le prix des actifs comme canal par lequel elle souhaitait intervenir : si le contenu en informations des actions a réellement diminué durant la crise, et si la Fed souhaitait y remédier, la politique monétaire non conventionnelle a-t-elle réellement atténué ces frictions? Tel est le thème sous-jacent de cet article.

Dans la littérature en finance d'entreprise, les entreprises qui ont du mal à obtenir des financements extérieurs sont qualifiées comme des entreprises à contraintes financières. Étant donné que les entreprises contraintes financièrement ne sont pas en mesure de financer leur expansion avec l'aide d'un financement externe, les investissements potentiels de ces entreprises dépendent encore plus du canal du cours des actions pour l'expansion et la rentabilité de l'entreprise. En analysant la sensibilité des investissements à la valorisation des entreprises cotées, Baker et al (2003) montrent que les investissements des entreprises financièrement contraintes sont jusqu'à trois fois plus sensibles au prix de leurs actions que les entreprises non contraintes, et ce lorsque la contrainte financière est mesurée par l'indice KZ (Kaplan-Zingales). Avec une dépendance accrue vis-à-vis du canal du cours des actions, une crise financière aura davantage de conséquences pour les entreprises avec des difficultés financières. Afin d'aider ces entreprises avec des difficultés financières en période de crise et d'atténuer les tensions économiques, la Réserve fédérale a annoncé le 25 novembre 2008 un ensemble de politiques monétaires non conventionnelles.

En période de crise financière extrême telle que celle de 2007-08, les politiques monétaires traditionnelles peuvent ne plus être efficaces et les banques centrales ont donc recours à des mesures non conventionnelles pour relancer la croissance économique et améliorer la demande globale. De plus, les banques qui ont mal tourné pendant la crise financière ont adhéré aux normes de Bâle II. Il était donc urgent de mettre en place des politiques monétaires non conventionnelles pour atténuer les frictions de l'économie. Tout en appliquant des politiques monétaires non conventionnelles, les banques centrales achètent des titres du Trésor à long terme et réduisent leur offre sur le marché libre, ce qui pourrait entraîner une baisse des taux d'intérêt sur une période donnée (Foley-Fischer et al, 2016). Ce type de politique monétaire non conventionnelle a été expérimenté pour la première fois par la Banque du Japon en 2001.

Cela pose toutefois la question de l'importance des politiques monétaires des banques centrales du point de vue des entreprises. Dans un article récent, Cloyne et al. (2018) montrent que les entreprises les plus jeunes affichent le changement le plus important en matière d'investissements en capital et constituent le principal moteur de l'investissement global en réponse aux annonces de politique monétaire des banques centrales britannique et américaine. Ils montrent également que cette condition est plus importante lorsque les jeunes entreprises ne paient pas de dividendes. Cela contraste vivement avec les entreprises plus anciennes qui ne réagissent pas aussi fermement aux politiques monétaires du

point de vue de l'investissement des entreprises. Ces conclusions sont également valables pour d'autres attributs de l'entreprise, tels que la liquidité, l'endettement, la croissance de l'entreprise et le Q de Tobin (Cloyne et al, 2018). Les entreprises plus jeunes empruntent également moins en réponse aux politiques monétaires et leur emprunt est fortement corrélé aux valeurs des garanties. Ces résultats montrent que les entreprises les plus jeunes sont celles qui réagissent le mieux aux politiques monétaires des banques centrales. Nous pourrions donc postuler que les entreprises aux contraintes financières ont plus de chances de réagir aux politiques monétaires non conventionnelles de la Réserve fédérale que les entreprises non-contraintes. Les politiques monétaires ont généralement un impact significatif sur les prix des actifs, ceux-ci dépendant de leurs taux directeurs. Par conséquent, les décisions de gestion qui dépendent des prix des actifs seront probablement affectées.

Bond, Edmans et Goldstein (2012) ont passé en revue un large éventail d'article académiques et d'ouvrages ayant démontré que les décisions de gestion dépendaient en patie des prix des actifs. Ils examinent l'effet des marchés financiers secondaires sur l'activité économique réelle et indiquent que les dirigeants d'entreprises utilisent les informations disponibles sur les marchés financiers secondaires pour prendre des décisions. Selon Bond, Edmans et Goldstein (2012), le document de Hayek (1945) est le premier de la littérature à émettre l'hypothèse selon laquelle les prix sont une source d'information utile pour tous. Comme indiqué précédemment, Hayek (1945) suggère que le prix est l'indice numérique le plus important dont dépendent les gestionnaires pour leur prise de décision. En fin de compte, les véritables décideurs, tels que les gestionnaires, les régulateurs, etc., utilisent ces informations pour prendre leurs propres décisions en fonction de leurs rôles. Selon Baumol (1965), ces décisions ont finalement un impact sur les flux de trésorerie des entreprises. Ainsi, les prix constituent une source d'information pour les gestionnaires lors de la prise de décision.

Bond, Edmans et Goldstein (2012) expliquent pourquoi les cours des actions fournissent un élément d'information aux gestionnaires en suggérant que ceux-ci peuvent apprendre certains aspects des entreprises extérieures à leur entreprise. Ce phénomène s'explique par le fait que même si un spéculateur individuel est peut-être moins informé que le gestionnaire, des informations agrégées provenant d'un grand nombre de spéculateurs pourraient rendre les marchés financiers secondaires plus informés que le gestionnaire (Grossman 1976, Hellwig 1980). Bond, Edmans et Goldstein (2012) ajoutent également que la prise de décision dépend non seulement d'informations internes dont les gestionnaires pourraient être le meilleur juge, mais également d'informations externes telles que les conditions du marché, les informations sur les concurrents de l'entreprise, l'impact possible de la gouvernance sur leur rentabilité, etc. Ce phénomène est bien résumé par Roll (1984), qui montre que les informations privées sur les transactions sur les marchés à terme du jus d'orange concernant les conditions météorologiques sont directement reflétées dans le prix des actifs qui y sont échangés. Par conséquent, les prix ne sont pas déterminés uniquement par les agriculteurs producteurs d'oranges, mais également par les commerçants qui ont négocié des prix futurs des oranges sur la base des prévisions météorologiques. De

plus, Allen (1993) postule que dans un système où les processus deviennent beaucoup plus complexes, les informations fournies par les marchés financiers secondaires deviennent plus importantes. Bond, Edmans et Goldstein (2012) expliquent également le fait que les informations externes sont tout aussi importantes pour les décisions réelles optimales que les informations internes en résumant la littérature sur les introductions en bourse, dont la plupart reposent sur l'hypothèse sous-jacente que les firmes ne sont pas accessibles aux dirigeants (Rock (1986); Benveniste et Spindt (1989); Benveniste et Wilhelm (1990) et Biais, Bossaerts et Rochet (2002).

En outre, il est notoire que les prix des actions influencent les agences de notation de crédit (Bond, Edmans et Goldstein, 2012) et que la notation attribuée à l'entreprise par les agences est susceptible d'affecter le crédit disponible pour ces entreprises. Les régulateurs sont également connus pour suivre les prix du marché (Feldman & Schmidt 2003, Burton & Seale 2005, Bond, Edmans et Goldstein, 2012) et les décisions qu'ils prennent auront très probablement une incidence sur les flux de trésorerie des entreprises (en fonction des taux d'intérêt qu'elles ont fixés) sur le marché. À la suite de la crise financière, les experts ont préconisé de suivre de plus près les prix du marché (Flannery 2009, McDonald 2010, Hart & Zingales 2011, Bond, Edmans et Goldstein, 2012). Ainsi, les informations externes que les gestionnaires sont susceptibles de tirer des cours des actions jouent un rôle très important dans les décisions qu'ils prennent.

Bond, Edmans et Goldstein (2012) ajoutent également que même si les gestionnaires ne tirent pas les enseignements du cours des actions, ils s'en soucient, car de nombreux contrats qu'ils signent sont liés aux prix du marché. Cela va à l'encontre de notre raisonnement précédent, mais il établit cependant un lien entre les cours des actions et les décisions prises par les gestionnaires, même s'ils n'en tirent pas les enseignements. La rémunération des dirigeants d'une entreprise est très probablement liée aux prix du marché sous forme d'options d'achat d'actions pour les employés, etc. Ainsi, même si le dirigeant n'apprend pas du cours des actions, il est incité à l'améliorer pour son propre compte. Donc, en fin de compte, avec ce raisonnement, même si aucun apprentissage n'est nécessaire, cela montre cependant que les prix du marché ont un effet réel sur l'économie du fait de leur rôle informatif. C'est peut-être pour cette raison que les actionnaires ont choisi d'associer la rémunération des dirigeants au cours des actions pour éviter les problèmes d'agence (Bond, Edmans et Goldstein, 2012). En outre, si les prix n'étaient pas informatifs, il n'y aurait aucune raison pour que les actionnaires choisissent d'établir un lien entre la rémunération des dirigeants et le prix des actions.

Bond, Edmans et Goldstein (2012) fournissent un troisième raisonnement expliquant pourquoi les prix aident les gestionnaires d'une entreprise à prendre des décisions. Les gestionnaires et autres décideurs suivent les prix du marché de manière irrationnelle en fonction des promoteurs de la finance comportementale. Ils suivent probablement les prix du marché car, en fin de compte, le prix contient toutes les informations. Tandis que le suivi des prix du marché par les décideurs peut être rationnel ou irrationnel, l'effet final est qu'il ajoute au rôle informatif des prix.

D'après les lacunes de la littérature sur les retours d'expérience et la littérature mesurant les politiques monétaires des entreprises, nous avons compris que nous ne savions pas si les politiques monétaires non conventionnelles amélioraient l'informativité des prix des entreprises aux contraintes financières. La raison en est que, lorsque la Réserve fédérale américaine a annoncé ces annonces de politique, le marché est susceptible de percevoir que ces annonces sont plus bénéfiques pour les entreprises soumises à des contraintes financières. Par conséquent, il y a plus d'échanges sur les actions des entreprises aux contraintes financières. Par conséquent, la quantité d'informations que ces transactions sont susceptibles de fournir aux gestionnaires des entreprises contraintes est beaucoup plus élevée. Par conséquent, les dirigeants d'entreprises contraintes seront susceptibles d'investir davantage dans la période suivant les annonces de la politique de la Réserve fédérale, leur sensibilité aux prix d'investissement étant bien supérieure à celle des entreprises non soumises à des contraintes. Cela a conduit à la formulation de la deuxième question de recherche, qui constitue le thème sous-jacent de notre deuxième chapitre: Les politiques monétaires non conventionnelles de la Réserve fédérale américaines sont-elles aidées à alléger les contraintes financières des entreprises cotées?

À l'aide d'une méthodologie de différence des différences, nous analysons dans un premier temps si la crise affectait davantage les entreprises contraintes que les entreprises non contraintes. À l'aide d'une étude d'événement, nous analysons également si les actions des entreprises sous contrainte ont davantage réagi aux annonces de la Réserve fédérale que les entreprises sans contrainte. Nous utilisons également une méthodologie des différences de différence pour analyser si la politique monétaire non conventionnelle a eu un effet plus atténuant sur les entreprises aux contraintes financières. Enfin, nous étudions si la sensibilité aux prix d'investissement des entreprises aux contraintes financières s'est beaucoup améliorée davantage que celle de leurs homologues sans contrainte en raison de la politique monétaire non conventionnelle.

Nos analyses nous ont permis de constater que la crise financière de 2007-08 avait affecté l'entreprise moyenne en termes d'informativité des prix, de la liquidité et du volume de négociation des actions. Nous constatons également que la crise a eu un impact particulièrement important sur les entreprises aux contraintes financières par rapport aux entreprises non contraintes. Cela signifie que la quantité d'informations transmises par la valorisation des actifs d'une entreprise soumise à des contraintes financières au gestionnaire a considérablement diminué en raison de la crise. Par conséquent, les dirigeants de ces entreprises sont moins susceptibles de prendre des décisions d'investissement avec les informations disponibles par rapport aux entreprises sous contrainte. Lorsque la Réserve fédérale américaine a annoncé des politiques monétaires non conventionnelles visant à atténuer les contraintes financières des entreprises et l'état de friction général de l'économie, nous avons constaté que les actions des entreprises sous contrainte avaient une réaction plus positive que celles sans contrainte. Cela indique que les investisseurs s'attendaient à ce que les politiques monétaires non conventionnelles de la Réserve fédérale soient plus favorables pour les entreprises contraintes que pour

celles non contraintes. L'information sur les prix d'une entreprise moyenne s'est nettement améliorée dans la période qui a suivi l'annonce de la politique de la Réserve fédérale par rapport à la période précédente. Nous observons également que cet effet est plus prononcé pour les entreprises non contraintes que pour les entreprises non contraintes, à l'aide des différences de méthodologie. Cela montre que la politique monétaire non conventionnelle a amélioré l'informativité des prix des actions des entreprises aux prises avec des difficultés financières. Cependant, nous constatons également que la sensibilité aux prix d'investissement des entreprises contraintes ne s'est pas améliorée dans la période qui a suivi la crise financière par rapport aux entreprises non contraintes. Cela montre que les conditions n'étaient pas encore suffisamment favorables du point de vue des dirigeants des entreprises financièrement contraintes pour prendre des décisions d'investissement avec la quantité d'informations ajoutées à leurs stocks.

A travers cet article, nous avons pu démontrer que la politique monétaire non conventionnelle a conduit à un meilleur accès à l'information aux gestionnaires des entreprises financièrement limitées. À travers les résultats de cet article, nous ajoutons à la littérature du feedback effect de Bond, Edmans et Goldstein (2012). Nous avons également pu mesurer l'efficacité des annonces de politique de la Réserve fédérale dans le processus.

Dans cet article, nous avons résumé un large éventail de publications montrant que les gestionnaires pouvaient apprendre du cours de leurs actions et prendre une décision d'investissement à partir de leur apprentissage. Cependant, cela soulève la question du cas des entreprises privées qui n'ont pas de marché secondaire pour les cours de leurs actions, ce qui les empêche de tirer des leçons de leurs propres cours de bourse. Dans le dernier chapitre de cette thèse prochain article, nous nous intéressons à la manière dont les dirigeants d'entreprises privées peuvent tirer comme enseignements des opportunités de croissance révélées sur les marchés financiers.

Chapitre 4: Qu'est-ce que les entreprises privées peuvent apprendre des entreprises cotées: le cas des fusions et acquisitions?

Pour notre troisième article, nous analysons ce que les acquéreurs privés apprennent des entreprises cotées du point de vue de leurs décisions d'investissement. Nous faisons cela avec le cas des stratégies de fusions et d'acquisitions d'entreprises privées. Le thème sous-jacent de cet article est le fait que les stratégies de leurs concurrents peuvent être une source d'information pour leurs dirigeants.

Foucault et Fresard (2018) apportent une solution possible à la question ci-dessus en démontrant que les dirigeants d'entreprise peuvent augmenter la valeur de leur propre entreprise en imitant les stratégies d'autres entreprises cotées. Ce phénomène est dû au fait que l'imitation améliore leur capacité à extraire davantage d'informations de leur propre action ou de l'action de leur concurrent dans leur prise de décision, ce qui en améliore l'efficacité. En outre, en imitant les stratégies des entreprises les plus performantes, les gestionnaires renforcent la corrélation entre la croissance des flux de trésorerie de

leurs entreprises et les flux de trésorerie des entreprises performantes. La logique sous-jacente est la même que celle évoquée plus haut, à savoir la sensibilité de l'investissement au prix, à condition que le cours de leurs actions soit suffisamment informatif. Foucault et Fresard (2018) montrent également que l'effet de conformité est plus fort pour les entreprises privées lorsqu'elles imitent les stratégies des entreprises cotées. Par conséquent, la stratégie des autres entreprises cotées est une source d'information pour les gestionnaires, qui les aide dans leur prise de décision, qu'ils suivent leur propre stratégie ou imitent les autres entreprises cotées.

En l'absence de stratégies efficaces des entreprises cotées, le marché pourrait indiquer que les opportunités de croissance dans un secteur donné pourraient également être une source d'informations permettant aux gestionnaires de fonder leurs décisions d'investissement sur des attributs tels que le ratio Q de Tobin dans un secteur. Par exemple, un Q de Tobin élevé dans un secteur indique que la valeur des actifs d'une entreprise de ce secteur s'apprécie beaucoup par rapport à la valeur comptable des actifs, ce qui indique des opportunités de forte croissance dans le secteur. Cela pourrait indiquer aux entreprises privées qu'elles devraient peut-être investir davantage dans ce secteur. Yan (2018), dans son article, montre empiriquement que les entreprises privées investissent davantage dans des secteurs où les évaluations industrielles sont plus élevées. En termes d'importance économique, ils montrent qu'une augmentation d'un écart-type des évaluations industrielles entraîne une augmentation de 1,4% des investissements en capital des entreprises privées. Cela va dans le sens de ce que les théoriciens néo-classiques de la théorie Q suggèrent que le capital devrait passer de secteurs à Q de Tobin bas aux secteurs à Q de Tobin élevés en cas de dispersion de Q entre les secteurs (Jovanovic et Rousseau, 2002).

Quelques articles montrent que les acquéreurs privés et cotées investissent différemment, même si les données accessibles au public sur les investissements réalisés par des entreprises privées constituent un problème empirique majeur. Feldman et al. (2018) montrent que les entreprises publiques investissent plus que les entreprises privées dans l'ensemble en raison de leur accès aux marchés boursiers. Asker et al. (2015) montrent que les entreprises privées sont plus sensibles aux opportunités d'investissement telles que la croissance des ventes ou le ratio Q de Tobin par rapport aux entreprises publiques. Sheen (2016) montre que les fabricants de produits chimiques privés utilisent leurs investissements sur le marché pour tirer parti des chocs de la demande. Les entreprises publiques qui deviennent privées via des rachats par emprunt (LBO) enregistrent plus de brevets que ce qu'elles en faisaient quand elles étaient cotées (Lerner et al. 2011, Feldman et al (2018)). Semblable à cela, Bernstein (2015) est en accord avec les conclusions ci-dessus quand elles montrent que la qualité des brevets des entreprises diminue après la publication de celle-ci. Il convient également de noter que les activités des entreprises publiques ont parfois une incidence sur les investissements des entreprises privées. Baderschter et al. (2013), à l'aide de la base de données « sage », montrent que la divulgation

des états financiers par les entreprises cotées a une incidence sur les niveaux d'investissement des entreprises privées.

À partir de l'hypothèse d'imitation, des postulats des théoriciens néo-classiques, de la littérature sur les différences entre les investissements des firmes privées et celles cotées et de la littérature sur le feedback, on peut affirmer que les entreprises dont les actions ne sont pas cotées et donc qui ne disposent pas de marché secondaire pour leurs actions, n'ont pas accès aux mêmes sources d'informations à laquelle les dirigeants d'entreprises cotées ont accès. Par conséquent, apprendre des entreprises cotées et imiter leurs stratégies pourrait être une solution possible à cela. Il est également possible que les entreprises privées observent simplement la croissance du point de vue des secteurs des entreprises cotées à la recherche d'opportunités de croissance et investissent dans ces secteurs. Nous analysons également cela du point de vue des fusions et acquisitions en raison du manque de données empiriques sur les investissements des entreprises privées. Cela conduit à la formulation de la troisième question de recherche, qui est: «Qu'est-ce que les entreprises privées peuvent apprendre des entreprises cotées et plus particulièrement dans le cas des opérations de fusions et acquisitions?"

Nous utilisons une méthodologie d'étude d'événements pour déterminer les rendements anormaux cumulés des acquéreurs, des cibles et de la transaction globale (si l'acquéreur et la cible sont cotées) autour de la date d'annonce des fusions. Cela nous aide à observer la réaction des investisseurs à l'annonce de la fusion par des entreprises cotées et, si les entreprises privées tirent des leçons de cet événement, à conclure davantage de transactions afin de créer de la valeur pour leurs investisseurs. Nous vérifions tout d'abord s'il existe une corrélation entre les stratégies d'acquisition d'entreprises privées de l'année en cours et les stratégies d'acquisition d'entreprises cotées des années précédentes. Nous analysons ensuite pour voir si les entreprises privées acquièrent lorsqu'elles constatent des opportunités de croissance plus élevées en termes d'évaluations dans un secteur particulier.

À travers ces analyses, nous constatons que les entreprises privées imitent les entreprises cotées en fonction des opportunités de croissance du secteur et des acquisitions réalisées parce dernières. Les acquéreurs privés imitent les acquéreurs cotées en faisant davantage d'acquisitions, alors que le secteur de l'acquéreur présente des opportunités de croissance plus importantes et que, dans le même temps, les acquéreurs cotées sont mieux valorisés sur les marchés. Cela pourrait signifier que les dirigeants des acquéreurs privés tirent les enseignements des signaux des secteurs en termes d'opportunités de croissance et de stratégies des acquéreurs cotées et prennent la décision d'imiter les stratégies des acquéreurs cotées pour créer de la valeur pour leurs actionnaires. Les acquéreurs privés imitent également les acquéreurs cotées lorsque ces derniers annoncent plus d'opérations et que la réaction des investisseurs aux annonces decelles-ci est positive. À travers ces résultats, nous contribuons à la littérature sur le feedback que nous analysons du point de vue des acquéreurs privés. Cela est également conforme à l'hypothèse d'imitation de Foucault et Fresard (2018), qui montre que les entreprises imitent le comportement d'une stratégie réussie pour leur propre bénéfice.

Nous avons également pu constater que les entreprises privées investissaient davantage dans un secteur quand elles tiraient parti des opportunités de croissance créées par les entreprises cotées signalées par le ratio Tobin de Q du secteur. Nous constatons également que les acquéreurs privés acquièrent davantage dans un secteur particulier lorsque la réaction moyenne des investisseurs aux annonces de fusion dans ce secteur est plus forte. Ceci est une contribution aux postulats des théoriciens néo-classiques du Q de Tobin qui montrent que les entreprises redéployeront toujours leurs actifs chaque fois qu'une opportunité d'investissement se présente.

LITERATURE BACKGROUND OF THE RESEARCH

One of the most relevant topics in corporate finance is optimum use of resources in the form of investment decisions. However, for best use of resources, managers need various sources of information which could help them in their decision making. The manager of a firm may learn from internal sources of information before making investment decisions. Internal sources could be the amount of private information that the managers have based on previous investments they made. For example: if a blockholder made a block investment in another firm, it could be used as the source of information for the manager of the blockholder to decide if a potential firm is worth investing. In addition, through a network of such investments, the manager of a blockholder could develop a lot of external sources of information such as social connections like board of directors (Cai and Sevilir, 2012; Renneboog and Zhao, 2013), auditors (Cai et al, 2016) and other CEOs (El-Khatib et al, 2014). These social connections could add to the source of information that the manager has and this could aid the manager in making more investment decisions. These investment decisions could be in the form of mergers and acquisitions.

Managers could also learn from another important source of information which is the price of a stock (Hayek, 1945). Hayek explains his rationale with the help of an example pertaining to the production of Tin. If the producers of Tin realize that there is a highly profitable new use of Tin, the demand for Tin will automatically go up which will result in a higher price of Tin. This, in turn will improve the profitability of the producers of Tin. Also, if only the producers know about this new use of it, they are likely to manipulate the production and supply of Tin to maximize their own profitability. On the other hand, there is also a possibility that a cheaper substitute for Tin is found and used for these unique purposes which could impact the profitability of the producers of Tin. There are also other factors which could impact the price of Tin such as transportation costs, storage costs involved during the production process. However, the whole system acts as one and a manager could obtain all the information he wants from one vector and that is the price of Tin. Thus, Hayek sums up by saying all relevant information that a manager needs for decision making is condensed in the form of a single numerical index which is the price of an entity alone. This price is not restricted to price of commodities or price of a product alone but could also be extended to other prices such as stock price. Hence from the perspective of corporate finance, one of the most relevant source of information for the manager of a public firm is the stock price of his firm (Hayek, 1945, Chen et al, 2006, Bond et al, 2012).

Managers could also get their information from the strategies of their peers (Foucault and Fresard, 2018) in case they cannot learn from their own stock prices. This is particularly relevant in the case of private firms which don't have a secondary market for its stock for managers to learn from. They could however learn by imitating the investment strategies of their peers who are successful and thus increase the correlation between their returns and the returns of successful peers. Thus, managers could potentially use many sources of information for their investment decisions. The importance of these data

points and the investment decisions made by managers with the help of this wealth of information is the underlying theme of this thesis.

The main research question addressed in this thesis is ***"How do managers utilize the sources of information available to them?"*** This question is motivated by the fact that managers play a very important role which influences the future of a firm. The decisions they make have a major implication in a number of facets in the firm such as capital structure and value creation for shareholders. Their decision making also helps the economy of a country in ways like employment generation and investment boosting. However, if managers have to make efficient uses of resources, they need to make the best of the information made available to them. Foucault and Fresard (2012) suggest that value maximizing managers use every source of information available to them. The rationale they provide is that in order to allocate capital efficiently, they need to forecast their cash flow accurately and this is where every source of information comes handy. Also, stronger informative signals should be given a higher weightage in these forecasts. Therefore, this thesis dwells deeper into how managers use the various sources of information available to them explained earlier for their investment decisions in this thesis.

The research question will be answered through three papers which are: 1. Do networks of blockholders have an impact on the outcome of Mergers and Acquisitions? 2. Were the unconventional monetary policies of Federal Reserve helpful in easing the price informativeness of constrained firms? 3. What do Private Acquirers learn from Public acquirers and what investment decisions do they make in the case of Mergers and Acquisitions?

The first paper of the thesis is an independent paper which studies the impact of corporate social network of blockholders on takeover outcomes. Through this paper, we review the investment decisions made by manager of a blockholder pertaining to mergers and acquisitions, based on the information they could get from the firms they have invested in. The chapter provides an answer on what is the probability of a firm being an acquirer in a social network of blockholders by the virtue of the block investments they own. It also provides an answer from the perspective of the targets by virtue of the firms being invested in. The chapter also provides an insight on probability of deal completion for the acquirers and targets because of their presence in the social network. In addition, the role of financial firms in such networks are better understood. The paper also gives a brief overview of the network topology and an explanation and interpretation of the main social network measures used in the chapter.

The second paper is an independent paper which reviews the impact of the unconventional monetary policies of the Federal Reserve in the period following the financial crisis of 2007-08 on financially constrained firms. Since, price is one of the most important numerical index for managers to assimilate information from (Hayek, 1945) for their investment decisions, this chapter is motivated by how the financial crisis would have impacted the investment decisions of these firms considering the steep drop in asset prices in the period following the financial crisis. From the literature it could be gauged that the crisis was more likely to hamper financially constrained firms in comparison to the unconstrained

firms. The unconventional monetary policies announced by the Federal Reserve is targeted at easing the financial constraints of these firms. Therefore we analyze if the measures were effective in easing the price informativeness of stocks of the constrained firms. The chapter also analyzes if the investment price sensitivity of financially constrained firms improved significantly in the period following the unconventional monetary policies.

The third paper provides a review on the managerial learning of private firms and follow up investment decisions taken by them by learning from the acquisition strategies of public firms. The chapter also provides an answer with respect to the acquisition strategies of private acquirers after learning from the growth opportunities available from the sector of the acquirer or target. We also analyze to see if the investor reaction to merger announcements of public firms at a sector level influences the acquisition strategies of private firms.

Chapter 2: Do networks of blockholders have an impact on the outcomes of Mergers and Acquisitions?

The first paper tests if the social connections acquired by the manager of a firm, influences the takeover probability of the firms it has invested in. The major source of information which helps managers make decisions in the context of this paper is ownership and control. When firms have investments in other firms, through ownership and control they tend to learn more about the firm they invest in, which could result in shared benefits for them and the firm they have invested in. Before we go into what learning do managers have from ownership and control, it would be prudent to ask what motivates firms to invest in other firms and thereby become blockholders. Holderness (2003) in his survey of blockholders writes that firms are motivated to become blockholders for two purposes: shared benefits of control and private benefits of control. Shared benefits of control primarily consist of sharing the cash flows and profits arising from the firm with the minority shareholders because of the increase in the ownership for the blockholders.

The private benefits of control could include something pecuniary as excess salary for a representative of the blockholder in the firm. They could also include synergies of production for the blockholder resulting in economies of scale or scope (Holderness, 2003). The non-pecuniary private benefits for the blockholder could be use of corporate space, easy access to subscriptions of the firms etc.

To give an example from the corporate world; Du-Pont acquired a 20% stake in Pioneer Hi-Bred International, a seed company in order to compete against Monsanto in the fast growing business of genetically engineered crops in 1997. The two companies then setup a joint venture Optimum Quality Grains, which helped create synergies between Du-Pont's agricultural research expertise and Pioneer's nutrition technology group. Thus, it led to the biggest research collaboration in agriculture in the world at that time. This collaboration eventually made a significant contribution to the share of revenue and

earnings of Du-Pont at that time. Du-Pont had acquired a 20% stake in Pioneer Hi-Bred as a defensive maneuver to help it outflank Monsanto but this stake had helped them overtake Monsanto in their own business at that point of time. This stellar performance probably convinced the management of Du-Pont to eventually take over the remaining stake in Pioneer Hi-Bred when they agreed to buy out the remaining 80% in 1999 for 7.8 billion.

In a similar case Nestle and Hagen-Daas (subsidiary of Pillsbury) announced the creation of Ice cream partners (ICP) in a 50:50 joint venture in 1999. Nestle had the manufacturing prowess, while Hagen-Daas used its superior branding to give ICP the best of the two worlds. This helped them leapfrog Unilever which was the market leader at that point of time. Seeing the performance of the joint-venture Nestle secured an option on the stake of Hagen-Daas in case Hagen-Daas was acquired. When General Mills acquired Pillsbury, Nestle exercised its option to acquire Hagen Daas' stake in ICP for 650 million in 2001. This helped Nestle overcome Unilever as the market leader in the ice cream segment.

These two examples illustrate the pecuniary benefit that blockholder receives in return for its investment in a certain entity. While one is a case of minority stake which lead to an acquisition, the other is a case of joint-venture which eventually led to one partner buying out the stake of the other. Nevertheless, it shows the potential follow-up decisions a manager could take based on the information obtained from the ownership and control by virtue of their investments in other firms or entities. This also shows that the managers of blockholders tend to learn from their investments (whether a minority stake or joint-venture) and follow that up with potential investment decisions pertaining to mergers and acquisitions. However, when a firm's manager decides to invest in a lot of firms as a blockholders, this leads to a formation of social network of blockholders which provides a source of information for a manager to blockholder to make further investment based decisions.

Literature in the field of social networks points to a consensus that they have a positive impact on firm performance (Dyer and Singh, 1998; Geletkanycz and Boyd, 2011; Larcker et al., 2013). The underlying rationale for the above phenomenon is that the social connections give the managers of the firms a source of information which helps them make decisions (Larcker and Tayan, 2010; Omer et al., 2012). Some of the examples provided in the literature show that firms which have a higher social network scores show higher risk-adjusted stock returns thanks to the greater information access and the influence they play in decision making of managers (Larcker et al, 2013).

However, in the context of manager's investment decisions thanks to their social networks, the literature shows that there is a positive correlation between mergers and acquisitions and social networks of various forms. Cai et al (2016) show that firms who share a common auditor have a higher probability of merging with each other. Renneboog and Zhao (2013) show that better connected companies have a higher probability of being an acquirer thanks to their social connections between the boards of directors. They also show that the probability of deal completion between the acquirer and the target increases when they share a board of director and the negotiation periods are shorter. In addition to that, connected

targets tend to choose offers which involve more of equity proportion in the deals. El Khatib et al (2014) were able to show that firms with highly connected CEOs have a higher probability of being an acquirer. These papers clearly suggest that the social networks of various forms (CEOs, board of directors, auditors, blockholders etc) provide a source of information for managers to make investment decisions particularly in the context of mergers and acquisitions.

Managers of blockholders ultimately get into contact with these various forms of social networks when they acquire investment stakes in many firms. They are eventually going to tap into these social networks to acquire information for their own decision making. Therefore, from the blockholder literature and the social network literature, we understood that there is a correlation between the investment decisions made by the managers of the blockholders and the social networks they have through the investments they made. This leads to the formulation of the first research question which is: ***"Do networks of blockholders have an impact on Mergers and Acquisitions?"***

We obtain the investment links between blockholders and the firms they have invested in from the Orbis database of Bureau Van Dijk (BVD) between 2007 and 2012. With the help of these investment links and social network methodology, we measure the importance of a particular blockholder or their investment target in the social network framework. These measures were chosen based on the social network literature (Renneboog and Zhao, 2013; El-Khatib et al, 2014). With the help of these variables, we study the influence of social networks on the probability of a blockholder being an acquirer. We also study the influence of social networks on the probability of the firms that are being invested in becoming a target. Finally, we analyze the influence of social networks on the takeover outcomes of an acquirer. We also observe the impact of these networks from the perspective of the target completing the deal with a prospective acquirer.

Through our analyses in the chapter, we find that blockholders who are well connected have a higher probability of being an acquirer because of the social connections they acquire thanks to their blockholding in a lot of firms. We also find that firms which are important because of the social connections acquired through firms investing in them, have a higher probability of being targets. Acquirers and targets who are more well connected and have higher importance in the social network frameworks have a higher probability of deal completion with the firms they are negotiating a deal with. Through these results, we contribute to the social network literature with a different type of network effect which is the impact of network of blockholders on mergers and acquisitions. In essence, the various social connections that a manager of a blockholder gets from their block investments, such as board of directors (Renneboog and Zhao, 2013), auditors (Cai et al, 2016) have an impact on the mergers and acquisitions of a firm. We also understand the role of financial firms in such networks better and contribute to the literature from that perspective.

In this paper we measure the impact of the information on investment decisions at a firm level. In other words, we analyze if a historical purchase of a block investment in another firm by a blockholder

influences the probability of a takeover investment in future by the blockholder. In our next paper, we move to the impact of macroeconomic factors on investment decisions from firm level factors. When a regulatory body such as Federal Reserve takes policy decisions to ease the frictions that the economy faces during the times of financial crisis, it sends some information signals to managers of a firm. If these information signals are seen as cues to managers of a firm take investment decisions is the focus in our next paper.

Chapter 3: Were the unconventional monetary policies of Federal Reserve helpful in easing the constraints of the financially constrained firms?

The second paper tests if the unconventional monetary policy announced by the Federal Reserve helped ease the financial constraints of firms following the financial crisis of 2007-08, which indirectly helps the firms invest more in the foreseeable future. However, if the price informativeness of a stock, which is the amount of information that the stock conveys to a manager, was severely hampered by the financial crisis of 2007-08, it should have resulted in lesser corporate investment by a firm in general. The reason for this is that lesser information input for managers should mean that there should be lesser investment output from the managers. If the information content of stocks decreased, did the unconventional monetary policy announced by the Federal Reserve ease these investment frictions faced by these firms forms the underlying theme of this paper.

In the corporate finance literature firms which have difficulty in obtaining external finance are classified as financially constrained firms. Since the financially constrained firms are unable to finance their expansion with the help of external finance, potential investments from these firms are even more dependent on the stock price channel for firm expansion and profitability of the firm. While analyzing the sensitivity of investment to the valuation of public firms, Baker et al (2003) show that the investments of financially constrained firms are up to three times more sensitive to price of their stocks than the unconstrained firms, when the financial constraint is measured by KZ (Kaplan-Zingales) index. Managers of the unconstrained firms prefer a smooth investment with change in fundamentals is the rationale Baker et al (2003) provide for this phenomenon. With a higher dependence on stock price channel, a financial crisis is more likely to impact the financially constrained firms more. In order to help these financially constrained firms during the times of financial crisis and also the ease the frictions in the economy as a whole, the Federal Reserve announced a set of unconventional monetary policies on the 25th November 2008.

During periods of extreme financial crisis such as the one of 2007-08, traditional monetary policies may no longer be effective and hence the central banks resort to unconventional measures to jumpstart the economic growth and improve the aggregate demand. Also, the banks which reeled during the times of financial crisis adhered to the Basel II norms. Hence, the unconventional monetary policies were urgently required to ease the frictions faced by the economy. While employing unconventional monetary policies, Central banks resort to buying long term treasury securities and reduce their supply in

the open market which could ultimately result in lower interest rates over a period of time (Foley-Fischer et al, 2016). These kind of unconventional monetary policies were first attempted by Bank of Japan in 2001.

This however, begs the question as of how important the monetary policies of Central banks are from the perspectives of firms. In a recent paper, Cloyne et al (2018) show that younger firms show the most significant change in capital expenditure investment and were the biggest drivers of aggregate investment in response to monetary policy announcements of the central banks in UK and US. They also show that this condition has higher significance when the younger firms don't pay dividend. This is in stark contrast to older firms that don't respond as strongly to the monetary policies from the perspective of corporate investment. These findings hold true for other attributes of the firm such as liquidity, leverage, firm growth and Tobin's Q (Cloyne et al, 2018). Younger firms also borrow less in response to the monetary policies and their borrowing is highly correlated to the collateral values. These findings show that younger firms are the ones most likely to respond to the monetary policies of central banks. In addition to this, younger firms are constrained from the definition of financial constraint in our papers. Hence, we could postulate that the financially constrained firms are more likely to respond to the unconventional monetary policies of the Federal Reserve than the unconstrained firms. Monetary policies in general have a significant impact on asset prices as the asset prices are dependent on their key policy rates. Therefore, managerial decisions which are dependent on asset prices are likely to be impacted by this.

Bond, Edmans and Goldstein (2012) review a wide range of literature to show that the managerial decisions are dependent on the lagged asset prices. They review the effect of secondary financial markets on the real economic activity and if the managers of firms use the information available from the secondary financial markets for their decision making. Hayek's (1945) paper was the first among the literature according to Bond, Edmans and Goldstein (2012) to hypothesize that prices is a useful source of information for everyone. As stated earlier, Hayek (1945) suggests that price is one of the most important numerical index on which managers are dependent on for their decision making. Ultimately, real decision makers such as managers, regulators etc. use these information for their own decision making based on their roles. According to Baumol (1965) these decisions ultimately impact the cash flows of firms. Thus, prices give a source of information for managers for decision making.

Bond, Edmans and Goldstein (2012) provide a line of reasoning for why stock prices provide an information component to the managers by suggesting that there are certain aspects that the managers can learn from outsiders to their firm. The reasons for this phenomenon are that while an individual speculator might be less informed than the manager, aggregated information from a lot of speculators could make the secondary financial markets more informed than the manager (Grossman 1976, Hellwig 1980). Bond, Edmans and Goldstein (2012) also add that decision making is not only dependent on internal information of which managers might be the best judge of, but also the external information such

as market conditions, information on the firm's rivals, possible impact of policy decisions by government on their profitability etc. This phenomenon is best summed up by Roll (1984) who show that private information of orange future trades regarding weather conditions is reflected directly into the price of orange future's price. Therefore, the prices are not only decided by farmers who produce oranges but also by traders who have traded on future prices of orange fruits based on the weather predictions. Also, Allen (1993) postulates that in a system where the processes become much more complex, the information provided by the secondary financial markets becomes more important. Bond, Edmans and Goldstein (2012) also add to the rationale that the external information is equally important to optimal real decisions as internal information by summarizing the IPO literature, most of which has underlying assumption that stock-market participants have information about some aspects of the firm that is not available to the firm's managers (Rock (1986); Benveniste and Spindt (1989); Benveniste and Wilhelm (1990); and Biais, Bossaerts and Rochet (2002).

In addition to all this, credit rating agencies are known to be influenced by stock prices (Bond, Edmans and Goldstein, 2012) and the rating awarded to the firm by the agencies are likely to affect the credit available to these firms. Regulators are also known to follow market prices (Feldman & Schmidt 2003, Burton & Seale 2005, Bond, Edmans and Goldstein, 2012) and the decisions they take are highly likely to impact the cash flow of firms (based on the interest rates they set in the market). Following the financial crisis, experts have advocated following the market prices even more closely (Flannery 2009, McDonald 2010, Hart & Zingales 2011, Bond, Edmans and Goldstein, 2012). Thus, the external information the managers are likely to learn from the stock prices play a very important role in the decisions they make.

Bond, Edmans and Goldstein (2012) also add that even if managers do not learn from stock prices, they care about them because a lot of contracts they sign are linked to the market prices. While, this is counterintuitive to our earlier line of reasoning, it however establishes a link between stock prices and decisions made by managers even if they don't learn from it. The compensation of a firm's managers is most likely tied up to the market prices in the form of employee stock options etc. Thus even, if the manager does not learn from stock prices, he has an incentive to improve the stock prices for his own personal benefits. So ultimately, with this line of reasoning, even if there is no learning involved it does however show that the market prices have a real effect on the economy because of their informational role. This is perhaps the reason why shareholders choose to link the remuneration of managers with the stock prices to avoid agency issues (Bond, Edmans and Goldstein, 2012). Also, if the prices were uninformative, there would not have been a reason as to why shareholders should choose to link the compensation of managers with stock prices.

Bond, Edmans and Goldstein (2012) provide a third line of reasoning as to why prices aid managers of a firm in decision making. Managers and other decision makers follow market prices irrationally according to behavioral finance proponents. They most likely follow market prices because

ultimately price contains all the information. While the following of market prices by decision makers maybe rational or irrational, the ultimately effect is that it adds to the informational role of prices.

From the gaps in the feedback literature and the literature measuring monetary policies of firms, we understood that we don't know if the unconventional monetary policies were effective in easing the price informativeness of the financially constrained firms. We understood that the unconventional monetary policies are likely to ease the price informativeness of a stock of an average firm. This effect is likely to be even more pronounced for constrained firms. The reason for this is that, when the Federal Reserve announced these policy announcements, the market is likely to perceive that these announcements are more beneficial for constrained firms. Hence, more trading happens on the stocks of financially constrained firms. Therefore, the amount of information these trades are likely to give the managers of constrained firms is much higher. Hence, the managers of constrained firms are likely to make more investment in the period following the Federal Reserve's policy announcements as their investment price sensitivity is much higher than unconstrained firms. This leads to the formulation of the second research question which forms the underlying theme of our second research paper which is ***"Were the unconventional monetary policies of Federal Reserve helpful in increasing the price informativeness of the stocks of financially constrained firms?"***

With the help of a differences in difference methodology, we initially analyze if the crisis affected constrained firms more than the unconstrained firms. With the help of an event study we also analyze if the stocks of constrained firms reacted more to the Federal Reserve announcements in comparison to unconstrained firms. We also use a differences in difference methodology to analyze if the unconventional monetary policy had a more alleviating effect on the financially constrained firms. Finally, we study if the investment-price sensitivity of the financially constrained firms improved much more than their unconstrained counterparts because of the unconventional monetary policy.

From our analyses we find that the financial crisis of 2007-08 had affected the average firm with respected to price informativeness, liquidity and volume of trading of the stocks. We also find that the crisis had a particularly larger impact on financially constrained firms in comparison to unconstrained firms. This signifies that the amount of information that the stock of a financially constrained firm conveys to the manager had decreased significantly because of the crisis and hence managers of these firms are less likely to make investment decisions with the information available in comparison to the constrained firms. When the Federal Reserve had announced the unconventional monetary policies in order to ease the financial constraints of firms and overall frictional state in the economy, we find that the stocks of the constrained firms had a more positive reaction than unconstrained firms. This indicates that the investors expected the unconventional monetary policies of Federal Reserve to be more positive for the constrained firms than the unconstrained firms. Price informativeness of an average firm had improved significantly in the period following the policy announcements by Federal Reserve in comparison to the period before. We also observe that this effect is more pronounced for unconstrained firms in comparison

to unconstrained firms with the help of differences in difference methodology. This shows that the unconventional monetary policy improved the price informativeness of the stocks of the financially constrained firms. However, we also find that the investment price sensitivity of constrained firms did not improve in the period following the financial crisis in comparison to the unconstrained ones. This shows that the conditions were still not conducive enough from the perspective of the managers of the financially constrained firms to make investment decisions with the amount of information that was added to their stocks.

Through this paper, we were able to show that the unconventional monetary policy led to easing in the price informativeness of constrained firms and hence in the process were able to give better access of information to managers of financially constrained firms. Through the results of this paper, we add to the feedback literature of Bond, Edmans and Goldstein (2012). We were also able to measure the effectiveness of the policy announcements of the Federal Reserve in the process.

In this paper, we summarized a wide range of literature which shows how managers could learn from their own stock price and make investment decision from their learning. However, it begs the question about the case of private firms which don't have a secondary market for their stock prices, which makes it unlikely for them to learn from their own stock prices. In our next paper, we focus on how managers of private firms could make investment decisions by learning from the opportunities created in a particular sector by the investment decisions of public firms.

Chapter 4: What do Private Acquirers learn from Public acquirers: Case of M&A?

For our third paper, we analyze what private acquirers learn from the public firms from the perspective of investment. We do this with the case of mergers and acquisition strategies of private firms. The underlying theme of this paper is that one of the major source of information for managers is the strategies of their peers or competitors.

Foucault and Fresard (2018) provides one possible solution to the above question by demonstrating that managers of firms can raise firm value of their own firms by imitating strategies of other public firms. This phenomenon is because imitation enhances their ability to extract more information from their own stock or peer's stock for decision making which also in the process improves the efficiency of their own decision making. In addition, by imitation of strategies of more successful firms, managers increase the correlation between growth in cash flows of their firms and the cash flows of successful firms. The underlying rationale is the same as the investment – price sensitivity as we discussed earlier, provided their stock prices are informative enough. Foucault and Fresard (2018) also show that that the conformity effect is stronger for private firms when they imitate strategies of public firms. Therefore, the strategy of other public firms is a source of information for managers which aids them in their decision making whether to follow their own strategy or imitate the other public firms.

In the absence of successful strategies by public firms, the market could signal that growth opportunities in a certain sector could also be a source of information for managers to base their investment decisions with attributes like the Tobin's Q ratio of a sector. For example, a sector's high Tobin's Q ratio signals that the value of the assets of a firm in that sector appreciates a lot in comparison to the book value of assets thereby indicating high growth opportunities in the sector. This could signal the private firms that they should perhaps invest more in that sector. Yan (2018) in his paper, shows empirically that private firms invest more in industries which have higher industrial valuations. In terms of economic significance, they show that a one standard deviation increase in industrial valuations lead to a 1.4% increase in capital investment of private firms. This is in line with what neo-classical Q-theorists suggest that capital should flow from low-Tobin's Q sector to high-Tobin's Q sector when there is dispersion in Q among the sectors (Jovanovic and Rousseau, 2002).

There are a few papers which show that private and public acquirers invest differently, even though publicly available data on investments made by private firms has been a major empirical problem. Feldman et al (2018) show that public firms invest more than private firms overall because of the access to stock markets. Asker et al (2015) show that private firms display a higher sensitivity to investment opportunities like sales growth or Tobin's Q ratio in comparison to public firms. Sheen (2016) shows that private chemical producers time their investments in the market to take advantage of shocks in demand. Public firms which go private via leveraged buyouts (LBOs) register more patents than what they did when they were public (Lerner et al 2011, Feldman et al (2018)). Similar to this, Bernstein (2015) are in agreement with the above findings when they show that the quality of patents of firms go down after it goes public. It should also be noted that sometimes the activities of public firms have an impact on the investments of private firms. Baderschter et al (2013) with the help of the sageworks database show that the disclosure of financial statements by public firms have an impact on the investment levels of private firms.

From the imitation hypothesis, the postulations of the neo-classical theorists, the literature about differences in private and public investment and the feedback literature, one question that propped up is where do managers of private firms get their information from, considering the fact that their stocks are not listed and they do not have a secondary market for their stocks. The absence of a secondary market deprives them of a source of information which managers of public firms have access to. Therefore learning from public firms and imitating their strategies could be a possible solution to this. There is also a possibility that private firms could just observe growth from the perspective of the sectors of public firms in search of growth opportunities and invest in those sectors. We also analyze this from the perspective of mergers and acquisitions because of lack of empirical data on investment of private firms. This leads to the formulation of the third research question which is: ***"What do private firms learn from public acquirers and what investment decisions do they make from the context of mergers and acquisitions?"***

We use an event study methodology to determine the cumulative abnormal returns of acquirers, targets and overall deal (if both acquirer and target are public) around the announcement date of mergers. This helps us observe the investor reaction to merger announcement by public firms and if private firms learn from this event, to make more deals on their own in order to create value for their investors. We initially test if there is a correlation between the acquisition strategies of private firms in the current year and the acquisition strategies of public firms in the previous years. We later analyze to see if private firms acquire when they observe higher growth opportunities in terms of valuations in that particular sector.

Through these analyses we find that private firms imitate public firms based on the growth opportunities in the sector and the acquisitions made by public firms. The private acquirers imitate the public acquirers by making more acquisitions, when the acquirer's sector has higher growth opportunities and at the same time public acquirers make more valuations at that point of time. This could signify that the managers of the private acquirers learn from the signals of the sectors in terms of growth opportunities and strategies of the public acquirers and make decisions to imitate strategies of public acquirers to create value for their own investors. The private acquirers also imitate the public acquirers when the public acquirers make more deals and the investor reaction to the public deal announcements is high. Through these results, we contribute to the feedback literature because we analyze from the perspective of the private acquirers. This is also in line with the imitation hypothesis of Foucault and Fresard (2018) who show that firms imitate the behavior of a successful strategy for their own benefits.

We were also able to find that the private firms invest more in a sector when they learn from the growth opportunities created by public firms signaled by the Tobin's Q ratio of the sector. We also find that the private acquirers acquire more in a particular sector when the mean investor reaction to the public merger announcements in that sector is higher. This is a contribution to the postulations of neo-classical Q theorists who show that firms will always redeploy assets whenever an investment opportunity arises.

CHAPTER TWO: Do networks of blockholders have an impact on the outcome of Mergers and Acquisitions?

ABSTRACT

The objective of this study is to analyze the impact of corporate network effects on takeover outcomes. The network effect is measured by the strength of a firm's investment in other firms. We find that firms which have more block investments in other firms have a higher probability of being an acquirer. Acquirers which are more well-connected have a higher probability of completing the deal with the target. Firms which are highly connected by the virtue of being the recipient of block investments, have a higher probability of being a target. In addition, the social connections of the targets help them complete the deal with the acquirer eventually.[1]

Keywords: Mergers and Acquisitions, Networks, Blockholders, Centrality, Connections

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1. INTRODUCTION

The objective of this paper is to examine the impact of networks of blockholders on mergers and acquisitions. External blockholders are very prevalent in the financial markets and they are motivated by factors which can be broadly classified into two: shared benefits of control and private benefits of control (Holderness, 2003). Holderness (2003) argues that the shared benefits of control are that the presence of an external blockholder leads to better management and decision making, which eventually augments the wealth of the shareholders in the long run. He also adds that the private benefits of control from an external blockholder's point of view is something financial such as executive compensation or synergies in production for it. The private benefits of acquiring a block could also be in view of a long term acquisition. When a firm acquires a block in another firm, it could lead to a partnership between the two firms as it creates a platform for them to share their core competencies. The major advantage of the block-investment for both the firms is that through these blocks they can share their ideas, reduce costs, increase their own efficiency and eventually they could improve their own profitability. The synergies created between the two firms through the partnership could form the basis of a merger between them in the future.

Networks and interconnections of various forms play an important role in finance. Literature points to the fact that networks of various forms have a positive impact on firm performance (Dyer and Singh, 1998; Geletkanycz and Boyd, 2011; Larcker et al., 2013). Networks could also help a firm become an acquirer thanks to the CEO's connections (El-Khatib, Retal (2014) or connections between board of directors (Cai and Sevilir (2012); Renneboog and Zhao (2013)).This paper deals with one such network, which is a network of blockholders. We focus on a network of blockholders because of their ubiquitous presence in the financial markets. In 2010, external blockholders held as much as 66.2 percent of the market value of NYSE stocks and 71.2 percent of the market value of NASDAQ stocks (Blume and Keim, 2012). With such a presence, they are likely to play an important role in corporate strategy of firms.

This paper solely focus on the roles played by networks that help the blockholders in takeover activity. To our knowledge, there has been very little prior academic research done on the effect of a network of blockholders in the takeover process. We would like to do that by answering the research question which is ***"Do a network of block holding positions increase the probability of a takeover of the firm by the blockholder?"*** We analyze the network effect through the following three hypotheses:

1. Does the network effect have an impact on the probability of a firm being a blockholder?

2. Does the network effect have an impact on the probability of a firm being a target?

3. Does the network effect have an impact on the probability of deal completion from the perspective of both the acquirer and target?

By answering these three questions, the network effect of block holdings on mergers could be better understood. Also, the role of financial firms in these networks could become clearer through our analysis.

This paper contributes to the feedback literature of Bond et al (2012) where they review the literature pertaining to corporate finance linking managerial investment decisions and sources of information available to them. The literature suggests that value maximizing managers use every information available to forecast the cash flows of their investment project when they make capital allocation for various projects (Foucault and Gehrig, 2008, Foucault and Fresard, 2012). Also, forecasts of the cash flows depend on the amount of private information the manager has. Therefore, by investing in many firms, the manager of a blockholder has certain private information which he will use for investment related decisions pertaining to acquisition of the firm he has invested in.

We obtain our panel data of shareholding structure of a firm from Bureau van Dijk (BVD), a Belgian financial data provider. Their database BVD orbis has thorough information on companies worldwide, which includes shareholder information of listed firms. Their main source of information for the database for the American listed firms are the US security exchange commission (SEC) filings (collected using the free online EDGAR database),institutional holdings from the NASDAQ one-line interface and Factset (a financial information provider). The ownership information is collected from the SEC filings Def. 14, 13-G, 13-D and 10-K (items 11 and 12). They also collect additional information through private correspondence, annual reports, stock exchanges, company websites, telephonic calls (in case of conflicting information), press news and other periodical databases like Zephyr M&A database.

From the BVD orbis database, we have a total of 17583 observations of US firm year links, between the blockholders and their targets of investment, between 2007 and 2012. The link between the two firms is that the blockholder owns at least 5% of the outstanding shares in the firms they have invested in. The network effects are measured with the help of two centrality measures – degree and eigenvector. The first measure degree centrality measures the number of links that a blockholder or its target of investment has. A well-connected firm will have a higher degree centrality score. The second measure Eigenvector centrality measures the importance of each individual in the network by taking into account the extent to which a firm is connected to other firms which are well-connected (El-Khatib et al, 2014). The choice of these two centrality measures is based on a number of previous contributions. Renneboog and Zhao(2013) show that the probability of deal completion increases when a bidder and target have one or more director in common and they measure the links with the help of degree centrality measures. El-Khatib et al (2014) show that CEOs with bigger networks were able to facilitate deals better and the CEO links were measured by degree centrality and eigenvector. Also, the paper by Ahern and Harford (2014) show that degree and eigenvector are the two centrality measures which are best suited for the input-output network. We use both weighted and unweighted networks for our analysis. For a weighted network, the weights are based on the percentage of share held by one firm in another.

The database is split into two sub-samples. We have a sub-sample where only non-financial firms invest in each other. The other sub-sample has financial firms as a blockholder in addition to the links in the previous sub-sample. The rationale for having financial firms in our network is that institutional ownership between two-firms increases the probability of the two firms merging (Brooks et al, 2016). Brooks et al (2016) also postulate that financial firms which own blocks in either the acquirer or the target or both may have an important governance role in the M&A process, reducing information symmetry and mitigating the bargaining and transaction cost.

The impact of network effects on the merger and acquisition process is analyzed using a logistic regression analysis. We initially study to what extent the network effects influence the probability of a blockholder being an acquirer. We define the firm to be an acquirer if the firm was an acquirer in the time period of our sample. The reason why we analyze this is that blockholders with a lot of block investments are likely to have a higher component of private information about their investments. They also are likely to acquire a lot of additional information from the social connections they acquired through the networks created by their investments. Also, value maximizing managers are more likely to use this private information for their investment decision making (Foucault and Gehrig, 2008). Therefore, they should have a higher probability of being an acquirer in the process.

We also analyze if the network effects influence the probability of the firm being invested in, in becoming a target. Just like the case of the acquirer variable definition, we define the firm to be a target, if the firm was a target during the period of the sample. The rationale behind this is quite similar to how the network effects the probability of a blockholder being an acquirer. When many firms take blocks in a certain firm, the firm being invested in has a component of private information on the individual blockholders. Also, they gain a lot of additional information through the social connections they acquire in the process because of their position in the social network. This helps them make a decision pertaining to the merger context. There is also a possibility that the presence of blockholders ensures that the firms which are recipients of block investments are better managed, which makes them more attractive as a potential target for firms which are looking for inorganic expansion. Therefore firms attracting more block investments should have a higher probability of being a target.

We analyze the impact of the extent to which the position of the acquirer or target in the social network helps them complete the deal. We define the dependent variable success to be a dummy variable which takes a value of 1 if the acquirer or target completed the deal and 0 otherwise. The rationale behind is that the amount of private information that the manager of a blockholder acquires through the social network will help the blockholder not only become an acquirer but also increases the probability of deal completion. The same rationale is also applicable with respect to the case of network effects helping the probability of deal completion from the perspective of the target.

From our analysis, we could observe that network effects have a significant impact on a firm being an acquirer if it has many block investments. This indicates that firms which have more block

investments in other firms are more likely to be acquirers in the long run because of the social connections they get through such investments and the significant private information they obtain from these connections. This result is consistent with the results of Renneboog and Zhao (2013), which show that better connected companies are more likely to be acquirers. We also find that firms which are the recipient of block investments have a higher probability of being a target. This is an indicator that the block investments in a firm, makes it more attractive as a target to potential acquirers. One of the reasons for the above phenomenon is that some blockholders could have been instrumental in the firms being better managed which led to better performance in the short run, hence making it more attractive as a target. Another reason could be that the firm which took a block position in the other firm views it as a target in the long run. Our analysis also shows that acquirers which are both well connected and important in the network are more likely to close the deal with the target. Targets which are important in the network have a higher probability of deal completion with acquirers. Hence, the social connections that the acquirer and the target develop through these block investments have a significant impact on takeover outcomes from the perspective of both the acquirer and the target. These results are also in line with the feedback literature, which show that managers of a firm use every piece of information available to them in the matters of investment decisions.

The structure of the paper is as follows. We explain the different centrality measures we use and what they signify in Section-2. The hypothesis development, literature review and the regression model are explained in Section-3. The data collection and the corresponding descriptive statistics are explained in Section-4 and the results that we obtained are explained in Section-5. We finally summarize the results and conclude in Section-6

2. CENTRALITY MEASURES

This section explains the different centrality scores used in our paper and what are the significance of the measures:

Degree: Degree of a network measures the importance of a particular individual (vertex in social network parlance) because of the number of connections it has with another individuals in the network (Freeman, 1978; Miura, 2011). In other words, degree is the number of links a particular firm has with other firms in the network by the virtue of investing or being invested in. If a blockholder has more number of links by the virtue of having invested more in other firms, it is likely to have higher out-degree measures. If the firm has more number of links by the virtue of other firms investing in it, it is likely to have a higher in-degree measure. Firms with higher degree measures are likely to be more central in the network of firms. Since a weighted network is also used in our analysis, it should be the noted that the weights assigned to each firm is based on the percentage of the shareholdings that a blockholder has in the firm it has invested in.

We use a directed network in our analysis where the number of links coming in and going out might be different and hence we have out-degree and in-degree. In this network the in-degree is defined as the degree of the target and out-degree as the degree of blockholder.

For a directed network, we define out-degree of a node as d_i which takes the value:

$$d_i = \frac{1}{|V|-1}\sum_{j \neq i} A_{ij} \text{ - (1)}$$

where $|V|$ is the number of total number of nodes in the network and A_{ij} is the adjacency matrix which gives the number of the nodes that a particular node is connected to. Adjacency matrix A_{ij} is defined as a $|V| \times |V|$ matrix with all entries equal to one if a node i and j are connected and zero otherwise.

For a directed network, we define in-degree of a network as d_i:

$$d_i = \frac{1}{|V|-1}\sum_{j \neq i} A'_{ij} \text{ - (2)}$$

Where $A'ij$ is the transpose of the adjacency matrix A_{ij} in equation (1).

Eigen-Vector: Eigen vector awards higher centrality scores to members which have many neighbours, important neighbours (measured by size of the neighbor) or both (Miura, 2011). Bonacich (1972) defines the eigenvector centrality score as the sum (weighted or unweighted) of centrality scores of its neighbours increased by a constant. For a directed network, we define eigen-vector of a node i as c_i which takes the value:

$$c_i = \lambda^{-1}\sum_{j=1}^{N} A'_{ij} c_j - (3)$$

Where $A'ij$is the transposed adjacency matrix, λ is a constant and $c_j$is the eigenvector of other nodes. When written in a form of a matrix notation the equation becomes:

$$\lambda\, c = A' c - (4)$$

From equation (4) it could be seen that c is the principal eigenvector of the adjacency matrix. From the equation (3) it could be observed that if a particular node is connected to more number of nodes in the network or connected to larger members (which are connected to more number of nodes in the network) or both, the eigenvector of that particular node is awarded a higher centrality score and therefore measures its importance.

In essence, eigenvector of a particular firm measures the importance of any firm in the network by the virtue of having more number of links with other well-connected firms. We calculate both the weighted and unweighted value of eigenvector of each member in the network. The weights are based on the percentage of the shareholding that a blockholder has in its target of investment. Hence we define the eigenvector of the target as the eigenvector of the links coming in and eigenvector of the blockholder as the eigenvector of the links going out.

3. LITERATURE REVIEW AND HYPOTHESES

There are quite a few papers which link the networks of various forms and performance of the firm. The main argument that they provide is that the social connections of the management measured by the network effects lead to better access of information from which the firm can benefit in decision making (Larcker and Tayan, 2010; Omer et al.,2012). Boards with bigger network centrality score show a superior risk-adjusted stock returns thanks to the greater information access (Larcker et al, 2013). Also, well connected CEOs have better access to low cost information thanks to their network contacts which aids them in a variety of purposes (Burt, 1997; Nahapiet and Ghoshal, 1998). Networks of directors serving in various companies could help them strengthen their ties, establish a stronger communication channel for soft information and eventually gives them more influence in boardroom discussion (Renneboog and Zhao, 2013).All these studies establish a positive link between networks and firm's performance or aid them indirectly. The key connection to all the above studies is that the networks of various interconnections (among the management) leads to a wealth of information which could help a firm in the long run. When firms acquire a block in other firms, it gives the management of the two firms an opportunity to interact with each other, which gives the blockholder specific information about the firm it has invested in. This information could be helpful for the blockholder in making a decision about a potential takeover. Also, value maximizing managers use every piece of information available to them in the matters pertaining to mergers and acquisitions (Foucault and Gehrig, 2008, Foucault and Fresard, 2012). Hence the private information made available to the blockholders are more likely to influence their decision making pertaining to a potential takeover.

Though a relatively new field, there has been a few papers which show that networks have an impact on mergers and acquisitions. A paper by Cai and Sevilir (2012) report in the context of mergers and acquisitions (M&As) that informational asymmetries are lower when the bidder and the target have a common director. Cai et al. (2016) were able to show that firms with a common auditor have a higher probability of merging with each other. In addition to this, such deals have higher acquisition announcement returns than the non-common auditor deals. Stronger product market connections lead to a greater incidence in cross-industry mergers is one of the main findings of Ahern and Harford (2014). They also add that these mergers propagate in waves through links between customer and suppliers. Another major finding in their paper is that merger activities that are central in their product market network are a precursor to merger waves across the economy. In a network of firms and its suppliers, customers and rivals, Harford et al. (2016) report that they were able to predict which pairs of firms were more likely to merge. They were also able to add to their existing results by showing which targets were more likely to attract multiple bidders and which mergers added the maximum value and attracted follow on merger activity. All these papers establish the link between networks of various forms and mergers and acquisitions. In this paper, we analyze the impact of network of block holder links on the merger process.

We formulate our hypotheses on the impact of networks on a firm being an acquirer, a firm being a target and probability of deal completion.

3.1 Probability of being an acquirer: The first question we would like to ask is whether blockholders that are more central and more well connected have a higher probability of being an acquirer or not. Renneboog and Zhao (2013) in their paper suggest that companies with better access to information through their networks are more likely to find targets and initiate takeover talks. The reason for this is that blockholders having many direct links with the firms they have invested in, increases the amount of soft information that they get through their social connections which helps it choose a suitable target. Also, financial firms investing in these firms could play the role of deal facilitator if they have block investments in either the blockholder or the target. In addition to all this, the feedback literature suggests that that the managers with higher amount of private information are more likely to make investment decisions. Hence, firms with more number of block investments should have a higher probability of being an acquirer. This leads to our first hypothesis (H1): ***Blockholders with a higher centrality scores have a higher probability of it being an acquirer.***

3.2 Probability of being a target: Our next question analyses whether network effects enable some firms to be more attractive as targets or not. When the firm being invested in has more number of links with block holders it will increase its in-degree centrality and eigenvector measure. Some blockholders play an important role in management of firms which could help the firms they have invested in, in their performance in the long run. Their performance could potentially make them more attractive as targets for acquirers in the future. In addition, the presence of financial firms as blockholders in a firm makes them attractive as targets because the financial firms could act as the facilitator of a merger in the future. This leads to our second hypothesis (H2): ***Firms with higher centrality scores will increase the probability of it being a target.***

3.3 Probability of deal completion: Our final hypothesis deals with the impact of network effects on deal completion. Once the intention to acquire the target has been revealed, the target has to decide how to react to this offer. Through the social connections they acquire thanks to its position in a network, the target is likely to receive a lot of information which helps it decide whether it should merge with its acquirer. Also, the acquirer has to decide its negotiation strategy based on the information it gets from its social connections. This gives us a notion that the network effects have an impact on the deal completion from both the side of the target and from the side of the acquirer. In addition, with a lot of private information received from the social networks on either side, any value maximizing manager is most likely to make the best decision pertaining to the deal completion. Hence, blockholders with more block investments and firms that attract more of these investments should have a higher probability of deal completion because of the private information available to them. Also, the financial firms could influence the strategies of both the sides because of their investment in either of the firms or both the firms. This

leads to our third hypothesis (H3): ***Targets or acquirers with higher centrality scores have a higher probability of merging with the firm it is negotiating with.***

4. DATA

We obtain our network links from the Bureau Van Dijk (BVD). From their BVD orbis database we have a total of 17583 observations between 2007 and 2012. The link between a blockholder and the firm it has invested in is that the blockholder owns at least 5% of the outstanding shares of the firm it has invested in each year. The percentage of outstanding shares are directly held by the blockholder and does not include indirect holdings.

[Insert Table 1]

In the Table 1, we compare what proportion of the firms in the sample are represented in comparison to the firms from the CRSP database. We observe that on an average 41% of the CRSP universe is represented in our sample of BVD orbis across all sectors and in all the years. So it is quite a representative sample of the CRSP database overall.

[Insert Table 2]

In the Table 2, we tabulate a square matrix to look at the sectors that a firm from a particular sector invests in. It could be observed that the blockholders are mostly interested in the firms of their own sector than from the other sectors with an average of 64% investments in their own sector. Financial sector is the sole exception to the above observation. Firms from the financial sector have an average of 28% investment in other financial firms and invest the remaining in the other sectors. It should also be noted that financial firms have the most investments for any sector every year as a percentage of the total links in the sample. Almost 73% of all links have a financial firm present in it either as a blockholder or as a target or as both. In total, we have 4491 links where non-financial firms invest in each other.

The overall data is split into two subsamples. In the first subsample, there is a network of non-financial firms investing in themselves alone. We have a total of 4491 observations in this sample across 6 years between 2007 and 2012. We calculate the network centrality measures of degree and eigenvector for both the blockholder and the target for this sample. To this we add firms from the CRSP database which don't have any links with other firms in this sample. Since they don't have any links with other firms in the sample, their network measures are also set to 0. In total there are 42875 observations in this subsample.

Our second subsample is when we add financial firms as a blockholder which invest either in the target or the blockholder or both the firms. There are a total of 14019 observations in this subsample across 6 years between 2007 and 2012. We calculate the network measures just like we did for in the previous subsample. In addition to this, just like the previous subsample, firms from CRSP universe,

which don't have links to other firms in this sample are added. Their centrality scores are set to zero since they don't have links with other firms in the network. If the firms which don't have links with other firms in the network are excluded we could end up having a biased sample which does not represent the whole universe of firms. In order to avoid this self-selection bias, we choose to set their centrality scores to zero. Overall, we have a total of 62062 observations in the subsample.

[Insert Table 3 and Table 4]

In our Table 3, we have four panels. Table 3 as a whole looks at the centrality measures of the blockholder and its target of investment in the whole CRSP universe on an annual basis between 2007 and 2012. Panel A of the table looks at the centrality measures of the blockholder in a weighted network. Panel B of the table looks at the centrality measures of the blockholder in an unweighted network. Panel C of the table looks at the centrality measures of the target of blockholder's investment in a weighted network. Panel D of the table looks at the centrality measures of the target of blockholder's investment in an unweighted network. We repeat the same process for the blockholder and its target of investment in table 4 albeit it consists of only firms from the BVD orbis database and not the whole CRSP universe.

In the CRSP universe, where there are only non-financial firms we notice that on an average, a blockholder has 0.2 links with the targets on an annual basis with a standard deviation of 0.84 though Pfizer has as many as 11 outward links in the year 2012. For the same sample (with only non-financial firms), where there are firms from the BVD orbis database alone, we have as many as 1.79 links with a standard deviation of 1.28 links. From a target level perspective of the same subsample (with only non-financial firms) for the CRSP universe we notice that the target has an average of 0.11 links with the blockholder on an annual basis with a standard deviation of 0.31 links. However, the number of inward links increases to as many as 1.01 links with a standard deviation of 0.11 links when the sample contains firms only from the BVD orbis database. Overall, we could say that blockholders are more central in the network than the targets thanks to the number of outward links they have which gives them an overall higher degree and eigenvector scores as well.

In the other subsample (where the financial firms are a blockholder),the blockholder on an average has 42 links with a target on an annual basis, with a standard deviation of 154 links though Blackrock has had as many as 816 links in 2010 in the CRSP universe. This average increases to an average of 185 links with a standard deviation of 280 links when only firms the BVD orbis database are there. In the CRSP universe, targets have as few as 0.35 links with the blockholders with a standard deviation of 0.75 links, though Cavco industries had as many as 6 blockholder links invested in it in the year 2012. However, this average increases to 1.55 links with a standard deviation of 0.81 links. It is quite clear that even in the setup with financial firms, blockholders are more central in the network than targets because of the number of links they have which gives them better network centrality measures. Also, the financial firms are more central than both these types of firms.

To observe which of these blockholders have been an acquirer or a target in our database, we collect the list of mergers between 2007 and 2012 from the SDC database and there are a total of 1662 observations which includes both deals which were successful and unsuccessful. The sample collection satisfies the following criteria:

- The firm has 100% control after acquisition and the firms acquired at least 50% of the shares of the target in the deal
- The deal was worth a minimum of 1 million US dollars
- The acquirer has the necessary data on the CRSP / Compustat to access the required data for the concerned models
- All the targets are from the United States and are public companies
- All the acquirers are from across the world and they could be a subsidiary, public or a private firm

From this database, the firms that were acquirers or targets between 2007 and 2012 are obtained. This helps us determine the probability of a firm being a target or acquirer.

4.1 Probability of being an acquirer or target: The variables collected from CRSP-Compustat merged database are current assets, total assets, total shares outstanding, long term debt, industry adjusted operating income, net power plant equipment, current liabilities, total sales, closing price and cash assets and short-term investments. From these variables we calculate the control variables for the acquirer and the target respectively. The firm specific characteristics that are controlled for in our analysis are Firm size, Market to book ratio, Return on assets, Property ratio, liquidity ratio, sales growth, cash assets and Leverage. We control for industrial level characteristics with the industrial concentration. The industrial concentration is defined by the HH index (Herfindahl-Hirschman index) using sales.

There are a total of 40106 observations between 2007 and 2012, when there are financial firms as a blockholder in our analysis. The number of observations decreases to 28931 observations when there are just non-financial firms investing in each other. The ratios in the data are winsorized to ensure that they lie between the 1^{st} and 99^{th} percentile and essentially avoid the problem of outliers. Also, the centrality measures are added to both the sub-samples. We replace the centrality measures to 0 if the firms do not have links with other firms in their respective samples.

Table 5 describes the summary statistics of the whole sample. In the table 6, we look at the difference in statistics between financial and non-financial firms. This difference is found out using a difference of means between financial firms and non-financial firms. This test is repeated to observe the difference of statistics between acquirers and non-acquirers in the Table 7 and targets and non-targets in the Table 8.

[Insert Table 5]

In the Table 5, it can be observed that only 1.73% of the whole sample has been an acquirer in this period. It also can be observed that 2.19% of the same sample has been a target in this period. Also, 26.44% of this sample are financial firms. Firms from the sample have a leverage of 17% with a standard deviation of 20% (sample from Karpoff et al (2014) have a leverage of 20%). The firms also have an average return on assets of 0.68% with a standard deviation of 22.2 %. They also have a property ratio of 48.27% and a liquidity ratio of 25.48% (Karpoff et al (2014) report a property ratio of 61% and a liquidity ratio of 19%). The average sales growth of the firms in the sample is 11% with a standard deviation of 42.88% (corresponding sales growth from Karpoff et al (2014) is 10%). The firms have an average cash and short term equivalent holdings of 19.66% in this period. They have also have an average market to book ratio of 1.56 with a standard deviation of 2.23 (Karpoff et al (2014) report an average of 1.53 for their sample).

[Insert Table 6]

From the Table 6, it is observed that financial firms are more central in the network than their non-financial counterparts. Financial firms have lesser long-term debt (16% for financial firms in comparison to 18% for nonfinancial firms) and have lesser liquidity (23.4% in comparison to 25.6% for non-financial firms) in the sample. The financial firms hold lesser cash (11% financial firms and 22% for non-financial firms), have lesser sales growth (6% vs 12.4%) and yet have a higher return on assets (3.1% versus -0.03%) than the non-financial firms. Financial firms also have a lower market to book ratio (0.86 versus 1.78) when compared to non-financial firms.

[Insert Table 7]

From the Table 7, it could be observed that acquirers have a better return on assets (5.5% versus 0.6%) and sales growth (15.5% versus 10.8%) than firms that weren't acquirers. The acquirers are less liquid (18.1% versus 25%) and have a poorer property ratio (41% versus 48.5%). They also hold lesser cash and short-term investments (14.5 % versus 19.8%) and don't have a very high market to book ratio (1.16 versus 1.58) value in comparison to their non-acquiring peers.

[Insert Table 8]

Table 8 shows that targets have lower sales growth in comparison to the firms that are not targets (2.5% versus 11%). In addition, the targets have lower market to book ratio than their non-target peers (1.26 versus 1.58).

With respect to the first hypothesis where we test if the network effects influences the probability of a blockholder being an acquirer, we use a logistic regression for our analysis. The dependent variable is a dummy variable "Acquirer" which takes a value of 1 if the firm was an acquirer between 2007 and 2012 and 0 otherwise. The independent variables are the centrality measures of the blockholder which measure the network effects. We control for industrial fixed effects and annual fixed effects in our

analysis. The control variable specifications are taken from Karpoff et al (2014). The logistic regression equation which we use to determine the probability of a firm being an acquirer in our set up is as follows:

$$Probability\ of\ being\ an\ acquirer_{i,j,t} = a_0 + a_1 * (Network\ measures\ of\ blockholder)_{i,t} + a_2 * (Ln(total\ assets))_{i,t} + a_3 * (Market\ to\ book\ ratio)_{i,t} + a_4 * (Leverage)_{i,t} + a_5 * (Return\ on\ assets)_{i,t} + a_6 * (sales\ growth)_{i,t} + a_7 * (Property\ ratio)_{i,t} + a_8 * (liquidity\ ratio)_{i,t} + a_9 * (cash\ asset)_{i,t} + a_{10} * (Industrial\ concentration)_{j,t} + a_{11} * (Industrial\ fixed\ effects)_j + a12 * (Annual\ fixed\ effects)_t + \varepsilon -$$ (5)

For our second hypothesis we test if the network effects influences the probability of a firm being a target with the help of a logistic regression model. The dependent variable is a dummy variable "Target" which takes a value of 1 if the firm was a target between 2007 and 2012 and 0 otherwise. The independent variables used in the framework are the centrality measures which measure the network effects. We also control for industrial fixed effects and annual fixed effects in our analysis. We use the same control variable specification as the ones used by Karpoff et al (2014) in their analysis. The logistic regression equation which we use to determine the probability of a firm being a target in our set up is as follows:

$$Probability\ of\ being\ a\ target_{i,j,t} = a_0 + a_1 * (Network\ Measures\ of\ Target\ of\ Investment)_{i,t} + a_2 * \left(Ln(total\ assets)\right)_{i,t} + a_3 * (Market\ to\ book\ ratio)_{i,t} + a_4 * (Return\ on\ assets)_{i,t} + a_5 * (Property\ Ratio)_{i,t} + a_6 * (Liquidity\ ratio)_{i,t} + a_7 * (Leverage)_{i,t} + a_8 * (sales\ growth)_{i,t} + a_9 * (Industrial\ concerntration)_{j,t} + + a_{10} * (Industrial\ fixed\ effects)_j + a11 * (Annual\ fixed\ effects)_t + \varepsilon$$ – (6)

4.2 Probability of deal completion: Betton et al (2014) in their paper developed a model which predicts the conditional probability of deal success. We use the same variable specifications in our model to see if the network effects influence the probability of deal completion from the perspective of the acquirer or the target. Our dependent variable is a dummy variable "Success" which takes a value equal to one if the deal has been completed between 2007 and 2012 and 0 if the deal is a failed bid. The independent variables are the centrality measures of both the acquirer and the network. They measure the network effects which help in deal completion from the perspective of both the acquirer and the target.

In our control variables we have controlled for the acquirer, target and the deal characteristics. In our acquirer characteristics we control for toehold, bidder being public, horizontal acquisition and four week premium. For the target characteristics we control for Target size, NYSE/AMEX, Turnover and poison pill. The deal characteristics which we control for are Tender offer, all cash and all stock.

[Insert Table 9]

In our sample of 1662 deals completed and uncompleted a total of 81.17% of the deals were completed (1349 deals). In the sample, 62.7% have gone for an all cash deal and 12.58% have gone for an all stock deal. 2.05% of the targets had a poison pill defense takeover which discourages hostile takeover. 33.15% of the targets were in the same sector as the acquirer. 55.84% of the bidder were public and 7.16% of the targets had a toehold block taken by the bidder in them. 27.08% of the targets were listed in NYSE or AMEX. The sample on an average has a turnover of 0.5 with a standard deviation of 0.54 and the corresponding 4 week premium is 46.68% with a standard deviation of 56.3 %. We also notice that acquirers on average have higher centrality measures than the targets in the sample. Overall, the statistics are in order with the statistics of Betton et al (2014).

We use a logistic regression for our analysis to measure the probability of deal success. We also control for annual fixed effects in our analysis. We use the centrality measures of both acquirer and target to see the impact of network measures from both the perspectives to see how they affect the probability of deal completion. The logistic regression equation which we use to determine the probability of a deal success in our set up is as follows:

$$Probability\ of\ deal\ success_{i,t} = a_0 + a_1 * (network\ measures\ of\ acquirer\ or\ target)_{i,t} + a_2 * (Target\ size)_{i,t} + a_3 * (Poison\ Pill)_{i,t} + a_4 * (Turnover)_{i,t} + a_5 * (Toe\ Hold)_{i,t} + a_6 * (Listed\ bidder)_{i,t} + a_7 * (4\ week\ premium)_{i,t} + a_8 * (Tender\ offer)_{i,t} + a_9 * (all\ cash)_{i,t} + a_{10} * (all\ stock)_{i,t} + a_{11} * (NYSE\ AMEX)_{i,t} + a12 * (Annual\ fixed\ effects)_t + \varepsilon - (7)$$

5. RESULTS

We discuss the results in details for the analysis of all our three hypotheses in this section. We also discuss the results and their significance for both the sub-samples separately.

5.1 Probability of being an acquirer: In the Panel A of the Table 10, we observe a coefficient of 17.34 at a 1% significance level from the column 1 for degree of source weighted. In terms of economic significance, firms have a 1.29 % probability of being an acquirer if they have a higher degree of source weighted. We also observe a coefficient of 820.2 at a 1% significance level in the column 2 of the table 10 for the degree of source unweighted. In terms of economic sense, we can say infer that firms have a 1.1% probability of being an acquirer if they have a higher degree of source unweighted. Therefore, the degree of the acquirer weighted and unweighted is shown to be quite significant from our analysis. This shows that blockholders which are more central in the network by the virtue of having more links with other firms have a higher probability of being an acquirer. We also observe a coefficient of 6.019 for the eigenvector of acquirer unweighted at a 1% significance level from the column 4 of the same table. Economically speaking, firms have a 0.8% probability of being an acquirer if they have a higher unweighted eigenvector score. Therefore, the eigenvector of acquirer unweighted is shown to be quite positively correlated to the probability of a firm being an acquirer. This signifies that firms with higher

eigenvector have a higher importance in the network and hence have a higher probability of being an acquirer. We however don't get significant results for weighted eigenvector measurement. Overall from our logistic analysis on the sample where there are only non-financial firms, we observe that degree of acquirer both weighted and unweighted measures have a very high positive significance on the probability of a firm being an acquirer. For robustness checks, we repeat our analysis with firm fixed effects instead of industrial fixed effects. We get similar results for the robustness checks.

For a similar analysis on a sample where there are financial firms as a blockholder, we obtain the same results. From the Panel B of the table 10, we observe a coefficient of 25.19 at a 1% significance level from the column 1 for degree of source weighted. In terms of economic significance, firms have a 1.2% probability of being an acquirer if they have a higher degree of source weighted. We also observe a coefficient of 53.58 at a 10% significance level for the degree of source unweighted from the column 2. Economically speaking, if the firms have a higher degree of source unweighted they have a 0.8% probability of being an acquirer. This shows that the probability of a firm being an acquirer is positively correlated to the degree of source score it has. The eigenvector of source unweighted has a coefficient of 3.85 at a 5% significance level from the column 4. From this result, we can infer that firms which have a higher eigenvector unweighted score have a 0.8% probability of being an acquirer. Therefore, the eigenvector of acquirer unweighted is shown to be quite positively correlated to the probability of a firm being an acquirer. We notice that degree of acquirer (both weighted and unweighted) and unweighted eigenvector of acquirer have a positive and significant impact on a blockholder being an acquirer.

They signify that blockholders which have more number of links in the network and are important in the network by being connected to other well-connected firms have a higher probability of being an acquirer. These results give us sufficient proof to validate our hypothesis that network effects play a significant impact on the probability of a firm being an acquirer. Hence, firms which have more block investments in other firms are more likely to be an acquirer because of the social connections they get through such investments. In sync with the postulations of the feedback effect, we could justify saying that firms with more private information are more likely to make decisions pertaining to investments. We are also able to show the importance of financial firms in this network and the role they play in convincing a firm to be an acquirer.

When it comes to control variables, we get a positively significant coefficient for bidder size, leverage and sales growth. We also observe a negative coefficient for market to book ratio. These results are consistent with the results of Brooks et al. (2016). We do not have significance for other control variables used in our analysis.

[Insert Table 10]

5.2 Probability of being a target: We repeat our analysis on the two subsamples to see the probability of a firm being target. From the column 1 of the Panel A of Table 11, we observe a coefficient

of 11.06 at a 1% significance level for the degree of target weighted. In terms of economic significance, firms which have a higher degree of target weighted measure have a 1.5% probability of target. This shows that the degree of target weighted is positively correlated to the probability of a firm being target. From the column 2 of Table 11 in the same panel, we observe a coefficient of 740.2 at a 1% significance level for degree of target unweighted. In terms of economic significance firms which have a higher degree of target unweighted score have a 1.6% probability of being a target. This shows that the degree of target unweighted is positively correlated to the probability of a firm being target. This is the case in the sample where only non-financial firms invest in each other. We don't find significance for eigenvector of target both weighted and unweighted.

This signifies that firms which are recipients of more block investments are more likely to be targets. In the sample where there are financial firms as a blockholder, we don't find any of the centrality measures being significant. Therefore, we find some evidence that firms which are more central in the network have a higher probability of being a target based on the results we got from the sub-sample with no financial firms. Hence, we can validate the hypothesis that firms that are the recipients of more block investments have a higher probability of target.

[Insert Table 11]

When it comes to control variables, we get a negative significance for firm size, market to book ratio and sales growth. These results are consistent with the results obtained in Karpoff et al (2014). The other control variables in our analysis are not significant.

5.3 Probability of deal completion: Finally, we move on to the impact of network effects on probability of deal completion, which we would like to explain both from the version of target's centrality measures and acquirer's centrality measures.

Initially we analyze the probability of deal completion from the perspective of the acquirer. From the Panel A of Table 12, we observe a coefficient of 18.06 at a 1% significance level for the degree of source weighted from the column 4. In terms of economic significance, we can infer that acquirers with a higher degree of source weighted have a 91.24 % probability of completing the deal with the target. We also observe a coefficient of 1183 at a 1% significance level for the degree of source unweighted form the column 2. In terms of economic significance, we can infer that acquirers with a higher degree of source unweighted have a 91.25 % probability of completing the deal with the target. Therefore, we can say that the degree of the acquirer is positively correlated to the probability of an acquirer completing the deal with the target. The eigenvector of source weighted has a coefficient of 19.19 from the column 3 at a 1% significance level. In terms of economic significance, we can infer that acquirers with a higher eigenvector of source weighted have an 89.44 % probability of completing the deal with the target. We also observe a coefficient of 15.75 at 1% significance level for the eigenvector of source unweighted from the column 1. In terms of economic significance, we can infer that acquirers with a higher eigenvector of source

unweighted have an 89.5 % probability of completing the deal with the target. This signifies that the eigenvector of the acquirer is positively correlated to the probability of an acquirer completing the merger with the target. This is for the sample with only non-financial firms.

When financial firms, are added to the sample, we observe a coefficient of 31.75 at a 1% significance level for the degree of source weighted from the column 4 of Panel B in Table 12. In terms of economic significance, we can infer that acquirers with a higher degree of source weighted have a 91.29 % probability of completing the deal with the target. We also observe a coefficient of 1885.9 at a 1% significance level for the degree of source unweighted from the column 3 of the same table. In terms of economic significance, we can infer that acquirers with a higher degree of source unweighted have a 92.11 % probability of completing the deal with the target. This shows that the degree of acquirer is positively correlated to the probability of deal completion when the financial firms are present in the sample. From the column 3, we observe that the eigenvector of source weighted has a coefficient of 261746.3 at a 1% significance level. In terms of economic significance, we can infer that acquirers with a higher eigenvector of source weighted have an 89.44 % probability of completing the deal with the target. We also observe a coefficient of 799851.8 at a 1% significance level for eigenvector of source unweighted from the column 1. In terms of economic significance, we can infer that acquirers with a higher eigenvector of source unweighted have an 89.25 % probability of completing the deal with the target. This signifies that the eigenvector of the acquirer is positively correlated to the probability of an acquirer completing the merger with the target with the help of the financial firms.

Therefore, acquirers who have more number of links and by the virtue of that are more central and important in the network have a higher probability of deal completion with the target. We could also observe the importance of financial firms in these networks. Therefore, we can validate the hypothesis that the acquirers who have more block investments in the network have a higher probability of deal completion. They achieve this through the information they obtain thanks to their block investments. Consistent, with the postulations of the feedback literature, we could justify that value maximizing managers of blockholders with more private information through the social network through their investments are more likely to complete deals with the firms they have invested in.

We then analyze the probability of deal completion and its relationship with a firm's position in the network from the perspective of the target. In the sample where only non-financial firms invested, we observe a coefficient of 0.329 for eigenvector of target weighted from the column 3 in the Panel A of Table 13 at a 1% significance level. In terms of economic significance, targets with a higher eigenvector score have an 87.26% of completing the deal with the acquirer. We also observe a coefficient of 15.75 at a 1% significance level for the eigenvector of target unweighted from the column 1. In terms of economic significance, targets with a higher eigenvector score have an 89.5% of completing the deal with the acquirer. This shows that the eigenvector of target is positively correlated to the probability of a target

completing the deal with an acquirer. However, we don't observe a positively correlation between probability of deal completion and the degree of target (both weighted and unweighted).

When financial firms are added to the sample, we observe that the eigenvector of target weighted has a coefficient of 856421.9 at a 1% significance level from the column 3 of the Panel B of Table 13. In terms of economic significance, targets with a higher eigenvector score have an 87.27% of completing the deal with the acquirer. This shows that the eigenvector of target is positively correlated to the probability of deal completion. We don't find any significance for other variables of interest.

We could infer from these results that the targets which have more links and by the virtue of that are more important in the network have a higher probability of deal completion with the acquirer. Therefore, we can validate our final hypothesis that the targets which are recipients of more block investments have a higher probability of deal completion with the acquirer. We could also observe the importance of the financial firms in the mergers from the perspective of the target as well. The targets complete the deal with the information they acquire from their information networks by the virtue of being invested in. These results are consistent with the postulations of the feedback literature, which show that value maximizing managers are more likely to make investment related decisions with a higher proportion of private information.

[Insert Table 12 and Table 13]

From our logistic analysis, we notice that the control variables poison pill, all stock deal and toehold have a negatively significant coefficient. We can also observe that public bidders and tender offers have a positively significant coefficient. These results are consistent with the results of Betton et al (2014). The other control variables do not have a significant impact on the probability of deal completion.

It should be noted that when we performed logistic regression for the probability of deal completion in the case where there are only non-financial firms in the sample, the iterations did not converge. Hence, we find out the probability of deal completion with a linear probabilistic model.

6. CONCLUSION

As we saw previously there is a growing literature on how social networks have an impact on mergers and acquisitions. They had shown that network of board of directors, networks of CEOs, networks of economic links created by customer, supplier and rival links all have an impact on mergers and acquisitions. We are adding something new to this literature by examining if networks of blockholders have an impact on mergers and acquisitions. We have done so by trying to answer three basic questions – 1. Impact of networks on a blockholder being an acquirer 2. Impact of networks on a firm being invested in becoming a target 3. Impact of networks on probability of deal completion if two firms decide to merge from both the measures of the acquirer side and the target side.

Our study shows that firms with many block investments in other firms have a higher probability of being an acquirer. We find that firms with higher block investments have a 0.8% to 1.5% probability of being an acquirer. By having more investments in other firms, they become more important and central in the network of mergers. By the virtue of these investments they acquire a lot of social connections which gives them a lot of information. With the help of this information, the acquirers were also more likely to complete the deal. We find that acquirers have an 89% to 92% probability of completing the deals with the target because of their position in the network.

We also find evidence that firms which are the recipient of such investments were more likely to be a target. These firms have a 1.5% probability of being a target because of their position in the network. We were also able to find evidence that the social connections of these targets helped them complete the deal in the long run. We also find that the targets had an 87% probability of deal completion with acquirers by virtue of their social connections. Therefore, the informational networks not only help the acquirer, they also help the target in their decision making of whether to be an acquirer or target and whether they need to complete the deal or not. Overall, we find that networks of blockholders have an impact on mergers and acquisitions.

From our paper, we were able to gain a better understanding of the takeover strategies of firms and how networks of blocks in firms help them in it. Through our results we were also able to add to the growing social network literature. In the process, we were also able to add to the feedback literature, which links investment decisions of managers to the amount of private information they have. We were also able to see the impact of financial firms in these networks.

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Table 1: Table 1 represents the sectoral split up of the firms in our database on an annual basis. The table give us a comparison of the number of firms that are there in the CRSP versus the number of firms are there in the sample in each sector on an annual basis. The sample consists of firms from the BVD orbis database. The timeframe of this sample is between 2007 and 2012.

Year	*SIC codes (shareholder)*	*Firms in CRSP (number)*	*Firms in sample (number)*	*Sample representation*
2007	01 to 09 (Agriculture, forestry and fishing)	15	6	40.00%
	10 to 14 (mining)	377	156	41.38%
	15 to 17 (construction)	58	16	27.59%
	20 to 39 (Manufacturing)	2422	1005	41.49%
	40 to 49 (Transportation)	599	262	43.74%
	50 to 51(Wholesale trade)	164	62	37.80%
	52 to 59 (Retail trade)	316	94	29.75%
	60 to 67 (Finance)	1984	490	24.70%
	70 to 89 (services)	1066	448	42.03%
	91 to 99 (Public admin)	87	26	29.89%
	Total	7088	2565	36.19%
2008	01 to 09 (Agriculture, forestry and fishing)	15	5	33.33%
	10 to 14 (mining)	377	166	44.03%
	15 to 17 (construction)	57	14	24.56%
	20 to 39 (Manufacturing)	2345	1056	45.03%
	40 to 49 (Transportation)	586	278	47.44%
	50 to 51(Wholesale trade)	160	60	37.50%
	52 to 59 (Retail trade)	307	107	34.85%
	60 to 67 (Finance)	1903	542	28.48%
	70 to 89 (services)	1045	483	46.22%
	91 to 99 (Public admin)	82	30	36.59%
	Total	6877	2741	39.86%

Year	*SIC codes (shareholder)*	*Firms in CRSP (number)*	*Firms in sample (number)*	*Sample representation*
	01 to 09 (Agriculture, forestry and fishing)	17	5	29.41%
	10 to 14 (mining)	360	158	43.89%
	15 to 17 (construction)	56	24	42.86%
	20 to 39 (Manufacturing)	2237	1022	45.69%
	40 to 49 (Transportation)	571	278	48.69%
2009	50 to 51(Wholesale trade)	149	65	43.62%
	52 to 59 (Retail trade)	290	106	36.55%
	60 to 67 (Finance)	1852	543	29.32%
	70 to 89 (services)	1020	474	46.47%
	91 to 99 (Public admin)	42	21	50.00%
	Total	6594	2696	40.89%
	01 to 09 (Agriculture, forestry and fishing)	20	9	45.00%
	10 to 14 (mining)	359	164	45.68%
	15 to 17 (construction)	56	25	44.64%
	20 to 39 (Manufacturing)	2193	1087	49.57%
	40 to 49 (Transportation)	548	290	52.92%
2010	50 to 51(Wholesale trade)	147	62	42.18%
	52 to 59 (Retail trade)	280	108	38.57%
	60 to 67 (Finance)	1826	543	29.74%
	70 to 89 (services)	1002	508	50.70%
	91 to 99 (Public admin)	29	17	58.62%
	Total	6460	2813	43.54%

Year	*SIC codes (shareholder)*	*Firms in CRSP (number)*	*Firms in sample (number)*	*Sample representation*
	01 to 09 (Agriculture , forestry and fishing)	18	8	44.44%
	10 to 14 (mining)	381	184	48.29%
	15 to 17 (construction)	54	26	48.15%
	20 to 39 (Manufacturing)	2167	1097	50.62%
	40 to 49 (Transportation)	552	292	52.90%
2011	50 to 51(Wholesale trade)	152	64	42.11%
	52 to 59 (Retail trade)	279	118	42.29%
	60 to 67 (Finance)	1831	539	29.44%
	70 to 89 (services)	941	446	47.40%
	91 to 99 (Public admin)	29	17	58.62%
	Total	6404	2791	43.58%
	01 to 09 (Agriculture , forestry and fishing)	19	6	31.58%
	10 to 14 (mining)	380	165	43.42%
	15 to 17 (construction)	52	22	42.31%
	20 to 39 (Manufacturing)	2153	1074	49.88%
	40 to 49 (Transportation)	541	277	51.20%
2012	50 to 51(Wholesale trade)	148	59	39.86%
	52 to 59 (Retail trade)	283	103	36.40%
	60 to 67 (Finance)	1798	558	31.03%
	70 to 89 (services)	955	475	49.74%
	91 to 99 (Public admin)	29	10	34.48%
	Total	6358	2749	43.24%

Table 2: Table 2 represents the sectors in which a blockholder from a particular sector invests in, between 2007 and 2012 based on the data we obtained from BVD orbis. This table shows the sectors in which blockholders invest in based on the 2 digit SIC code.

			Target										
	Year	*SIC codes (shareholder)*	*01 to 09*	*10 to 14*	*15 to 17*	*20 to 39*	*40 to 49*	*50 to 51*	*52 to 59*	*60 to 67*	*70 to 89*	*91 to 99*	*Total*
Blockholder	2007	01 to 09 (Agriculture, forestry and fishing)	2	0	0	0	0	0	0	0	0	0	2
		10 to 14 (mining)	0	40	2	2	6	1	0	2	0	0	53
		15 to 17 (construction)	0	0	2	1	0	0	0	1	0	0	4
		20 to 39 (Manufacturing)	0	4	0	302	3	7	1	3	40	1	361
		40 to 49 (Transportation)	0	5	0	6	67	0	2	0	5	0	85
		50 to 51(Wholesale trade)	0	0	0	2	2	9	1	0	5	0	19
		52 to 59 (Retail trade)	0	0	0	5	2	2	24	3	4	0	40
		60 to 67 (Finance)	5	106	10	651	191	34	38	452	209	11	1707
		70 to 89 (services)	0	2	0	21	4	2	5	5	128	1	168
		91 to 99 (Public admin)	1	0	1	12	1	0	1	5	7	0	28
	2008	01 to 09 (Agriculture, forestry and fishing)	2	0	0	0	0	0	0	0	0	0	2
		10 to 14 (mining)	0	40	1	3	4	1	0	1	0	0	50
		15 to 17 (construction)	0	0	2	1	0	0	0	1	0	0	4
		20 to 39 (Manufacturing)	0	3	0	309	3	8	2	3	40	1	369
		40 to 49 (Transportation)	0	5	0	1	67	1	1	1	8	0	84
		50 to 51(Wholesale trade)	0	0	0	3	2	9	2	0	4	0	20
		52 to 59 (Retail trade)	0	0	0	4	2	1	28	2	8	0	45
		60 to 67 (Finance)	1	114	12	731	203	37	59	543	257	24	1981
		70 to 89 (services)	0	1	0	18	3	2	4	8	135	1	172
		91 to 99 (Public admin)	1	0	0	13	2	0	1	5	5	0	27

			Target										
	Year	*SIC codes (shareholder)*	*01 to 09*	*10 to 14*	*15 to 17*	*20 to 39*	*40 to 49*	*50 to 51*	*52 to 59*	*60 to 67*	*70 to 89*	*91 to 99*	*Total*
Blockholder	2009	01 to 09 (Agriculture, forestry and fishing)	2	0	0	0	0	0	0	0	0	0	2
		10 to 14 (mining)	0	32	1	3	5	1	0	0	0	0	42
		15 to 17 (construction)	0	0	3	1	0	0	0	1	0	0	5
		20 to 39 (Manufacturing)	0	4	0	297	3	8	2	4	43	0	361
		40 to 49 (Transportation)	0	6	0	1	65	1	0	2	10	1	86
		50 to 51(Wholesale trade)	0	0	0	3	3	7	2	0	3	0	18
		52 to 59 (Retail trade)	0	0	0	2	2	3	25	2	6	0	40
		60 to 67 (Finance)	1	128	21	830	271	57	66	673	270	10	2327
		70 to 89 (services)	0	0	0	16	2	1	5	7	140	0	171
		91 to 99 (Public admin)	1	0	0	10	2	0	1	4	3	0	21
	2010	01 to 09 (Agriculture, forestry and fishing)	2	0	0	0	0	0	0	0	0	0	2
		10 to 14 (mining)	0	28	1	4	5	1	0	0	0	1	40
		15 to 17 (construction)	0	0	3	1	0	0	0	1	0	0	5
		20 to 39 (Manufacturing)	0	6	0	282	3	8	2	5	39	0	345
		40 to 49 (Transportation)	0	4	0	2	53	1	0	2	8	0	70
		50 to 51(Wholesale trade)	0	0	0	3	2	7	1	0	2	0	15
		52 to 59 (Retail trade)	0	0	0	1	2	2	19	2	5	0	31
		60 to 67 (Finance)	6	139	22	995	281	63	94	611	339	7	2557
		70 to 89 (services)	0	0	0	15	2	2	4	5	141	1	170
		91 to 99 (Public admin)	1	0	0	13	2	0	1	5	4	0	26

			Target										
	Year	*SIC codes (shareholder)*	*01 to 09*	*10 to 14*	*15 to 17*	*20 to 39*	*40 to 49*	*50 to 51*	*52 to 59*	*60 to 67*	*70 to 89*	*91 to 99*	*Total*
Blockholder	2011	01 to 09 (Agriculture , forestry and fishing)	2	0	0	0	0	0	0	0	0	0	2
		10 to 14 (mining)	0	39	1	6	7	1	1	0	0	1	56
		15 to 17 (construction)	0	0	3	1	0	0	0	1	0	0	5
		20 to 39 (Manufacturing)	0	7	0	313	5	9	1	3	43	1	382
		40 to 49 (Transportation)	0	4	1	4	67	2	0	1	10	0	89
		50 to 51(Wholesale trade)	0	0	0	3	2	8	2	0	3	0	18
		52 to 59 (Retail trade)	0	0	0	2	3	1	20	1	5	0	32
		60 to 67 (Finance)	5	160	23	877	265	52	90	583	245	5	2305
		70 to 89 (services)	0	0	0	15	2	2	5	6	145	1	176
		91 to 99 (Public admin)	1	0	0	12	1	0	1	5	3	0	23
	2012	01 to 09 (Agriculture , forestry and fishing)	2	0	0	0	0	0	0	0	0	0	2
		10 to 14 (mining)	0	43	1	6	7	1	1	0	0	1	60
		15 to 17 (construction)	0	0	2	1	0	0	1	0	0	0	4
		20 to 39 (Manufacturing)	0	7	0	347	6	10	3	3	44	1	421
		40 to 49 (Transportation)	0	6	0	4	74	2	0	1	10	0	97
		50 to 51(Wholesale trade)	0	0	0	4	1	6	2	0	3	0	16
		52 to 59 (Retail trade)	0	0	0	3	2	1	25	1	6	0	38
		60 to 67 (Finance)	3	120	27	794	224	43	56	587	243	3	2100
		70 to 89 (services)	0	0	0	16	1	2	4	8	151	0	182
		91 to 99 (Public admin)	1	0	0	9	2	1	0	4	3	0	20
		Total links	39	1053	139	6981	1934	417	603	3563	2782	72	17583

Table 3: Table 3 represents the summary statistics of the centrality measures of the blockholder and its target of investment in the CRSP database which consists of firms from the BVD orbis database and firms that are not in the database, between 2007 and 2012. There are two subsamples of firms – a sample which consists of only non-financial firms and a sample where there are financial firms as a blockholder in addition to the links of the first sample. Panel A of the table looks at the centrality measures of the blockholder in a weighted network. Panel B of the table looks at the centrality measures of the blockholder in an unweighted network. Panel C of the table looks at the centrality measures of the target of investment in a weighted network. Panel D of the table looks at the centrality measures of the target of investment in an unweighted network.

Panel A: Summary statistics of the centrality measures of blockholder in a weighted network setup:

This subsample consists of only non-financial firms						This subsample has financial firms as a blockholder but not as a target of investment					
Stats	Year	Mean	SD	Max	N	Stats	Year	Mean	SD	Max	N
Percentage of blockholding (%)		5.01	17.92	100	8056	Percentage of blockholding (%)		4.70	15.77	100	11055
Eigen vector of blockholder	2007	0.00018	0.01114	0.71	8056	Eigen vector of blockholder	2007	0.00013	0.00951	0.71	11055
Degree of blockholder		0.00692	0.02782	0.32	8056	Degree of blockholder		0.02917	0.09927	0.63	11055
Percentage of blockholding (%)		5.38	17.98	100	7557	Percentage of blockholding (%)		5.00	15.57	100	10655
Eigen vector of blockholder	2008	0.00000	0.00000	0	7557	Eigen vector of blockholder	2008	0.00000	0.00000	0.0000427	10655
Degree of blockholder		0.00762	0.03027	0.35	7557	Degree of blockholder		0.05388	0.17858	0.93	10655
Percentage of blockholding (%)		5.50	17.82	100	7088	Percentage of blockholding (%)		5.11	15.17	100	10352
Eigen vector of blockholder	2009	0.00020	0.01188	0.82	7088	Eigen vector of blockholder	2009	0.00013	0.00983	0.82	10352
Degree of blockholder		0.00793	0.03050	0.36	7088	Degree of blockholder		0.12636	0.39766	1.72	10352
Percentage of blockholding (%)		5.86	19.00	100	6726	Percentage of blockholding (%)		5.47	15.90	100	10266
Eigen vector of blockholder	2010	0.00000	0.00000	0.00	6726	Eigen vector of blockholder	2010	0.00000	0.00000	0.00	10266
Degree of blockholder		0.00997	0.03921	0.40	6726	Degree of blockholder		0.22138	0.63726	2.35	10266
Percentage of blockholding (%)		6.55	19.84	100	6669	Percentage of blockholding (%)		5.78	16.60	100	9980
Eigen vector of blockholder	2011	0.00021	0.01224	0.71	6669	Eigen vector of blockholder	2011	0.00014	0.01001	0.71	9980
Degree of blockholder		0.00998	0.03718	0.36	6669	Degree of blockholder		0.19875	0.58608	2.19	9980
Percentage of blockholding (%)		7.02	20.74	100	6689	Percentage of blockholding (%)		6.14	17.70	100	9754
Eigen vector of blockholder	2012	0.00000	0.00000	0.00	6689	Eigen vector of blockholder	2012	0.00000	0.00000	0.00	9754
Degree of blockholder		0.01166	0.04409	0.41	6689	Degree of blockholder		0.16527	0.51600	2.02	9754
Percentage of blockholding (%)		5.84	18.87	100	42785	Percentage of blockholding (%)		5.35	16.12	100	62062
Eigen vector of blockholder	Total	0.00010	0.00837	0.82	42785	Eigen vector of blockholder	Total	0.00007	0.00695	0.82	62062
Degree of blockholder		0.00891	0.03501	0.41	42785	Degree of blockholder		0.13008	0.45055	2.35	62062

Panel B: Summary statistics of the centrality measures of blockholder in an unweighted network setup:

This subsample consists of only non-financial firms						This subsample has financial firms as a blockholder but not as a target of investment					
Stats	Year	Mean	SD	Max	N	Stats	Year	Mean	SD	Max	N
Number of links	2007	0.16	0.65	7	8056	Number of links	2007	7.28	27.13	153	11055
Eigen vector of blockholder		0.00018	0.01114	0.71	8056	Eigen vector of blockholder		0.00013	0.00951	0.71	11055
Degree of blockholder		0.00013	0.00052	0.01	8056	Degree of blockholder		0.00334	0.01244	0.07	11055
Number of links	2008	0.19	0.76	10	7557	Number of links	2008	16.07	59.61	325	10655
Eigen vector of blockholder		0.00000	0.00000	0	7557	Eigen vector of blockholder		0.00000	0.00000	1.6E-5	10655
Degree of blockholder		0.00015	0.00060	0.01	7557	Degree of blockholder		0.00700	0.02598	0.14	10655
Number of links	2009	0.19	0.73	9	7088	Number of links	2009	39.70	130.03	560	10352
Eigen vector of blockholder		0.00020	0.01188	0.71	7088	Eigen vector of blockholder		0.00014	0.00983	0.71	10352
Degree of blockholder		0.00015	0.00059	0.01	7088	Degree of blockholder		0.01768	0.05790	0.25	10352
Number of links	2010	0.21	0.85	10	6726	Number of links	2010	73.60	220.56	816	10266
Eigen vector of blockholder		0.00000	0.00000	0.00	6726	Eigen vector of blockholder		0.00000	0.00000	0.00	10266
Degree of blockholder		0.00018	0.00074	0.01	6726	Degree of blockholder		0.03130	0.09382	0.35	10266
Number of links	2011	0.23	0.86	9	6669	Number of links	2011	66.44	204.37	767	9980
Eigen vector of blockholder		0.00021	0.01224	0.71	6669	Eigen vector of blockholder		0.00014	0.01001	0.71	9980
Degree of blockholder		0.00018	0.00067	0.01	6669	Degree of blockholder		0.02834	0.08715	0.33	9980
Number of links	2012	0.29	1.13	11	6689	Number of links	2012	53.41	174.93	685	9754
Eigen vector of blockholder		0.00000	0.00000	0.00	6689	Eigen vector of blockholder		0.00000	0.00000	0.00	9754
Degree of blockholder		0.00021	0.00084	0.01	6689	Degree of blockholder		0.02357	0.07720	0.30	9754
Number of links	Total	0.21	0.84	11	42785	Number of links	Total	41.93	154.09	816	62062
Eigen vector of blockholder		0.00010	0.00837	0.71	42785	Eigen vector of blockholder		0.00007	0.00695	0.71	62062
Degree of blockholder		0.00017	0.00066	0.01	42785	Degree of blockholder		0.01818	0.06653	0.35	62062

Panel C: Summary statistics of the centrality measures of the target of investment in a weighted network setup:

This subsample consists of only non-financial firms						This subsample has financial firms as a blockholder but not as a target of investment					
Stats	Year	Mean	SD	Max	N	Stats	Year	Mean	SD	Max	N
Percentage of blockholding (%)		5.01	17.92	100	8056	Percentage of blockholding (%)		4.70	15.77	100	11055
Eigen vector of target	2007	0.00018	0.01114	0.71	8056	Eigen vector of target	2007	0.00013	0.00951	0.71	11055
Degree of target		0.00036	0.00520	0.16	8056	Degree of target		0.00054	0.00537	0.18	11055
Percentage of blockholding (%)		5.38	17.98	100	7557	Percentage of blockholding (%)		5.00	15.57	100	10655
Eigen vector of target	2008	0.00013	0.01150	1	7557	Eigen vector of target	2008	0.00019	0.00969	0.83991	10655
Degree of target		0.00023	0.00363	0.08	7557	Degree of target		0.00061	0.00548	0.15	10655
Percentage of blockholding (%)		5.50	17.82	100	7088	Percentage of blockholding (%)		5.11	15.17	100	10352
Eigen vector of target	2009	0.00020	0.01188	0.82	7088	Eigen vector of target	2009	0.00013	0.00983	0.82	10352
Degree of target		0.00026	0.00385	0.08	7088	Degree of target		0.00095	0.00747	0.20	10352
Percentage of blockholding (%)		5.86	19.00	100	6726	Percentage of blockholding (%)		5.47	15.90	100	10266
Eigen vector of target	2010	0.00021	0.01219	0.71	6726	Eigen vector of target	2010	0.00019	0.00987	0.57	10266
Degree of target		0.00029	0.00433	0.13	6726	Degree of target		0.00098	0.00744	0.19	10266
Percentage of blockholding (%)		6.55	19.84	100	6669	Percentage of blockholding (%)		5.78	16.60	100	9980
Eigen vector of target	2011	0.00021	0.01224	0.71	6669	Eigen vector of target	2011	0.00014	0.01001	0.71	9980
Degree of target		0.00036	0.00566	0.31	6669	Degree of target		0.00119	0.00865	0.17	9980
Percentage of blockholding (%)		7.02	20.74	100	6689	Percentage of blockholding (%)		6.14	17.70	100	9754
Eigen vector of target	2012	0.00037	0.01222	0.67	6689	Eigen vector of target	2012	0.00015	0.01012	0.71	9754
Degree of target		0.00036	0.00652	0.41	6689	Degree of target		0.00139	0.01017	0.24	9754
Percentage of blockholding (%)		5.84	18.87	100	42785	Percentage of blockholding (%)		5.35	16.12	100	62062
Eigen vector of target	Total	0.00021	0.01184	1.00	42785	Eigen vector of target	Total	0.00016	0.00983	0.84	62062
Degree of target		0.00031	0.00495	0.41	42785	Degree of target		0.00093	0.00756	0.24	62062

Panel D: Summary statistics of the centrality measures of the target of investment in an unweighted network setup:

This subsample consists of only non-financial firms						This subsample has financial firms as a blockholder but not as a target of investment					
Stats	Year	Mean	SD	Max	N	Stats	Year	Mean	SD	Max	N
Number of links	2007	0.09	0.30	2	8056	Number of links	2007	0.26	0.62	4	11055
Eigen vector of target		0.00018	0.01114	0.71	8056	Eigen vector of target		0.00013	0.00951	0.71	11055
Degree of target		0.00001	0.00008	0.00	8056	Degree of target		0.00001	0.00008	0.00	11055
Number of links	2008	0.10	0.31	2	7557	Number of links	2008	0.30	0.68	5	10655
Eigen vector of target		0.00013	0.01150	1	7557	Eigen vector of target		0.00013	0.00969	0.8090646	10655
Degree of target		0.00000	0.00007	0.00	7557	Degree of target		0.00001	0.00009	0.00	10655
Number of links	2009	0.10	0.31	2	7088	Number of links	2009	0.38	0.80	5	10352
Eigen vector of target		0.00020	0.01188	0.71	7088	Eigen vector of target		0.00014	0.00983	0.71	10352
Degree of target		0.00000	0.00007	0.00	7088	Degree of target		0.00002	0.00013	0.00	10352
Number of links	2010	0.10	0.31	2	6726	Number of links	2010	0.42	0.85	5	10266
Eigen vector of target		0.00021	0.01219	0.71	6726	Eigen vector of target		0.00029	0.00987	0.40	10266
Degree of target		0.00001	0.00008	0.00	6726	Degree of target		0.00002	0.00013	0.00	10266
Number of links	2011	0.12	0.33	2	6669	Number of links	2011	0.39	0.79	5	9980
Eigen vector of target		0.00021	0.01224	0.71	6669	Eigen vector of target		0.00014	0.01001	0.71	9980
Degree of target		0.00001	0.00009	0.00	6669	Degree of target		0.00002	0.00014	0.00	9980
Number of links	2012	0.13	0.34	3	6689	Number of links	2012	0.36	0.75	6	9754
Eigen vector of target		0.00000	0.00000	0.00	6689	Eigen vector of target		0.00015	0.01012	0.71	9754
Degree of target		0.00001	0.00011	0.01	6689	Degree of target		0.00002	0.00017	0.00	9754
Number of links	Total	0.11	0.31	3	42785	Number of links	Total	0.35	0.75	6	62062
Eigen vector of target		0.00016	0.01081	1.00	42785	Eigen vector of target		0.00016	0.00983	0.81	62062
Degree of target		0.00001	0.00009	0.01	42785	Degree of target		0.00002	0.00013	0.00	62062

Table 4: Table 4 represents the summary statistics of the blockholder and its target of investment present in the BVD orbis database alone between 2007 and 2012. There are two subsamples of firms – a sample which consists of only non-financial firms and a sample where there are financial firms as a blockholder but not as a target of investment. Panel A of the table looks at the centrality measures of the blockholder in a weighted network. Panel B of the table looks at the centrality measures of the blockholder in an unweighted network. Panel C of the table looks at the centrality measures of the target of investment in a weighted network. Panel D of the table looks at the centrality measures of the target of investment in an unweighted network. The definitions of the centrality measures are explained in the Appendix A.

Panel A: Summary statistics of the centrality measures of the blockholder in a weighted network setup:

This subsample consists of only non-financial firms							This subsample has financial firms as a blockholder but not as a target of investment						
Stats	Year	Mean	SD	Min	Max	N	Stats	Year	Mean	SD	Min	Max	N
Percentage of blockholding (%)		54.47	28.23	5	100	741	Percentage of blockholding (%)		26.02	28.69	5	100	1996
Eigen vector of blockholder	2007	0.002	0.037	0	0.71	741	Eigen vector of blockholder	2007	0.001	0.022	0	0.71	1996
Degree of blockholder		0.075	0.057	0.004	0.32	741	Degree of blockholder		0.162	0.182	0.002	0.63	1996
Percentage of blockholding (%)		53.95	25.01	5	100	752	Percentage of blockholding (%)		24.34	26.64	5	100	2190
Eigen vector of blockholder	2008	0.000	0.000	0	0	752	Eigen vector of blockholder	2008	0.000	0.000	0	0.00004	2190
Degree of blockholder		0.077	0.063	0.004	0.35	752	Degree of blockholder		0.262	0.317	0.002	0.93	2190
Percentage of blockholding (%)		53.65	22.70	5	100	726	Percentage of blockholding (%)		22.20	24.92	5	100	2380
Eigen vector of blockholder	2009	0.002	0.037	0	0.82	726	Eigen vector of blockholder	2009	0.001	0.020	0	0.82	2380
Degree of blockholder		0.077	0.061	0.004	0.36	726	Degree of blockholder		0.550	0.675	0.002	1.72	2380
Percentage of blockholding (%)		57.62	23.81	5	100	684	Percentage of blockholding (%)		21.28	25.43	5	100	2630
Eigen vector of blockholder	2010	0.000	0.000	0	0.00	684	Eigen vector of blockholder	2010	0.000	0.000	0	0.00	2630
Degree of blockholder		0.098	0.081	0.004	0.40	684	Degree of blockholder		0.863	1.015	0.002	2.35	2630
Percentage of blockholding (%)		56.93	23.54	5.43	100	766	Percentage of blockholding (%)		23.16	26.50	5	100	2488
Eigen vector of blockholder	2011	0.002	0.036	0	0.71	766	Eigen vector of blockholder	2011	0.001	0.020	0	0.71	2488
Degree of blockholder		0.087	0.073	0.004	0.36	766	Degree of blockholder		0.796	0.949	0.002	2.19	2488
Percentage of blockholding (%)		56.96	25.35	5.07	100	822	Percentage of blockholding (%)		25.59	28.41	5	100	2335
Eigen vector of blockholder	2012	0.000	0.000	0	0.00	822	Eigen vector of blockholder	2012	0.000	0.000	0	0.00	2335
Degree of blockholder		0.095	0.089	0.004	0.41	822	Degree of blockholder		0.690	0.866	0.002	2.02	2335
Percentage of blockholding (%)		55.61	24.90	5	100	4491	Percentage of blockholding (%)		23.64	26.77	5	100	14019
Eigen vector of blockholder	Total	0.001	0.026	0	0.82	4491	Eigen vector of blockholder	Total	0.000	0.015	0	0.82	14019
Degree of blockholder		0.085	0.072	0.004	0.41	4491	Degree of blockholder		0.576	0.801	0.002	2.35	14019

Panel B: Summary statistics of the blockholder in an unweighted network setup:

This subsample consists of only non-financial firms							This subsample has financial firms as a blockholder but not as a target of investment						
Stats	Year	Mean	SD	Min	Max	N	Stats	Year	Mean	SD	Min	Max	N
Number of links		1.79	1.28	1	7	741	Number of links		40.31	52.40	1	153	1996
Eigen vector of blockholder	2007	0.002	0.037	0	0.71	741	Eigen vector of blockholder	2007	0.001	0.022	0	0.71	1996
Degree of blockholder		0.001	0.001	0.001	0.01	741	Degree of blockholder		0.018	0.024	0.000	0.07	1996
Number of links		1.89	1.62	1	10	752	Number of links		78.17	111.53	1	325	2190
Eigen vector of blockholder	2008	0.000	0.000	0	0	752	Eigen vector of blockholder	2008	0.000	0.000	0	0.00002	2190
Degree of blockholder		0.001	0.001	0.001	0.01	752	Degree of blockholder		0.034	0.049	0.000	0.14	2190
Number of links		1.85	1.47	1	9	726	Number of links		172.27	224.43	1	559	2380
Eigen vector of blockholder	2009	0.002	0.037	0	0.71	726	Eigen vector of blockholder	2009	0.001	0.020	0	0.71	2380
Degree of blockholder		0.001	0.001	0.001	0.01	726	Degree of blockholder		0.077	0.100	0.000	0.25	2380
Number of links		2.04	1.83	1	10	684	Number of links		287.17	358.50	1	816	2630
Eigen vector of blockholder	2010	0.000	0.000	0	0.00	684	Eigen vector of blockholder	2010	0.000	0.000	0	0.00	2630
Degree of blockholder		0.002	0.002	0.001	0.01	684	Degree of blockholder		0.122	0.152	0.000	0.35	2630
Number of links		1.99	1.70	1	9	766	Number of links		265.89	337.44	1	766	2488
Eigen vector of blockholder	2011	0.002	0.036	0	0.71	766	Eigen vector of blockholder	2011	0.001	0.020	0	0.71	2488
Degree of blockholder		0.002	0.001	0.001	0.01	766	Degree of blockholder		0.114	0.144	0.000	0.33	2488
Number of links		2.36	2.34	1	11	822	Number of links		223.10	300.02	1	685	2335
Eigen vector of blockholder	2012	0.000	0.000	0	0.00	822	Eigen vector of blockholder	2012	0.000	0.000	0	0.00	2335
Degree of blockholder		0.002	0.002	0.001	0.01	822	Degree of blockholder		0.098	0.132	0.000	0.30	2335
Number of links		1.99	1.76	1	11	4491	Number of links		185.42	279.87	1	816	14019
Eigen vector of blockholder	Total	0.001	0.026	0	0.71	4491	Eigen vector of blockholder	Total	0.000	0.015	0	0.71	14019
Degree of blockholder		0.002	0.001	0.001	0.01	4491	Degree of blockholder		0.080	0.121	0.000	0.35	14019

Panel C: Summary statistics of the centrality measures of the target of investment in a weighted network setup:

This subsample consists of only non-financial firms							This subsample has financial firms as a blockholder but not as a target of investment						
Stats	Year	Mean	SD	Min	Max	N	Stats	Year	Mean	SD	Min	Max	N
Percentage of blockholding (%)		54.47	28.23	5	100	741	Percentage of blockholding (%)		26.02	28.69	5	100	1996
Eigen vector of target	2007	0.002	0.037	0	0.71	741	Eigen vector of target	2007	0.001	0.022	0	0.71	1996
Degree of target		0.004	0.017	0	0.16	741	Degree of target		0.003	0.012	0	0.18	1996
Percentage of blockholding (%)		53.95	25.01	5	100	752	Percentage of blockholding (%)		24.34	26.64	5	100	2190
Eigen vector of target	2008	0.001	0.036	0	1	752	Eigen vector of target	2008	0.001	0.021	0	0.84	2190
Degree of target		0.002	0.011	0	0.08	752	Degree of target		0.003	0.012	0	0.15	2190
Percentage of blockholding (%)		53.65	22.70	5	100	726	Percentage of blockholding (%)		22.20	24.92	5	100	2380
Eigen vector of target	2009	0.002	0.037	0	0.82	726	Eigen vector of target	2009	0.001	0.020	0	0.82	2380
Degree of target		0.003	0.012	0	0.08	726	Degree of target		0.004	0.015	0	0.20	2380
Percentage of blockholding (%)		57.62	23.81	5	100	684	Percentage of blockholding (%)		21.28	25.43	5	100	2630
Eigen vector of target	2010	0.002	0.038	0	0.71	684	Eigen vector of target	2010	0.001	0.019	0	0.57	2630
Degree of target		0.003	0.013	0	0.13	684	Degree of target		0.004	0.014	0	0.19	2630
Percentage of blockholding (%)		56.93	23.54	5	100	766	Percentage of blockholding (%)		23.16	26.50	5	100	2488
Eigen vector of target	2011	0.002	0.036	0	0.71	766	Eigen vector of target	2011	0.001	0.020	0	0.71	2488
Degree of target		0.003	0.016	0	0.31	766	Degree of target		0.005	0.017	0	0.17	2488
Percentage of blockholding (%)		56.96	25.35	5	100	822	Percentage of blockholding (%)		25.59	28.41	5	100	2335
Eigen vector of target	2012	0.003	0.035	0	0.67	822	Eigen vector of target	2012	0.001	0.021	0	0.71	2335
Degree of target		0.003	0.018	0	0.41	822	Degree of target		0.006	0.020	0	0.24	2335
Percentage of blockholding (%)		55.61	24.90	5	100	4491	Percentage of blockholding (%)		23.64	26.77	5	100	14019
Eigen vector of target	Total	0.002	0.036	0	1.00	4491	Eigen vector of target	Total	0.001	0.021	0	0.84	14019
Degree of target		0.003	0.015	0	0.41	4491	Degree of target		0.004	0.015	0	0.24	14019

Panel D: Summary statistics of the centrality measures of the target of investment in an unweighted network setup:

This subsample consists of only non-financial firms							This subsample has financial firms as a blockholder but not as a target of investment						
Stats	Year	Mean	SD	Min	Max	N	Stats	Year	Mean	SD	Min	Max	N
Number of links		1.02	0.13	1	2	741	Number of links		1.42	0.71	1	4	1996
Eigen vector of target	2007	0.002	0.037	0	0.71	741	Eigen vector of target	2007	0.001	0.022	0	0.71	1996
Degree of target		0.000	0.000	0	0.00	741	Degree of target		0.000	0.000	0	0.00	1996
Number of links		1.01	0.10	1	2	752	Number of links		1.45	0.74	1	5	2190
Eigen vector of target	2008	0.001	0.036	0	1	752	Eigen vector of target	2008	0.001	0.021	0	0.81	2190
Degree of target		0.000	0.000	0	0.00	752	Degree of target		0.000	0.000	0	0.00	2190
Number of links		1.01	0.07	1	2	726	Number of links		1.64	0.85	1	5	2380
Eigen vector of target	2009	0.002	0.037	0	0.71	726	Eigen vector of target	2009	0.001	0.020	0	0.71	2380
Degree of target		0.000	0.000	0	0.00	726	Degree of target		0.000	0.000	0	0.00	2380
Number of links		1.01	0.08	1	2	684	Number of links		1.66	0.88	1	5	2630
Eigen vector of target	2010	0.002	0.038	0	0.71	684	Eigen vector of target	2010	0.001	0.019	0	0.40	2630
Degree of target		0.000	0.000	0	0.00	684	Degree of target		0.000	0.000	0	0.00	2630
Number of links		1.01	0.11	1	2	766	Number of links		1.58	0.81	1	5	2488
Eigen vector of target	2011	0.002	0.036	0	0.71	766	Eigen vector of target	2011	0.001	0.020	0	0.71	2488
Degree of target		0.000	0.000	0	0.00	766	Degree of target		0.000	0.000	0	0.00	2488
Number of links		1.01	0.15	1	3	822	Number of links		1.51	0.78	1	6	2335
Eigen vector of target	2012	0.000	0.000	0	0.00	822	Eigen vector of target	2012	0.001	0.021	0	0.71	2335
Degree of target		0.000	0.000	0	0.01	822	Degree of target		0.000	0.000	0	0.00	2335
Number of links		1.01	0.11	1	3	4491	Number of links		1.55	0.81	1	6	14019
Eigen vector of target	Total	0.001	0.033	0	1.00	4491	Eigen vector of target	Total	0.001	0.021	0	0.81	14019
Degree of target		0.000	0.000	0	0.01	4491	Degree of target		0.000	0.000	0	0.00	14019

Table 5: Summary statistics of the data used for the logistic regression to measure the probability of a firm being a target or an acquirer. The sample includes all the firms between 2007 and 2012 that have been a part of the CRSP universe. Acquirer is a dummy variable and takes a value of one if the firm was an acquirer in the period and zero otherwise. Target is a dummy variable which takes a value of one and zero otherwise. Finance is a dummy variable which takes a value of one if the firm is a financial firm and zero otherwise. Mean is the arithmetic average. Sd is the standard deviation. Min is the minimum and max is the maximum. N is the number of observations. The variables have been defined in Appendix 2. All the control variables have been taken from CRSP and Compustat merged database. The centrality measures are explained in Appendix 1.

Stats	*Mean*	*Sd*	*min*	*Max*	*N*
Acquirer	1.73%	13.05%	0	1	40106
Target	2.19%	14.64%	0	1	40106
Degree source weighted	0.00354	0.0289	0	2.56	40106
Degree source unweighted	0.00016	0.0038	0	0.38	40106
Degree target weighted	0.00153	0.02347	0	2.56	40106
Degree target unweighted	0.00018	0.00032	0	0.38	40106
Eigenvector source weighted	0.00018	0.0091	0	0.82	40106
Eigenvector source unweighted	0.00031	0.0090	0	0.71	40106
Eigenvector target weighted	0.00052	0.0122	0	0.96	40106
Eigenvector target unweighted	0.00092	0.0122	0	0.71	40106
Finance	26.44%	44.10%	0	1	40106
Ln(assets)	6.60	2.23	-1.72	15.14	30615
Leverage	0.17	0.20	0.00	0.89	30507
ROA	0.68%	22.23%	-122.50%	38.36%	30576
Property ratio	48.27%	42.47%	0.00%	191.83%	26143
Liquidity ratio	25.48%	25.59%	-35.03%	89.03%	24209
MTB	1.56	2.23	0.07	16.44	30507
HH index	688.50	684.70	128.54	3822.06	34366
Sales Growth	10.95%	42.88%	-82.49%	277.05%	28504
Cash asset	19.66%	22.60%	0.05%	94.79%	30614

Table 6: Summary statistics of the data used for the logistic regression to see the probability of a firm being a target or an acquirer. The sample includes all the firms between 2007 and 2012 that have been a part of the CRSP universe. We also do a difference of means tests between financial and non-financial firms. Acquirer is a dummy variable and takes a value of one if the firm was an acquirer in the period and zero otherwise. Target is a dummy variable which takes a value of one and zero otherwise. Finance is a dummy variable which takes a value of one if the firm is a financial firm and zero otherwise. Mean is the arithmetic average. Sd is the standard deviation. Min is the minimum and max is the maximum. T-stat represents the Student t-statistic of the difference of means test and p-val, the corresponding probability under the null hypothesis of no difference. The variables have been defined in Appendix 2. All the control variables have been taken from CRSP and Compustat merged database. The centrality measures are explained in Appendix 1.

Stats	*mean*	*Sd*	*N*	*Finance*	*Non-finance*	*T stat*	*P- val*
Acquirer	1.73%	13.05%	40106	1.74%	1.73%	0.02	0.98
Target	2.19%	14.64%	40106	0.59%	2.77%	-13.13	0.00
Degree source weighted	0.004	0.03	40106	0.004	0.003	3.31	0.00
Degree source unweighted	0.0001	0.00	40106	0.00044	0.0001	8.49	0.00
Degree target weighted	0.002	0.02	40106	0.002	0.001	4.18	0.00
Degree target unweighted	0.0001	0.00	40106	0.0003	0.00002	6.53	0.00
Eigenvector source weighted	0.0002	0.01	40106	0.0002	0.0001	-0.13	0.90
Eigenvector source unweighted	0.0003	0.01	40106	0.0007	0.0002	5.52	0.00
Eigenvector target weighted	0.001	0.01	40106	0.0006	0.0003	-2.53	0.01
Eigenvector target unweighted	0.0001	0.01	40106	0.0001	0.0001	0.47	0.64
Finance	26.44%	44.10%	40106	na	Na	na	na
Ln(assets)	6.60	2.23	30615	7.59	6.32	42.97	0.00
Leverage	0.17	0.32	30507	0.16	0.18	-3.17	0.00
ROA	0.68%	22.23%	30576	3.14%	-0.03%	10.40	0.00
Property ratio	48.27%	42.66%	26143	14.74%	51.89%	-43.42	0.00
Liquidity ratio	25.48%	25.59%	24209	23.36%	25.56%	-2.48	0.01
MTB	1.57	2.28	30507	0.86	1.78	-29.59	0.00
HH index	688.50	684.70	34366	405.14	814.97	-53.33	0.00
Sales Growth	10.94%	42.89%	28504	6.14%	12.37%	-10.34	0.00
Cash asset	19.67%	22.60%	30614	11.11%	22.13%	-36.39	0.00

Table 7: Summary statistics of the data used for the logistic regression to see the probability of a firm being a target or an acquirer. The sample includes all the firms between 2007 and 2012 that have been a part of the CRSP universe. We also do a difference of means tests between acquirers and firms that have not been an acquirer. Acquirer is a dummy variable and takes a value of one if the firm was an acquirer in the period and zero otherwise. Target is a dummy variable which takes a value of one and zero otherwise. Finance is a dummy variable which takes a value of one if the firm is a financial firm and zero otherwise. Mean is the arithmetic average. Sd is the standard deviation. Min is the minimum and max is the maximum. T-stat represents the Student t-statistic of the difference of means test and p-val, the corresponding probability under the null hypothesis of no difference. The variables have been defined in Appendix 2. All the control variables have been taken from CRSP and Compustat merged database.

Stats	*Mean*	*Sd*	*N*	*Acquirer*	*Non acquirer*	*T-stat*	*p-val*
Acquirer	1.73%	13.05%	40106	na	Na	na	na
Target	2.19%	14.64%	40106	2.16%	2.19%	-0.06	0.95
Finance	26.44%	44.10%	40106	26.48%	26.44%	0.02	0.98
Ln(assets)	6.60	2.23	30615	8.46	6.56	22.15	0.00
Leverage	17.33%	31.87%	30507	19.05%	17.35%	1.37	0.17
ROA	0.68%	22.23%	30576	5.49%	0.57%	5.69	0.00
Property ratio	48.27%	42.66%	26143	40.71%	48.43%	-4.19	0.00
Liquidity ratio	25.48%	25.59%	24209	18.06%	25.64%	-6.59	0.00
MTB	1.57	2.28	30507	1.16	1.58	-4.70	0.00
HH index	688.50	684.70	34366	606.19	690.16	-3.16	0.00
Sales Growth	10.94%	42.89%	28504	15.44%	10.84%	2.72	0.01
Cash asset	19.67%	22.60%	30614	14.45%	19.78%	-6.07	0.00

Table 8: Summary statistics of the data used for the logistic regression to see the probability of a firm being a target or an acquirer. The sample includes all the firms between 2007 and 2012 that have been a part of the CRSP universe. We also do a difference of means tests between firms that were targets and that have not been targets in this period. Acquirer is a dummy variable and takes a value of one if the firm was an acquirer in the period and zero otherwise. Target is a dummy variable which takes a value of one and zero otherwise. Finance is a dummy variable which takes a value of one if the firm is a financial firm and zero otherwise. Mean is the arithmetic average. Sd is the standard deviation. Min is the minimum and max is the maximum. T-stat represents the Student t-statistic of the difference of means test and p-val, the corresponding probability under the null hypothesis of no difference. The variables have been defined in Appendix 2. All the control variables have been taken from CRSP and Compustat merged database.

Stats	*Mean*	*Sd*	*N*	*Target*	*Non target*	*T-stat*	*P-val*
Acquirer	1.73%	13.05%	40106	1.71%	1.73%	-0.0607	0.9516
Target	2.19%	14.64%	40106	na	na	na	na
Finance	26.44%	44.10%	40106	7.17%	26.87%	-13.13	0.00
Ln(assets)	6.60	2.23	30615	6.37	6.60	-1.91	0.06
Leverage	17.33%	31.87%	30507	15.77%	17.41%	-0.93	0.36
ROA	0.68%	22.23%	30576	1.03%	0.68%	-0.55	0.81
Property ratio	48.27%	42.66%	26143	47.90%	48.27%	-0.15	0.71
Liquidity ratio	25.48%	25.59%	24209	27.45%	25.46%	1.26	0.21
MTB	1.57	2.28	30507	1.27	1.58	-2.41	0.02
HH index	688.50	684.70	34366	733.62	688.07	1.20	0.23
Sales Growth	10.94%	42.89%	28504	2.49%	11.04%	-3.51	0.00
Cash asset	19.67%	22.60%	30614	20.92%	19.65%	1.05	-0.29

Table 9: Summary statistics of the data used for the logistic regression to see the probability of a deal completion. The sample includes all the firms between 2007 and 2012 that have been a part of the CRSP universe. Success is a dummy variable taking 1 if the deal was completed and 0 if it was a failed bid. All the deal characteristics were collected from Thompson SDC Database. Mean is the arithmetic average. Sd is the standard deviation. Min is the minimum and max is the maximum. The control variables have been defined in Appendix 2. The centrality measures are explained in Appendix 1.

Stats	*Mean*	*sd*	*Min*	*Max*	*N*
Success	81.17%	39.11%	0	1	1662
Degree source weighted	0.0121	0.0294	0	0.26	1662
Degree source unweighted	0.0003	0.0014	0	0.03	1662
Eigenvector source weighted	0.00067	0.0153	0	0.58	1662
Eigenvector source unweighted	0.0012	0.0214	0	0.71	1662
Degree target weighted	0.00059	0.0043	0	0.08	1662
Degree target unweighted	0.00001	0.00007	0	0.0012	1662
Eigenvector target weighted	0.00065	0.0203	0	0.82	1662
Eigenvector target unweighted	0.00008	0.0002	0	0.09	1662
Target size	5.65	1.98	1.02	10.09	1662
NYSE AMEX	27.08%	44.45%	0	1	1662
Turnover	0.50	0.54	0.01	3.63	1662
Toehold	7.16%	25.79%	0	1	1662
Premium 4 week (%)	46.68	56.30	-49.08	362.50	1662
Bidder public	55.84%	49.67%	0	1	1662
Poison pill	2.05%	14.16%	0	1	1662
Horizontal	33.15%	47.09%	0	1	1662
All cash	62.70%	48.38%	0	1	1662
All stock	12.58%	33.17%	0	1	1662

Table 10: We use a logistic regression to estimate the probability of being an acquirer. The dependent variable is a dummy variable equal to 1 if the firm was an acquirer and 0 otherwise. We control for annual and industrial fixed effects. The independent variables or the centrality measures and their interpretations have been defined in Appendix 1. The control variables have been defined in Appendix 2. All the control variables have been taken from CRSP and Compustat merged. We execute the regressions for two samples. Regressions on Panel A is when there are no financial firms in the sample and in Panel B when there are financial firms as blockholders in the sample. P-values are the values in the parentheses. The sample includes all the firms between 2007 and 2012 that have been a part of the CRSP universe. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

Panel A: Probability of a firm being an acquirer when there are no financial firms in the sample.

	Acquirer	*Acquirer*	*Acquirer*	*Acquirer*
Degree of Acquirer weighted	17.34***			
	(0.000)			
Degree of Acquirer unweighted		820.2***		
		(0.000)		
Eigenvector of Acquirer weighted			2.926	
			(0.241)	
Eigenvector of Acquirer unweighted				6.019***
				(0.000)
Ln(assets)	0.309***	0.347***	0.532***	0.533***
	(0.000)	(0.000)	(0.000)	(0.000)
Leverage	0.505***	0.536***	0.496***	0.492**
	(0.008)	(0.004)	(0.009)	(0.010)
MTB	-0.0976***	-0.108***	-0.125***	-0.125***
	(0.001)	(0.000)	(0.000)	(0.000)
ROA	0.487	0.356	0.0464	0.0492
	(0.288)	(0.426)	(0.916)	(0.911)
Property ratio	-0.420**	-0.517**	-0.745***	-0.736***
	(0.037)	(0.010)	(0.000)	(0.000)
Liquidity ratio	-0.362	-0.467	-0.535	-0.517
	(0.426)	(0.297)	(0.213)	(0.230)
Sales growth	0.366***	0.395***	0.369***	0.376***
	(0.001)	(0.000)	(0.001)	(0.000)
HH index	0.000155	0.000182	0.000287	0.000167
	(0.748)	(0.699)	(0.559)	(0.715)
Cash	0.279	0.272	0.303	0.290
	(0.548)	(0.553)	(0.495)	(0.514)
_cons	-6.293***	-7.020***	-8.126***	-7.891***
	(0.000)	(0.000)	(0.000)	(0.000)
Industrial fixed effects	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes
N	20150	20150	20150	20150

Panel B: Probability of a firm being an acquirer when there are financial firms in the sample as blockholders but not as a target of investment.

	Acquirer	*Acquirer*	*Acquirer*	*Acquirer*
Degree of Acquirer weighted	25.19***			
	(0.000)			
Degree of Acquirer unweighted		53.58*		
		(0.060)		
Eigenvector of Acquirer weighted			3.013	
			(0.223)	
Eigenvector of Acquirer unweighted				3.850**
				(0.011)
Ln(assets)	0.366***	0.528***	0.535***	0.534***
	(0.000)	(0.000)	(0.000)	(0.000)
Leverage	0.498***	0.509***	0.511***	0.506***
	(0.008)	(0.006)	(0.006)	(0.007)
MTB	-0.095***	-0.121***	-0.123***	-0.123***
	(0.000)	(0.000)	(0.000)	(0.000)
ROA	0.0110	-0.0379	-0.0422	-0.0393
	(0.327)	(0.766)	(0.712)	(0.754)
Property ratio	-0.476**	-0.719***	-0.721***	-0.725***
	(0.017)	(0.000)	(0.000)	(0.000)
Liquidity ratio	-0.244	-0.473	-0.459	-0.478
	(0.570)	(0.256)	(0.268)	(0.249)
Sales growth	0.36***	0.369***	0.365***	0.369***
	(0.001)	(0.000)	(0.000)	(0.000)
HH index	0.000252	0.000275	0.000387	0.000286
	(0.598)	(0.548)	(0.429)	(0.531)
Cash	0.0868	0.265	0.269	0.273
	(0.841)	(0.528)	(0.519)	(0.513)
_cons	-6.877***	-8.077***	-8.351***	-8.126***
	(0.000)	(0.000)	(0.000)	(0.000)
Industrial fixed effects	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes
N	20792	20792	20792	20792

Table 11: We use a logistic regression to estimate the probability of being a target. The dependent variable is a dummy variable equal to 1 if the firm was a target and 0 otherwise. We control for annual and industrial fixed effects. The independent variables or the centrality measures and their interpretations have been defined in Appendix 1. The control variables have been defined in Appendix 2. All the control variables have been taken from CRSP and Compustat merged. We execute the regressions for two samples. Regressions on Panel A is when there are no financial firms in the sample and in Panel B when there are financial firms as blockholders in the sample. P-values are the values in the parentheses. The sample includes all the firms between 2007 and 2012 that have been a part of the CRSP universe.

Panel A: Probability of a firm being a target when there are only non-financial firms in the sample.

	Target	*Target*	*Target*	*Target*
Degree of Target weighted	11.06***			
	(0.004)			
Degree of Target unweighted		740.2***		
		(0.007)		
Eigenvector of target weighted			-3634.0	
			(0.935)	
Eigenvector of target unweighted				-16.78
				(0.895)
Ln(assets)	-0.0631*	-0.0649*	-0.0569*	-0.0569*
	(0.058)	(0.050)	(0.091)	(0.091)
Leverage	0.00542	0.00944	-0.00210	-0.00234
	(0.985)	(0.973)	(0.994)	(0.993)
MTB	-0.0869**	-0.0867**	-0.0861**	-0.0861**
	(0.044)	(0.045)	(0.044)	(0.044)
ROA	0.567	0.570	0.552	0.553
	(0.155)	(0.153)	(0.168)	(0.167)
Property ratio	0.0485	0.0471	0.0451	0.0454
	(0.822)	(0.828)	(0.835)	(0.834)
Liquidity ratio	0.378	0.379	0.368	0.368
	(0.279)	(0.278)	(0.293)	(0.292)
Sales growth	-0.639**	-0.637**	-0.641**	-0.642**
	(0.015)	(0.015)	(0.015)	(0.015)
HH index	-0.000168	-0.000170	-0.000192	-0.000181
	(0.752)	(0.749)	(0.718)	(0.733)
_cons	-3.558***	-3.546***	-3.559***	-3.571***
	(0.000)	(0.000)	(0.000)	(0.000)
Industrial fixed effects	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes
N	19783	19783	19783	19783

Panel B: Probability of a firm being a target when there are financial firms in the sample as blockholders but not as a target of investment.

	Target	*Target*	*Target*	*Target*
Degree of Target weighted	3.200			
	(0.526)			
Degree of Target unweighted		137.3		
		(0.610)		
Eigenvector of target weighted			-128937.7	
			(0.581)	
Eigenvector of target unweighted				-952459.1
				(0.731)
Ln(assets)	-0.0607*	-0.0597*	-0.0566*	-0.0566*
	(0.074)	(0.077)	(0.093)	(0.093)
Leverage	-0.000697	-0.00152	-0.00438	-0.00382
	(0.998)	(0.996)	(0.988)	(0.989)
MTB	-0.0844**	-0.0845**	-0.0850**	-0.0849**
	(0.049)	(0.049)	(0.048)	(0.048)
ROA	0.566	0.564	0.556	0.557
	(0.158)	(0.159)	(0.166)	(0.166)
Property ratio	0.0498	0.0485	0.0456	0.0462
	(0.818)	(0.822)	(0.833)	(0.831)
Liquidity ratio	0.373	0.371	0.367	0.367
	(0.285)	(0.287)	(0.293)	(0.293)
Sales growth	-0.640**	-0.640**	-0.640**	-0.641**
	(0.014)	(0.014)	(0.014)	(0.014)
HH index	-0.000181	-0.000182	-0.000194	-0.000184
	(0.733)	(0.732)	(0.715)	(0.729)
_cons	-3.557***	-3.561***	-3.562***	-3.574***
	(0.000)	(0.000)	(0.000)	(0.000)
Industrial fixed effects	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes
N	19783	19783	19783	19783

Table 12: We use a logistic regression to estimate the probability of deal completion from an acquirer's point of view. The dependent variable is a dummy variable success equal to 1 if the deal was completed and 0 otherwise. We control for annual fixed effects. The independent variables or the centrality measures and their interpretations have been defined in Appendix 1. We use the centrality measures of the acquirer in this case. The control variables have been defined in Appendix 2. All the deal characteristics have been taken from Thompson SDC Database. We execute the regressions for two samples. Regressions on Panel A is when there are no financial firms in the sample and in Panel B when there are financial firms as blockholders in the sample. P-values are the values in the parentheses. The sample consists of all completed and uncompleted deals between 2007 and 2012. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

Panel A: Probability of deal completion from the perspective of the acquirer when there are only non-financial firms in the sample.

	Success	*Success*	*Success*	*Success*
Eigen vector of acquirer unweighted	15.75***			
	(0.000)			
Degree of acquirer unweighted		1183.0***		
		(0.000)		
Eigen vector of acquirer weighted			19.19***	
			(0.000)	
Degree of acquirer weighted				18.06***
				(0.000)
ln(Target size)	-0.0121	-0.0552	-0.0120	-0.0526
	(0.764)	(0.187)	(0.766)	(0.207)
NYSE AMEX	-0.149	-0.0848	-0.150	-0.0775
	(0.392)	(0.633)	(0.387)	(0.664)
Turnover	-0.488	-0.482	-0.489	-0.465
	(0.246)	(0.268)	(0.245)	(0.281)
Poison Pill	-2.961***	-2.802***	-2.961***	-2.765***
	(0.000)	(0.000)	(0.000)	(0.000)
Toehold	-1.070***	-1.125***	-1.070***	-1.102***
	(0.000)	(0.000)	(0.000)	(0.000)
Public bidder	0.506***	0.0843	0.508***	0.0828
	(0.001)	(0.613)	(0.001)	(0.621)
Horizontal	0.0946	0.146	0.0934	0.152
	(0.526)	(0.331)	(0.531)	(0.312)
Premium 4 week	0.00331	0.00290	0.00332	0.00284
	(0.396)	(0.473)	(0.395)	(0.479)
Tender offer	1.148***	1.081***	1.148***	1.077***
	(0.000)	(0.000)	(0.000)	(0.000)
All Cash	-0.106	-0.183	-0.108	-0.181
	(0.550)	(0.315)	(0.542)	(0.320)
All stock	-0.467	-0.247	-0.469	-0.252
	(0.049)	(0.293)	(0.047)	(0.285)
_cons	1.525	1.853	1.529	1.822
	(0.000)	(0.000)	(0.000)	(0.000)
Annual Fixed effects	Yes	Yes	Yes	Yes
N	1662	1662	1662	1662

Panel B: Probability of deal completion from the perspective of the acquirer when there are financial firms in the sample as blockholders but not as a target of investment.

	Success	*Success*	*Success*	*Success*
Eigen vector of acquirer unweighted	799851.8***			
	(0.000)			
Degree of acquirer unweighted		1885.9***		
		(0.000)		
Eigen vector of acquirer weighted			261746.3***	
			(0.000)	
Degree of acquirer weighted				31.75***
				(0.000)
ln(Target size)	-0.0138	-0.0654	-0.0129	-0.0609
	(0.732)	(0.124)	(0.749)	(0.147)
NYSE AMEX	-0.149	-0.0979	-0.152	-0.0923
	(0.392)	(0.582)	(0.381)	(0.605)
Turnover	-0.487	-0.634	-0.487	-0.528
	(0.248)	(0.162)	(0.248)	(0.221)
Poison Pill	-2.96***	-2.772***	-2.96***	-2.745***
	(0.000)	(0.000)	(0.000)	(0.000)
Toehold	-1.069***	-1.113***	-1.07***	-1.093***
	(0.000)	(0.000)	(0.000)	(0.000)
Public bidder	0.504***	0.0566	0.507***	0.0516
	(0.002)	(0.738)	(0.001)	(0.759)
Horizontal	0.0918	0.183	0.0903	0.180
	(0.538)	(0.225)	(0.544)	(0.234)
Premium 4 week	0.00329	0.00437	0.00328	0.00344
	(0.399)	(0.299)	(0.400)	(0.390)
Tender offer	1.152***	1.098***	1.149***	1.087****
	(0.000)	(0.000)	(0.000)	(0.000)
All Cash	-0.108	-0.180	-0.105	-0.187
	(0.541)	(0.319)	(0.554)	(0.303)
All stock	-0.464*	-0.286	-0.465**	-0.285
	(0.050)	(0.230)	(0.049)	(0.229)
_cons	1.541***	1.873***	1.534***	1.850***
	(0.000)	(0.000)	(0.000)	(0.000)
Annual Fixed effects	Yes	Yes	Yes	Yes
N	1662	1662	1662	1662

Table 13: We use a logistic regression to estimate the probability of deal completion from a target's perspective. The dependent variable is a dummy variable success equal to 1 if the deal was completed and 0 otherwise. We control for annual fixed effects. The independent variables or the centrality measures and their interpretations have been defined in Appendix 1. We use the centrality measures of the target in this case. The control variables have been defined in Appendix 2. All the deal characteristics have been taken from Thompson SDC Database. We execute the regressions for two samples. Regressions on Panel A is when there are no financial firms in the sample and in Panel B when there are financial firms as blockholders in the sample. P-values are the values in the parentheses. The sample consists of all completed and uncompleted deals between 2007 and 2012. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

Panel A: Probability of deal completion from the perspective of the target when there are only non-financial firms in the sample.

	Success	*Success*	*Success*	*Success*
Eigen vector of target unweighted	15.75***			
	(0.000)			
Degree of target unweighted		372.0		
		(0.447)		
Eigen vector of target weighted			0.329***	
			(0.000)	
Degree of target weighted				12.10
				(0.221)
ln(Target size)	-0.0121	-0.0135	-0.00246	-0.0143
	(0.764)	(0.738)	(0.658)	(0.724)
NYSE AMEX	-0.149	-0.153	-0.0211	-0.153
	(0.392)	(0.377)	(0.373)	(0.379)
Turnover	-0.488	-0.514	-0.0861	-0.510
	(0.246)	(0.225)	(0.253)	(0.229)
Poison Pill	-2.961***	-2.953***	-0.529***	-2.951***
	(0.000)	(0.000)	(0.000)	(0.000)
Toehold	-1.07***	-1.075***	-0.194***	-1.075***
	(0.000)	(0.000)	(0.000)	(0.000)
Public bidder	0.506***	0.503***	0.0680***	0.5***
	(0.001)	(0.002)	(0.001)	(0.002)
Horizontal	0.0946	0.0920	0.0112	0.0948
	(0.526)	(0.538)	(0.565)	(0.525)
Premium 4 week	0.00331	0.00353	0.000627	0.00348
	(0.396)	(0.369)	(0.378)	(0.375)
Tender offer	1.148***	1.148***	0.128***	1.148***
	(0.000)	(0.000)	(0.000)	(0.000)
All Cash	-0.106	-0.109	-0.0176	-0.111
	(0.550)	(0.538)	(0.452)	(0.532)
All stock	-0.467	-0.459	-0.0641	-0.462
	(0.049)	(0.052)	(0.070)	(0.051)
_cons	1.525***	1.536***	0.824***	1.538***
	(0.000)	(0.000)	(0.000)	(0.000)
Annual Fixed effects	Yes	Yes	Yes	Yes
N	1662	1662	1662	1662

Panel B: Probability of deal completion from the perspective of the target when there are financial firms in the sample as blockholders but not as a target of investment.

	Success	*Success*	*Success*	*Success*
Eigen vector of target unweighted	23331082.8			
	(0.513)			
Degree of target unweighted		827.0		
		(0.310)		
Eigen vector of target weighted			856421.9***	
			(0.004)	
Degree of target weighted				15.63
				(0.321)
ln(Target size)	-0.0118	-0.0152	-0.0120	-0.0151
	(0.770)	(0.709)	(0.765)	(0.709)
NYSE AMEX	-0.149	-0.152	-0.149	-0.151
	(0.389)	(0.382)	(0.392)	(0.386)
Turnover	-0.475	-0.513	-0.450	-0.499
	(0.260)	(0.227)	(0.288)	(0.237)
Poison Pill	-2.953***	-2.962***	-2.953***	-2.961***
	(0.000)	(0.000)	(0.000)	(0.000)
Toehold	-1.067***	-1.076***	-1.084***	-1.076***
	(0.000)	(0.000)	(0.000)	(0.000)
Public bidder	0.499***	0.502***	0.487***	0.502***
	(0.002)	(0.002)	(0.002)	(0.002)
Horizontal	0.0924	0.0919	0.0949	0.0944
	(0.535)	(0.537)	(0.525)	(0.526)
Premium 4 week	0.00319	0.00352	0.00298	0.00340
	(0.415)	(0.370)	(0.448)	(0.386)
Tender offer	1.14***	1.149***	1.151***	1.15***
	(0.000)	(0.000)	(0.000)	(0.000)
All Cash	-0.103	-0.107	-0.0882	-0.106
	(0.560)	(0.548)	(0.618)	(0.553)
All stock	-0.459*	-0.458*	-0.435*	-0.459*
	(0.053)	(0.053)	(0.067)	(0.052)
_cons	1.527***	1.542***	1.52***	1.538***
	(0.000)	(0.000)	(0.000)	(0.000)
Annual Fixed effects	Yes	Yes	Yes	Yes
N	1662	1662	1662	1662

Appendix 1: Network Topology: Centrality measures and its meanings

VARIABLE	DEFINITION (MEASUREMENT)
Path	A unique tie of shareholding between Company A and Company B
Distance	Length of the shortest path (Percentage of share held) connecting company A and company B
Number of links	It's the number of links that one firm has with other firms in the network in the network in a year. It is calculated from both the perspective of the blockholder and its target of investment.
Degree	It is a measure of how well connected a firm is and firms with higher degree score tend to be more central in the network. For the blockholder it is the number of outgoing links based on the number of companies it has invested in. It is also known as out-degree or degree of blockholder/acquirer. For the target it is the number of links coming in based on the number of blockholders which have invested in it. It is also known as in-degree or degree of target. For a weighted network the measures are weighted based on the percentage of share held by a blockholder in its target of investment.
Eigen vector	If the firm has a lot of links with other firms or with important firms in the network, the measure will be higher for that company in the network. It measures the importance of a firm in the network. It is known as eigenvector of blockholder/acquirer and eigenvector of target for the target. The measures could be weighted based on percentage of shares held by a blockholder in its target of investment or it could be unweighted.

Appendix 2: Variable definitions

Variable Name	Definition	Database
Acquirer	A dummy variable which takes a value equal to 1 if it was an acquirer between 2007 and 2012 and 0 if it was not	SDC
All cash	A dummy variable which takes a value equal to one if the deal was all cash and 0 otherwise	SDC
All stock	A dummy variable which takes a value equal to one if the deal was all stock and 0 otherwise	SDC
Cash assets	The ratio of total cash to that of the total assets	Compustat
Finance	A dummy variable which takes a value equal to 1 if a financial firm (SIC 6000-6999) and 0 otherwise	Compustat
HHindex	Sum of the square of the market share of each company in a given sector where market share is calculated by the ratio of sales of a given company and the total sales of the industry	Compustat
Horizontal	A dummy variable which takes a value equal to one if the bidder and the target have the same 4 digit SIC code and 0 otherwise	SDC
Leverage	Long term debt (item DLTT) divided by total assets (item AT)	Compustat
Liquidity ratio	Current assets (item ACT) minus Current liability (item LCT) divided by total assets (item AT)	Compustat
Ln(Assets)	Natural logarithmic value of total assets (item AT) listed in ‘000000 dollars	Compustat
MTB	Ratio of the sum of market capitalization , which is nothing but the product of outstanding shares in the market and closing price on that day (item CSHO * item PRC) and long term debt (item DLTT) divided by total assets (item AT)	Compustat
NYSE AMEX	A dummy variable which takes a value equal to one if the target is listed in NYSE or AMEX and 0 otherwise	SDC
Poison Pill	A dummy variable which takes a value equal to one if the target has a poison pill and 0 otherwise	SDC
Premium 4 week	offer price divided by market price of the target 4 weeks before the announcement	SDC
Property Ratio	Ratio of gross property plant and equipment (item PPEGT) divided by the total assets (item AT)	Compustat

Variable Name	Definition	Database
Public bidder	A dummy variable which takes a value equal to one if the Acquirer is listed publicly and 0 otherwise	SDC
ROA	operating income after depreciation and amortization (item OIADP) divided by the total assets (item AT)	Compustat
Sales growth	The annual sales growth rate of a firm in comparison to the previous year	Compustat
Success	A dummy variable which takes a value equal to one if the deal is completed and 0 otherwise	SDC
Target	Takes a dummy equal to one if the firm was a target between 2007 and 2012	SDC
Target size	Target market value 42 days before announcement (logarithm is used in regression)	CRSP, SDC
Tender offer	A dummy variable which takes a value equal to one if the deal was classified as tender offer by SDC and 0 otherwise	SDC
Toehold	A dummy variable which takes a value equal to one if the acquirer holds a non-zero percentage target's share before the announcement in the target before announcement and 0 otherwise	SDC
Turnover	Target average daily ratio of trading volume to total shares outstanding over the 52 weeks before the announcement	CRSP

CHAPTER THREE: Impact of unconventional monetary policy on financially constrained firms

ABSTRACT

The objective of this study is to analyze the impact of the unconventional monetary policies announced by the Federal Reserve on financially constrained firms. These policies were primarily announced in hope of easing financially constraint of firms, which in turn could help these firms invest more. Financial crisis had severely hampered an average firm on the stock price channel. The volume, liquidity and price informativeness of all the firms decreased significantly. This effect was even more pronounced for financially constrained firms in comparison to unconstrained firms. We also find that the stocks of financially constrained firms reacted overwhelmingly in a positive way to the policy announcements by the Federal Reserve in comparison to unconstrained firms. The price-informativeness of financially constrained firms increased significantly in the period after the Fed intervention in comparison to firms which are unconstrained[2].

Keywords: Unconventional monetary policy, firm-financial constraints, Stock price Informativeness, Managerial Learning

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1. INTRODUCTION

The objective of this study is to analyze the impact of unconventional monetary policies like quantitative easing (QE) and maturity extension program (MEP) on firms which were constrained financially before the global financial crisis of 2007-08. Following the financial crisis of 2007-08, the Federal Reserve implemented a number of unconventional measures. They were targeted at buying US treasury securities and mortgage backed securities which could help put a downward pressure on the long term interest rates which could ease the financial constraints of the corporates and overall economy (Foley-Fischer, Ramcharan and Yu, 2016; Cahill, D'Amico, Li, Sears, 2013; Gertler and Karadi, 2011, 2013; Krishnamurthy and Vissing-Jorgensen, 2011, 2013; and Shleifer and Vishny, 2011).

A set of empirical tests are developed to analyze the impact of unconventional monetary policies on financially constrained firms. We initially analyze the impact of the financial crisis on the constrained firms to see if it is indeed necessary for Federal intervention to alleviate the financial crisis. Our follow up analysis consists of two steps. First, we would like to show that the stocks of financially constrained firms have reacted positively to the policy announcements of the Federal Reserve in anticipation that these announcements will ease their financial constraint. A paper by Foley-Fischer et al (2016) shows that the MEP announced by Federal Reserve was able to alleviate the financial constraints of some firms. They analyze the impact of the policy announcements through the debt channel where they show that stock prices of firms dependent on long-term debt increased following the announcement. Foley-Fischer et al (2016) also show that these financially constrained firms issued more long-term debt and expanded their employment and investment activities following the announcements. While, Foley-Fischer et al (2016) analyze the impact of the policy announcements through the debt channel, we would like to differentiate ourselves from their paper by analyzing the impact of the Federal Reserve's policy announcements through the stock price channel.

Chen, Goldstein and Jiang (2006) suggest that one of the main roles of the financial markets is production and aggregation of information for various sections dependent on them. The transmission of information is enabled by traders for their own speculative trades which is then reflected in market prices (Grossman and Stiglitz (1980), Glosten and Milgrom (1985), Kyle (1985), Chen, Goldstein and Jiang (2006)). For example: A paper by Roll in 1984 shows that the private information of orange future trades regarding weather conditions is reflected directly into the price of orange future's price (Chen, Goldstein and Jiang (2006)). This shows that the private information of parties not related to either the production or consumption of orange fruits play a key role in deciding the prices of orange fruits. This analogy holds true for the financial markets as well with respect to the stock price channel.

Stock price channel is important because it is positively correlated to corporate investment which could in turn have a real impact on the economic activity (Tobin, 1969; von Furstenberg, 1977; Baker, Stein and Wurgler, 2003). The reasons are that the stock prices aid managers in decision making

because the prices provide them with a component of information which the managers don't have and aids them in decision making related to investments (Hayek, 1945; Baumol, 1965; Chen, Goldstein and Jiang, 2006; Bakke and Whited, 2010; Bond, Edmans and Goldstein, 2012). Even if managers don't use information from stock prices for their decision making the prices are important to them as they are a party to many contracts which depend on the stock prices (Bond, Edmans, and Goldstein, 2012). Investors trade on signals on stocks and these trades add to the information channel to the manager. However, at a time of financial crisis like the one during 2008-09, investors are less likely to trade on stocks because of the risk involved. According to a report in NY times, the trading strategy of Credit Suisse had reported that nearly three and a half years after the crisis, the average daily trading volume was 6.5 billion trades a day in April 2012 in comparison to the peak of 2008 when the daily trading volume was 12.1 billion trades a day. Such a steep decline in daily trading volume is more likely to affect constrained firms than unconstrained firms because their fundamentals are riskier for investors to trade on. This could also decrease the availability of information to the managers of the constrained firms who could base their investment decisions on the information channel. Regulators, who also follow the market prices closely because their decisions are more likely to affect the cash flow of firms, follow the impact on these firms and hence are likely to make policy decisions which are not only positive for the debt channel for constrained firms but the equity channel as well (Feldman and Schmidt, 2003, Burton and Seale, 2005, Bond et al, 2012). A policy decision which is perceived as positive for the financial markets are more likely to entice investors to trade more on the constrained firms. This could be beneficial for constrained firms because a positive signal allows a bigger likelihood for investors to trade on the constrained firms. Also, the policy announcements such as QE is likely to inject a lot of money into the financial markets which could ease the financial constraints of the constrained firms in terms of information and future investments.

To put things in perspective how much money in likely to be injected into the markets, the Federal Open Market Committee (FOMC) announced on 18/2/3009 during the first phase of QE (QE1) that it will purchase 300 billion dollars of long term treasuries during the next 6 months. This is likely to inject 50 billion dollars of cash into the markets each month. During, the second phase of QE (QE2) the FOMC announced on 03/11/2010 that it is likely to purchase an additional 600 billion dollars of long term securities by the second quarter of 2011. In this process, they will inject 75 billion dollars per month into the markets. In the final phase of QE (QE3) during this period, the FOMC announced on 13/9.2012 that they will purchase 85 billion dollars of long-term securities per month till the end of the year. Overall, the Federal Reserve roughly added somewhere between 50 to 85 billion dollars a month in the period they announced the quantitative easing programs for. Injection of money on such a scale into the markets is expected to ease the financial constraints of constrained firms as such measures are expected to be beneficial for them in terms of liquidity constraints. These measures are also likely to increase the information channel of these stocks.

This in turn is likely to improve the price informativeness of the constrained firms. Price informativeness is a measure which was proposed by Roll (1988) and a measure called price non-synchronicity was later developed by Morck, Yeung, and Yu (2000), Durnev et al. (2003), and Durnev, Morck, and Yeung (2004) (Chen et al, (2006)). It is computed by regressing the return of the stock in a particular year against the returns of its sector in that year and returns of the market in the same year. The rationale behind this measure is that if the stock returns are highly correlated to the returns of the sector and returns of the market, it is likely to give firm-specific information to the managers of the firm. Therefore, the corollary of this is that the stock returns of firms which are less correlated with the returns of the market and returns of the sector are more likely to add firm-specific information to the managers of the firm. This added information could aid managers in their decision making and they are more likely to allocate investment based on the information channel. Hence our paper analyzes the impact of the policy announcements on price informativeness (Chen et al, 2006) of the stock price and the investment price sensitivity (Baker et al, 2003).

This contribution to the literature of ours is important because we could understand better whether the policy announcements had achieved their intended targets with respect to easing the financial constraints of firms. Also, the reactions of managers of these firms to these announcements with respect to investment is better understood. We also believe that we are the first paper to analyze the impact of the unconventional monetary policies from the stock price channel. We also contribute to the feedback literature of Bond et al (2012) where they summarize that managerial investment decisions are dependent on lagged asset prices.

The paper by Foley-Fischer et al (2016) analyzes the impact of MEP on stock prices reaction around September 22, 2011 alone. There was a total of 35 events announced by the Federal Reserve from 2008 to 2014 but many of the announcements are targeted at improving the liquidity constraints of mortgage backed securities (which were also affected by the financial crisis). Also post December 12, 2012 the Federal Reserve started the tapering program which was targeted at gradually decreasing the size of the bond buying program to a point at which it need not buy any more bonds. Overall, we identified 8 events that puts a downward pressure on long term interests that are linked to improving the financial constraints of firms on a long run[3]. The common link between these events is that Federal Reserve announces that it will buy long term Treasury or agency securities and to what extent. These events are specifically targeted at decreasing the long term interest rates specifically and injecting much needed liquidity in the market in terms of money. These are the measures specifically targeted at improving the financial constraints of firms and hence these are the specific measures which is likely to improve the information channel of firms in general.

[3]The dates of the 8 events we identified are 1/12/2008, 10/8/2010, 27/8/2010, 21/9/2010, 3/11/2010, 21/09/2011, 20/6/2012 and 12/12/2012. The details of all the events and the announcements are briefly explained in Appendix 1.

We collect the fundamental data from CRSP/Compustat database and returns of the stocks from the CRSP database for all the firms across the 8 events between 2008 and 2012 from the CRSP/Compustat universe and calculate the cumulative abnormal returns for the firms across these events. We measure the financial constraint of a firm with the age-size index (AS index) which was developed by Hadlock and Pierce (2010). As a robustness check we also use the Whited and Wu index (WW index). In order to analyze the impact of these 8 announcements on financial constraints we regress the cumulative abnormal returns of the stocks on the financial constraints of these firms. We have a total of 20455 firm-event observations for our analysis between 2008 and 2012 across the 8 events. On an average we have 2556 firm-event observations for each of these events. For the first event where the Federal Reserve first announced their policy decisions to ease the financial constraints of firms, we observe a total of 2934 firm-event observation.

We initially analyze the impact of the financial crisis on the various attributes of financially constrained firms such as price informativeness, volume and the amihud illiquidity. Adjusted volume is a ratio of the daily volume of trade deflated by the total number of outstanding shares. Amihud illiquidity is the ratio of the daily returns of stocks to that of the dollar volume of trade as proposed by Amihud (2000). We use a differences-in difference framework to analyze this impact. We define the firms to be constrained if they lie in the last tercile of the AS index score they have in the year 2007. Our control group for this analysis consists of firms that lie in the first tercile of AS index and we define them to be unconstrained firms. We repeat this analysis the same way for our robustness check where we use Whited and Wu index except that we define the constrained and control firms based on their score they have in the year 2006. We collect the fundamental data of firms from CRSP at a 12-month and a 24-month period centered on the financial crisis. Most economists agree on the fact that the crisis began in the early periods of August 2007 (Thakor, 2015) and we choose 09-08-2007 to be the date because that is when the news came out of the financial markets that the economy could be crippled by financial crisis and therefore. We collect our data for 6 months and 12 months before and after the crisis to study the impact of the financial crisis.

From our analysis, we observe that the price informativeness of the constrained firms decreased significantly in the period following the financial crisis in comparison to unconstrained firms. We observe this phenomenon to hold true when the sample size is 24 months centered on the crisis. In terms of economic significance, we find that the constrained firms had a decrease of around 53 percentage point decrease in price informativeness in the 24-month sample in comparison to unconstrained firms. We also find that across the firms in the sample, we find a significant decrease in price informativeness in the period following the financial crisis. Economically, we find all the firms in the sample had a decrease of 59.03 percentage point and 54.76 percentage point decrease in the price informativeness in the period following the crisis at a 24-month and 12-month sample respectively. We also observe that the illiquidity of constrained firms increased by 40 to 50 percentage points in comparison to unconstrained firms when

the sample is 24 months centered on the crisis and 18 to 21 percentage points when the sample is 12 months around the crisis. Firms in general display an increase of illiquidity by 9.5 percentage points in the 12-month sample and 19.7 percentage points in the 24-month sample. Adjusted volume of financially constrained firms decreased by 0.273 to 0.331 percentage points in the 24-month sample. We also observe that the financially constrained firms display a decrease in adjusted volume by 0.142 to 0.175 percentage points in the 12-month sample. All these observations show that financial crisis had hampered the financially constrained firms more than the unconstrained firms. Also, firms in general have been severely affected by the financial crisis.

We then analyze the impact of the policy announcements on the market reaction of constrained firms in comparison to unconstrained firms. From our analysis, we could observe that the firm's constraint measures have had a positive correlation with the cumulative abnormal returns of the stock prices across the 8 events. This result could be interpreted that the market perceives policy announcements will ease the financial constraints of the firms. This result is consistent with the finding of Foley-Fischer et al (2016) who show that the stock prices rose significantly for firms which were financially constrained following the MEP. The economic significance of the above results is that a one standard deviation in financial constraints led to an increase of 0.25 to 0.27 percentage point increase in cumulative abnormal returns across these 8 events. We also find that the stock prices of financially constrained firms increased by 1.47 to 1.58 percentage points with a one standard deviation increase in a firm's constraint levels around the first event alone.

We find that the price informativeness of financially constrained firms has increased significantly in the period following the policy announcements in comparison to the period before with respect to unconstrained firms. Price informativeness of financially constrained firms increased by approximately 46 percentage points in comparison to unconstrained firms in the 12-month sample. The significance of the increase in price informativeness of constrained firms is that the policy announcements have increased the amount of information available to the managers of these firms which could potentially result in increased investment in the future periods. Overall, we find that the policy announcements have been helpful in easing the financial constraints of firms at a price informativeness level.

The structure of the paper is as follows. The hypothesis development, literature review and the regression model are explained in Section- 2. The data collection and the corresponding descriptive statistics are explained in Section - 3 and the results that we obtained are explained in Section - 4. We finally summarize the results and conclude in Section – 5.

2. LITERATURE REVIEW AND HYPOTHESIS

Studies in corporate finance show how various impediments in raising external finance creates financial constraints for firms. These financial constraints are more likely to affect decisions of managers in a variety of issues including capital structure and the firm's investment decisions (Hennessy and

Whited (2007), Hadlock and Pierce (2010)). Follow-up studies further reveal that these constraints could have a significant impact on the firm's stock price returns in future (Lamont et al. (2001), Hadlock and Pierce (2010)).

There are quite a few papers in the literature that have shown that corporate investment and the stock market are positively correlated across time and in cross-section (Baker et al, 2003). The traditional explanation for this relationship is that stock prices reflect the marginal product of capital (Baker et al, 2003). This traditional explanation is the interpretation of the relationship between corporate investment and Tobin's Q as shown by Tobin (1969) and von Furstenberg (1977) (Baker et al, 2003). Also, managers tend to learn new information from stock prices which helps them make decisions related to investment (Hayek, 1945; Baumol, 1965; Chen et al, 2006; Bakke and Whited, 2010; Bond et al, 2012). Foucault and Fresard (2012) show that cross-listed firms display higher investment-price sensitivity to firms than firms that don't cross list. The rationale they provide for this phenomenon is that managers are reliant on the stock prices and the information it provides them.

This is consistent with other papers which suggest that information from stock prices aid managers of the firms to make investment related decisions (Chen et al, 2006, Bond et al, 2012). The idea behind this is that there are a lot of participants who do not have communication with the firms outside the trading channels and yet they add to the information channel that the stock prices contain (Dow and Gorton, 1997; Subrahmanyam and Titman, 1999; Chen et al, 2006). Therefore, stock prices could have a component of information which the managers do not have. This is empirically explained by Edman et al (2017) where they show that countries which have introduced stringent regulations regarding insider trading, this shock reduces the manager's contribution to stock price and increases an outsider's contribution to stock price. Also, optimal real decisions might not depend on only the internal information of a firm which the manager possess but also on the external information such as the state of the economy, market share of competitors, demand for the product from consumers etc (Bond et al, 2012). Therefore, the usefulness of the information that a stock price provides a manager has increases as the complexity of the production processes increases (Allen, 1993, Bond et al, 2012).

Another line of argument why information and stock prices are related is that value maximizing managers should use every relevant information to forecast the cash flows of their investment project when they make capital allocation for various projects (Foucault and Gehrig, 2008, Foucault and Fresard, 2012). They further add that these forecasts of the cash flows depend on the amount of private information the manager has and the information that could be obtained from the stock prices. Hence, the forecasts and allocation of capital puts more weight on the information signals.

Their results are once again consistent with the positive correlation between investment and stock prices. As explained earlier firms have a financial constraint because of frictions in obtaining external finance. Therefore, the stock price channel is even more important for these financially constrained firms. Since these financial constraints have a significant impact on their future stock returns,

potential investments from these firms are even more dependent on the stock price channel for firm expansion and profitability of the firm. Baker et al (2003) in their paper show that firms that are highly constrained, where the firm constraint is measured by KZ (Kaplan-Zingales) index, have an investment-price sensitivity of up to three times more than firms that are not financially constrained. The rationale they provide is that is that the managers of the unconstrained firms prefer a smooth investment with change in fundamentals. So, the question is how a global financial crisis affects financially constrained firms considering their stock channel is likely to be impacted and their existing financial constraints is because of hurdles in obtaining external finance.

While unconventional monetary policy is an extreme decision taken by central banks during periods of economic crisis, there are certain papers which measures the impact of periodic monetary policies on the investment behavior of firms. Cloyne et al (2018) with the help of data related to monetary policies from UK and US from 1986 to 2016 show that younger firms paying no dividend display the maximum significant increase in corporate investment in comparison to older firms after controlling for size, asset growth, Tobin's Q, leverage or liquidity. They also show that younger or firms which pay no dividend account for 75% of aggregate investment in response to monetary policies. Since age and size are useful predictors of a firms financial constraints, younger firms are more likely to be constrained in comparison to older firms. Therefore we could say that financially constrained firms are more likely to be aided by monetary policies of central banks in comparison to unconstrained firms.

There is a growing literature which studies the impact of unconventional monetary policies. Some of them argue that the unconventional monetary policies might have had little real impact because economic growth post crisis might be driven by pace of reallocation across industries and geography (King, 2013). Skeptics of these policies argue that they could fuel asset-price bubbles, excessive risk-taking and future instabilities (Rajan, 2013; Stein, 2014). However, some papers show that these policies have had a positive impact on financial markets (Gagnon et al, 2011; Lutz, 2015; Foley-Fischer et al 2016). These policies have led to reduction in long-term interest rates on a range of securities including securities that were not included in the program (Gagnon et al, 2011). These policies have also led to a large increase in investor sentiment (Lutz, 2015). It should also be noted that Federal Reserve was not the first central bank to enter into this kind of unconventional monetary policy. Following the burst of the asset price bubble Japanese economy suffered a period of prolonged stagnation. In order to counter this, the Bank of Japan (BoJ) adopted an unconventional monetary policy from 2001 to 2006 in order to stem the continuous decline and set the basis of sustainable economic growth. Study of these policies did once again produce mixed results. While the QE was largely successful in easing financing constraints for firms, it was largely unsuccessful in raising aggregate demand in the economy (Ugai, 2007). Ueda (2011) and D'Amico and King (2010) who find that the BoJ's policy decisions had no impact on the easing of interest rates in the Japanese economy. It should however be noted that the Japanese case was not

helped by the fact that one year after the exit of BoJ from the QE, the global financial crisis struck and they had to go back to the QE in 2007.

Foley-Fischer et al (2016) initially perform an event study on the reaction of the stocks of constrained firms to the maturity extension plan (MEP) that was announced by the Federal Reserve. With a total of 2618 observations, they were able to show that the stock prices of financially constrained firms reacted positively to firms which were dependent on long-term debt. With the help of a differences-in difference methodology between 2007 and 2013 (MEP happened on Sep 22, 2011), they were also able to show that the firms issued more debt and expanded their investment and employment in the period following the MEP. Their paper also adds that the credit spread of the firms issuing long term debt fell disproportionately and insurance companies which are more reliant on treasuries seemed to have increased their holdings of riskier corporate debt during this period. Most of these papers are targeted at the impact of the unconventional monetary policies on the debt channel for firms. We would however like to differentiate ourselves by trying to study the impact of these policies on the equity channel.

We initially analyze if the price informativeness of a firm has been impacted by the financial crisis. We measure the price informativeness with the help of the measure price non-synchronicity. The idea behind the measure is that if returns of a stock is highly correlated with the returns of the sector and the market it is less likely to convey the amount of private information that a manager has which is useful for investment decisions (Chen et al, 2006). This measure explains the amount of private information a manager has and hence the measure will be higher when the returns of a stock is less correlated with the returns of the sector and the returns of the market.

Therefore, trading channels add to the information channel of the managers which aids them in decision making. However, during a financial crisis, it is highly likely that most traders won't trade on the markets because of the risk involved. Also, the information that the trading channel provides is crucial for them to make their investment decisions and hence this is more likely to impact constrained firms than the unconstrained firms. This rational lead to the formulation to our first hypothesis (H1): ***Financial crisis has impacted financially constrained firms significantly more than the unconstrained firms in the stock price channel.*** We define the stock price channel to be with respect to price informativeness, adjusted volume and amihud illiquidity of the financially constrained firms. We intend to study the impact of the financial crisis on the constrained firms with a differences-in difference methodology with the help of a 24-month and 12-month sample centered on the crisis.

From our results, we were able to show that the financially constrained firms were more significantly impacted by the financial crisis in comparison to unconstrained firms. So, with the Federal Reserve announcing their unconventional monetary policy, we believe that the market will view these policies to be more beneficial for constrained firms in comparison to unconstrained firms. The reason is that the unconventional monetary policies injects much needed money into the economy which could elicit a response from the investors. Also, if the market perceives that the unconventional monetary

policies to be more positive for financially constrained firms there should be a positive correlation between the cumulative abnormal returns of financially constrained firms and their constraint levels. Hence, we formulate our next hypothesis (H2) which is that: ***Financial constraints of firms are positively correlated to the cumulative abnormal returns of the stocks around the announcement dates of Federal Reserve's policies.*** We use an event study based on 8 events and the first event alone to analyze this hypothesis.

In general government and central banks across the world would want the corporate sector to invest more which could indirectly boost the economy rather than through government intervention. So, it is in their best in their interest, Federal Reserve would want to first ease the financial constraint of the markets. Regulators follow market prices very closely because they know that their decisions affect the cash flow of firms (Feldman and Schmidt, 2003, Burton and Seale, 2005, Bond et al, 2012). Also, their proposals have advocated increasing the reliance on market prices following the financial crisis (Flannery 2009, McDonald 2010, Hart and Zingales 2011, Bond et al, 2012). Hence it is in their best interests to send a strong signal to the financial markets that they want to alleviate the constraints of firms. They can send these information signals through their policy announcements (unconventional monetary policy) which could trigger a positive market reaction among investors. This positive market reaction could trigger an increase in price informativeness, liquidity and volume of a stock and indirectly the investment allocation thanks to these measures. Based on this rationale we formulate our third hypothesis that (H3): ***Policy announcements have had a more positive impact in easing the price informativeness, adjusted volume and amihud illiquidity of financially constrained firms in comparison to unconstrained firms.*** Just like the first hypothesis, we test this hypothesis with a differences-in difference methodology in a 12-month and 24-month sample centered on the first policy announcement of the Federal Reserve.

We finally test the investment price sensitivity of a firm before and after the policy announcements. Our rationale behind this test is that we believe that investors anticipate the easing of financial constraints by the QE. This investor anticipation and trading on the stocks of the constrained firms increase the information channel to the managers of the constrained firms. As explained earlier, managers of the constrained firms are more likely to use the information channel for their investment decisions. A possible explanation for the above phenomenon comes back to the explanation that corporate investment and the stock market are highly correlated (Baker et al, 2003). Also, the paper by Baker et al (2003) further adds that the constrained firms have a higher investment price sensitivity of up to three times than unconstrained firms. In addition, as Foucault and Gehrig (2008) suggested, value maximizing managers use every relevant information to forecast the cash flows of their investment project when they make capital allocation for various projects. This phenomenon is well explained by Edmans et al (2017) where they not only show that countries which enforce stringent regulations regarding insider trading not only increases the influence of outsiders in the price informativeness of stocks, they also show

that the investment price sensitivity of stocks increase. This effect is more pronounced particularly in industries where the learning is large. Also, this effect is even more in emerging countries where the impact of outsiders is the most post-enforcement.

When the price informativeness of constrained firms improve because of the policy announcements they are likely to provide more information to the manager of the constrained firms to make investment decisions. Chen et al (2006) also show that price non-synchronicity is positively correlated to the investment-price sensitivity which thereby proves their hypothesis that stock prices with large amount of price information in turn affects a manager's investment decisions. All these theories lend credence to the formulation of our final hypothesis which is that (H4): ***Policy announcements have had more a positive impact on the investment-price sensitivity of the constrained firms in comparison to the unconstrained firms.***

3. DATA

We collect all the data from CRSP/Compustat merged database. We exclude financial firms (SIC 6000-6999) and utilities (SIC 4900) from our analysis. We exclude firm-year observations which have a book value of equity of less than 10 million and have less than 30 days of trading in a year.

We measure the financial constraint of a firm with the help of AS index (size – age index) developed by Hadlock and Pierce (2010). In their paper they show that size and age are useful predictors of the amount of financial constraint and hence their measure is solely based on these two characteristics of the firm. As a robustness check of financial constraint, we also use the index suggested by Whited and Wu (2006) in their paper. The formulas and definitions of these variables have been explained in detail in our Appendix 2. All the ratios collected for our sample are winsorized by each event to ensure that they lie between the 1st and 99th percentile and essentially avoid the problem of outliers. The reason why we choose the Whited and Wu index as a robustness check is that they show that their index is a better indicator of a firm's financial constraints than the KZ index. Also, they further explain that the Tobin's Q, which is one of the variables used in KZ index contains a lot of measurement error as shown by Erickson and Whited (2000) and hence could affect the effectiveness of the index (Whited and Wu, 2006).

To calculate the age-size index Hadlock and Pierce (2010) define age to be the number of years they are listed in Compustat. Size is defined to be logarithmic value of firm size. To avoid the problem of outliers if the firm size is bigger than 4.5 billion the values are winsorized to take a value of 4.5 billion. If the firms are older than 37 years the values are winsorized to take a value of 37 years. Therefore, the age size index is calculated as $(-0.737* \text{Size}) + (0.043* \text{Size}^2) - (0.040*\text{Age})$. To calculate the Whited and Wu index, Whited and Wu (2006) show that cash flow, if the firm distributed dividends or not, leverage, firm size, industrial sales growth and sales growth of the firm are useful predictors of the financial constraint levels of a firm. When represented mathematically we have the following equation to calculate the whited and wu index:

$$Whited\ and\ Wu\ index_{i,t} = -0.091 * CF_{i,t} + 0.062 * DIVPOS_{i,t} + 0.21 * Leverage_{i,t} - 0.44 * size_{i,t} + 0.102 * isg_{i,t} - 0.35 * sg_{i,t} - (1)$$

Where CF is the cashflow, divpos is if the firm disbursed dividends, leverage is the long-term leverage, size is the logarithmic value of the firm value, isg is the industrial sales growth and sg is the sales growth at a firm level.

With respect to our first hypothesis, we analyze the impact of financial crisis on the constrained firms at a stock price channel. We analyze this impact by observing the impact of financial crisis on price informativeness, adjusted volume and amihud illiquidity measures. We compute the price non-synchronicity by regressing the daily stock returns of a firm against the returns of its corresponding sector (measured by its 3-digit SIC code) and the market returns on a semester basis. We collect the stock prices, number of shares outstanding, stock returns, the market returns, the SIC code from CRSP between 2007 and 2009. From this we calculate the corresponding industrial returns based on a firm's 3-digit SIC code. We regress the stock returns on the returns of the market and returns of the sector across the period on a semester basis. The price non-synchronicity is calculated on a semester basis by regressing the returns of the stock i on the returns of the sector j and the returns of the market m for each year. When we represent the above process in the form of a mathematical equation we have:

$$R_{i,j,t} = \alpha + \beta_{m,t} * (R_{m,t}) + \beta_{j,t} * (R_{j,t}) + \varepsilon_{i,j,t} - (2)$$

where $R_{i,j,t}$ is the return of a stock i in the sector j in a particular time t, $R_{m,t}$ is the return of the market m in a given time t and $R_{j,t}$ is the return of the 3-digit sectoral returns of the sector j in the time t. From the R^2 we obtain from the regression, we calculate the price non-synchronicity as $\ln((1-R^2)/R^2)$.

Adjusted volume is calculated as the ratio of daily volume to that of the total number of outstanding shares. Amihud illiquidity is calculated as the ratio of absolute value of returns to that of dollar volume of trades (Amihud, 2002). Therefore, the amihud illiquidity for a stock i on a day d is calculated as:

$$Illiquidity_{i,d} = {R_{i,d}}/{VOLD_{i,d}} - (3)$$

Where R_{id} is the return of stock i on day d and VOLD is the daily volume of the dollars.

Also, the adjusted volume of a stock i on day d is calculated as:

$$Adjusted\ volume_{i,d} = {Volume_{i,d}}/{Number\ of\ outstanding\ shares_{i,d}} - (4)$$

We analyze the impact when the timeframe of the sample is a 12-month and 24-month sample centered on the crisis. We choose 09-08-2007 as the day the financial analysis was first announced in the financial press as the day that economy could be heading for a period of crisis. Therefore our 24-month

and 12-month sample is 12 months and 6 months respectively centered on the crisis and we use a differences-in difference methodology to analyze the impact.

[Insert Table 1]

Table 1 refers to the summary statistics of firms in the 12-month and 24-month sample in the period centered on the financial crisis. We find that an average firm has a mean price non-synchronicity score of 1.73 with a standard deviation of 1.8. The firms in our sample have a mean amihud illiquidity of 0.22 with a standard deviation of 1.09. Also, the firms have a mean adjusted volume of 0.01 with a standard deviation of 0.011. These statistics are observed in the 24-month sample. In our 12-month sample, we observe that the firms have a mean price non-synchronicity of 1.61 with a standard deviation of 1.69. We also observe that they have a mean amihud illiquidity of 0.18 with a standard deviation of 0.76 and a mean adjusted volume of 0.01 with a standard deviation of 0.011.

[Insert Table 2]

In our table 2 we do a difference in means between the constrained firms and unconstrained firms in both the samples (12-month and 24-month sample) to observe the differences in statistics between them. We observe that constrained firms have a significantly higher price informativeness than unconstrained firms in both the samples. This is observed at both the tercile and the quartile levels. Constrained firms in the subsamples have a significantly higher amihud illiquidity than the unconstrained firms for both the samples at a quartile and tercile levels. We also observe that the unconstrained firms have a significantly higher abnormal volume than constrained firms in both the samples at the tercile and quartile levels.

For our first hypothesis, based on the values of the AS index (Hadlock and Pierce, 2010), we define a dummy variable “treated” which takes a value equal to one if the firm is constrained and zero if the firm is not financially constrained. If a firm lies in the first tercile or quartile of AS index it is financially unconstrained and if the firm lies in the last tercile or quartile of AS index is not financially constrained based on the values of the index in 2007. We exclude firms that belong to the middle tercile or quartile from our sample. We also define a dummy variable “post” which takes a value equal to zero if the observations are before 09-08-2007 and takes a value equal to one if the date is after that. For our first hypothesis, the interaction term between treated and post is the variable of interest. The dependent variable is price non-synchronicity, adjusted volume or amihud illiquidity. As a robustness check we also use the value of Whited and Wu index. The firms are defined to be constrained if it lies in the first tercile or quartile of Whited and Wu index and if the firm lies in the last tercile or quartile of Whited and Wu index is not financially constrained based on the values of the index in 2006.

Based on the above statistics, we analyze the impact of financial crisis on financially constrained firms with a differences-in difference framework. We use a firm fixed effects and year semester fixed

effects for our analysis. We also analyze the general impact of financial crisis at a firm level with firm fixed effects. The following are the models we use for our analysis.

$$(Price\ Non-Synchronicity\ or\ Amihud\ Illiquidity\ or\ Adjusted\ volume)_{i,t} = \alpha + \beta_1 * (Firm\ fixed\ effects)_i + \beta_2 * (Year\ semester\ fixed\ effects)_t + \beta_3 * (Treatedxpost)_{i,t} + \varepsilon - (5)$$

$$Price\ Non-Synchronicity\ or\ Amihud\ Illiquidity\ or\ Adjusted\ volume_{i,t} = \alpha + \beta_1 * (Post)_t + \beta_2 * (Firm\ fixed\ \ effects)_i + \varepsilon - (6)$$

In order to analyze the impact of market reaction on the financial constraint of firms we obtain our share prices in order to calculate the cumulative abnormal returns from CRSP. The most commonly used methods of estimating abnormal returns tries to disentangle the abnormal returns of a firm i in response to the event alone from the reaction of other events announced by firm i in the estimation window. Therefore, the short-term announcement returns of an event i in response to a policy announcement by Federal Reserve are estimated using market adjusted return models are estimated as in equation 7[4]:

$$AR_{i,t} = R_{i,t} - R_{m,t} - (7)$$

Where $AR_{i,t}$ is the abnormal returns for a firm i on event t, $R_{i,t}$ is the returns of a firm i at a time t and $R_{m,t}$ is the returns of the market at a time t. The cumulative abnormal returns for a firm i is the sum of abnormal returns over a 3-day interval (t - 1 to t + 1) around the policy announcement event (t=0) as shown in equation 8:

$$CAR_{i,t} = \sum_{t-1}^{t+1} AR_{i,t} - (8)$$

We also obtain the fundamental data for these firms from CRSP/Compustat merged database. We exclude financial firms (SIC 6000-6999) and utilities (SIC 4900) from our analysis. We have a total of 20455 firm-event observations for the 8 events between 2008 and 2012. We also have total of 2934 firm-event observations for the first event alone.

[Insert Table 3]

Panel A of Table 3 represents the summary statistics of the fundamental data of firms across the 8 events between 2008 and 2012. We observe that the CAR of the firms in the sample is 0.07 %. The firms in our sample have a mean leverage of 16.49% with a standard deviation of 18.92%. We also find that the firms in the sample have a mean Tobin's Q ratio of 1.81 (the sample from Foley-Fischer et al (2016) report a mean Tobin's Q ratio of 1.7). The mean capital intensity of the firms in the sample is 4.54% (the sample from Foley-Fischer et al (2016) report a mean capital intensity of 6%). Firms in our sample have a mean capital expenditure expense of 4.68%. We also observe a cash flow of 5.47%. The Panel B represents the summary statistics of the fundamental data of firms for the first event alone. We

[4]Our choice of methodology to determine the cumulative abnormal returns in this case is not an issue. As shown by Brown and Warner (1980) a methodology as simple as market model performs well under a wide variety of conditions.

observe that the CAR of the sample for the first event is 1.41% which is significantly higher than the mean CAR of all the 8 events. Firms in our sample have a mean Tobin's Q ratio of 2.18. We also observe that the firms have a mean leverage of 17.79% with a standard deviation of 20.19%. The mean capital intensity of the firms in the sample is 4.94%. Firms in our sample have a mean capital expenditure of 5.93% with a standard deviation of 7.46%. We also observe a cash flow of 1.28% for the firms in the sample.

[Insert Table 4]

Table 4 compares the summary statistics of constrained firms versus unconstrained firms in the period during the unconventional monetary policies. In the panel A, the firm's constraint levels in are measured by their position in the tercile of AS index. In the panel B, the firm's constraint levels are measured by quartile of AS index. Unlike the tests for our previous hypothesis, we consider firms to constrained if they belong to the last quartile or tercile of AS index and the rest of them are defined to be unconstrained. Panel A and Panel B is for the sample between 2008 and 2012 comprising of all 8 events. In the panel C, the firm's constraint levels in are measured by their position in the tercile of AS index. In the panel D, the firm's constraint levels are measured by quartile of AS index. Panel C and Panel D is for the sample for the first event alone.

We generally observe that the stock prices of constrained firms reacted significantly to the policy announcements more than the stocks of unconstrained firms. We observe this for all the panels. We also observe that the constrained firms have significantly higher Tobin's Q ratio than the unconstrained firms for all the panels. However, we observe that the unconstrained firms have significantly higher capital expenditure, cash flow and leverage than constrained firms in all the panels.

With the respect to our second hypothesis where we analyze whether the markets reacted positively with an expectation that the announcements of the Federal Reserve will ease the financial constraints of firms, we use a linear regression (OLS) for our analysis. The dependent variable is the 3-day cumulative abnormal returns and the variable of interest is the constraint measures (measured by AS index or the Whited and Wu index). We define a first to be financially constrained if the firms lie in the last tercile of AS index based on the value they carry in 2007 and rest of the firms are part of the control group. As a robustness check, we define the firm to be constrained based on the value of Whited and Wu index they carry in 2006 in the same spirit as we do for AS index. We control for cash flow, capital expenditure, Tobin's Q ratio, leverage and capital intensity. The control variables we use are the same control variables used by Foley-Fischer et al (2016). In addition, we control for industrial fixed effects and event fixed effects. We also use a cluster standard error of the events in our analysis. The linear regression model in which we analyze the impact of the announcements on the stock prices of the financially constrained firms is as follows:

$$CAR\_beta_{i,j,t} = \alpha + \beta_1 * (Industrial\ fixed\ effects)_j + \beta_2 * (event\ fixed\ effects)_t + \beta_3 * (Constraint\ measures)_{i,t} + \beta_4 * (capex)_{i,t} + \beta_5 * (MTB)_{i,t} + \beta_6 * (leverage)_{i,t} + \beta_7 * (CF)_{i,t} + \beta_8 * (capital\ intensity)_{i,t} + \varepsilon - (9)$$

We then move onto our next hypothesis, where we analyze if the Federal Reserve helped ease the financial constraints of firms. We use a similar methodology as the one we used for the first hypothesis. We use a 24-month and 12-month sample centered on the first fed intervention (which was 25-11-2008). We calculate price informativeness with the price non-synchronicity where we regress the stock returns are regressed against the market returns and the sectoral returns on a semester basis and use the R^2 to calculate the price non-synchronicity with a logarithmic format ($\ln((1-R^2)/R^2)$). We also calculate adjusted volume and amihud illiquidity similar to what we did for the first hypothesis. We also calculate the financial constraint with the AS index and we define the firm to be constrained if they lie in the last tercile or quartile of AS index based on the values they take in 2007 and they are defined to be unconstrained if they lie in the first tercile or quartile of AS index based on the values they taken in 2007. As a robustness check, we use the Whited and Wu index and define the dummy variables just like how we do for AS index based on the values of Whited and Wu index the firms score in 2006. The post variable is defined to be a dummy variable which takes a value of one if the observations are after 25-11-2008 and zero otherwise.

[Insert Table 5]

Table 5 refers to the summary statistics of firms in the 12-month and 24-month sample in the period centered on the first Fed intervention. We find that an average firm has a mean price non-synchronicity score of 1.05 with a standard deviation of 1.73. The firms in our sample have a mean amihud illiquidity of 0.4 with a standard deviation of 1.74. Also, the firms have a mean adjusted volume of 0.01 with a standard deviation of 0.0124. These statistics are observed in the 24-month sample. In our 12-month sample, we observe that the firms have a mean price non-synchronicity of 0.76 with a standard deviation of 1.74. We also observe that they have a mean amihud illiquidity of 0.65 with a standard deviation of 2.73 and a mean adjusted volume of 0.01 with a standard deviation of 0.0126.

[Insert Table 6]

In our table 6 we do a differences-in means test between the constrained firms and unconstrained firms in both the samples (12-month and 24-month sample). We observe that constrained firms have a significantly higher price informativeness than unconstrained firms in both the samples. This is observed at both the tercile and the quartile levels. Constrained firms in the subsamples have a significantly higher amihud illiquidity than the unconstrained firms for both the samples at quartile and tercile levels. We also observe that the unconstrained firms have a significantly higher abnormal volume than constrained firms in both the samples at the tercile and quartile levels.

Based on the above statistics, we analyze the impact of unconventional monetary policy on financially constrained firms with a differences-in difference framework. We use a firm fixed effects and year semester fixed effects for our analysis. The dependent variable is price non-synchronicity, adjusted volume or amihud illiquidity. We defined the variable treated if a firm lies in the first tercile or quartile of AS index it is financially unconstrained and if the firm lies in the last tercile or quartile of AS index is not financially constrained based on the values of the index in 2007. We exclude firms that belong to the middle tercile or quartile from our sample. We also define a dummy variable "post" which takes a value equal to zero if the observations are before 25-11-2008 and takes a value equal to one if the date is after that. For our third hypothesis, the interaction term between treated and post is the variable of interest. As a robustness check we also use the value of Whited and Wu index. The firms are defined to be constrained if it lies in the first tercile or quartile of Whited and Wu index and if the firm lies in the last tercile or quartile of Whited and Wu index is not financially constrained based on the values of the index in 2006.

We also analyze the general impact of policy intervention at a firm level with firm fixed effects. The following are the models we use for our analysis.

$$(Price\ Non-Synchronicity\ or\ Amihud\ Illiquidity\ or\ Adjusted\ volume)_{i,t} = \alpha + \beta_1 * (Firm\ fixed\ effects)_i + \beta_2 * (Year\ semester\ fixed\ effects)_t + \beta_3 * (Treatedxpost)_{i,t} + \varepsilon - (10)$$

$$(Price\ Non-Synchronicity\ or\ Amihud\ Illiquidity\ or\ Adjusted\ volume)_{i,t} = \alpha + \beta_1 * (Post)_t + \beta_2 * (Firm\ fixed\ \ effects)_t + \varepsilon - (11)$$

We finally move on to our final hypothesis, where we analyze the impact of policy announcements on the investment-price sensitivity. We collect the financials of firms from CRSP/Compustat merged database for the period between 2006 and 2011.

[Insert Table 7, Table 8]

Table 7 displays the summary statistics of firms between 2006 and 2011. We have a total of 12564 firm-year observations in this period. We find that the firms in the sample have a capital expenditure of 5.99% with a standard deviation of 7.04%. We also find that that they have a capital expenditure plus research and development expenses of 10.17% with a standard deviation of 10.43%. Firms in the sample have a cash ratio of 15.34% and leverage of 16.47%. The mean Tobin's Q ratio of the firms in the sample is 1.8. The firms in the sample also have a cash flow of 8.09%. Also, the firms have disbursed dividends of 1.37% relative to that of the total assets.

Table 8 displays the difference in means between the constrained firms and unconstrained firms. Panel A looks at the difference in means between constrained and unconstrained firms at a tercile level of AS index. Panel B looks at the difference in means between constrained and unconstrained firms at a quartile level of AS index. We find across both the panels that constrained firms have a significantly

higher capital expenditure plus research and development expenses than the unconstrained firms. Unconstrained firms have a much higher cash holding than the constrained firms. Unconstrained firms also have a significantly higher leverage ratio in comparison to constrained firms. Constrained firms have a much higher Tobin's Q ratio than the unconstrained firms. Unconstrained firms paid out more dividends than the constrained firms and also have a higher cash flow ratio.

For our final hypothesis we analyze the impact of policy announcements on investment-price sensitivity with a differences-in difference model. The dependent variable is the investment (measured by either capital expenditure or capital expenditure plus research and development expenses) and the variable of interest is the interaction term between market-to book ratios, treated and post variable. We have analyzed the regressions in a set up with no fixed effects, and later on we did the analysis in a set up with annual fixed effects and eventually we control for both industrial fixed effects and annual fixed effects. Control variables are chosen in order to control for variables which could impact the investment of a firm. Relationship between cash flow and investment is well documented and hence we control for cash flow in our model. We include leverage in our model in order to control for the impact of leverage on corporate investment. We also include cash and dividend in our model to control for their impact on investment. The differences-in difference model in which we analyze the impact of the announcements on investment-price sensitivity of the financially constrained firms is as follows:

$$CAPEX_{i,t} = \alpha + \beta_1 * \left(MTB_{i,t-1} x treated_i x Fed_t\right) + \beta_2 * \left(MTB_{i,t-1} x treated_i\right) + \beta_3 * \left(MTB_{i,t-1} x Fed_t\right) + \beta_4 * \left(Treated x Fed_{i,t}\right) + \beta_5 * \left(MTB_{i,t-1}\right) + \beta_6 * \left(leverage_{i,t}\right) + \beta_7 * \left(Cash_{i,t}\right) + \beta_8 * \left(Dividend_{i,t}\right) + \beta_9 * (CF)_{i,t} + \beta_{10} * (Annual\ fixed\ effects)_t + \beta_{11} * (Firm\ fixed\ effects)_t + \varepsilon - (12)$$

$$CAPEXRD_{i,t} = \alpha + \beta_1 * \left(MTB_{i,t-1} x treated_i x Fed_t\right) + \beta_2 * \left(MTB_{i,t-1} x treated_i\right) + \beta_3 * \left(MTB_{i,t-1} x Fed_t\right) + \beta_4 * \left(Treated x Fed_{i,t}\right) + \beta_5 * \left(MTB_{i,t-1}\right) + \beta_6 * \left(leverage_{i,t}\right) + \beta_7 * \left(Cash_{i,t}\right) + \beta_8 * \left(Dividend_{i,t}\right) + \beta_9 * (CF)_{i,t} + \beta_{10} * (Annual\ fixed\ effects)_t + \beta_{11} * (Firm\ fixed\ effects)_t + \varepsilon - (13)$$

4. RESULTS

We discuss the results in details for the analysis of all our three hypotheses in this section:

Table 9 and 10 display the impact of financial crisis on the financially constrained firms. Table 9 analyzes the impact of the crisis on constrained firms in a 12-month period centered on the financial crisis. Table 10 analyzes the same in a 24-month sample.

[Insert Table 9, Table 10]

We can observe that the price non-synchronicity of financially constrained firms has not been impacted negatively and significantly in the 12-month sample for both the quartile and tercile level.

However, we also observe that the price informativeness of constrained firms has been impacted significantly more than the unconstrained firms in the 24-month sample. This can be observed at both a quartile and tercile level. From column 1 of Table 10, we observe that the coefficient on the variable of interest (treated_asindex_t) is -0.128 at a 1% significance level. In terms of economic significance, we can infer that the constrained firms at a tercile level of AS index have been impacted negatively at a scale of 53.2 percentage points more than the unconstrained firms for price informativeness. We can also observe that the coefficient in column 2 of Table 10 for the variable of interest is -0.116 at a 5% significance level. Economically, this can be inferred that the constrained firms measured by quartile level of AS index have been impacted negatively by 52.9 percentage points in comparison to the unconstrained firms for price informativeness. We also observe that the financial crisis had affected the price informativeness at a firm level negatively and significantly. This can be observed for both the samples. Economically, we observe that an average firm has been negatively impacted significantly by 59 percentage points in a 24-month sample and 54.76 percentage points in a 12-month sample.

We also observe that the amihud illiquidity had increased significantly has been impacted significantly for financially constrained firms in comparison to constrained firms both a tercile and quartile level. This is observable at both the 24-month sample and 12-month sample. From the column 4 and column 5 of Table 10, we observe a coefficient of 0.406 and 0.502 for the variables of interest (tercile and quartile respectively) at a 1% significance level. In terms of economic significance, we can infer that the illiquidity of constrained firms increased significantly by 40.6 to 50.2 percentage points in comparison to unconstrained firms in the period following the crisis at the tercile and quartile levels of AS index respectively. From the column 4 and column 5 of Table 9, we observe a coefficient of 0.179 and 0.213 for the variables of interest (tercile and quartile respectively) at a 1% significance level. In terms of economic significance, we can infer that the illiquidity of constrained firms increased significantly by 17.9 to 21.3 percentage points in comparison to unconstrained firms in the period following the crisis at the tercile and quartile levels of AS index respectively. We also observe that the crisis had a negative impact on the liquidity significantly for firms in general at a 12-month and 24-month sample. Economically, we observe that the firms in general have a 9.52 to 19.7 percentage point increase in illiquidity at a 12-month and 24-month sample respectively.

We also observe that the adjusted volume had decreased significantly has been impacted significantly for financially constrained firms in comparison to constrained firms both a tercile and quartile level. This is observable at both the 24-month sample and 12-month sample. From the column 7 and column 8 of Table 10, we observe a coefficient of -0.00273 and -0.00331 for the variables of interest (tercile and quartile respectively). In terms of economic significance, we can infer that the adjusted volume of constrained firms decreased significantly by 0.273 to 0.331 percentage points in comparison to unconstrained firms in the period following the crisis at the tercile and quartile levels of AS index respectively at a 1% significance level. From the column 7 and column 8 of Table 10, we observe a

coefficient of -0.00142 and -0.00175 for the variables of interest (tercile and quartile respectively). In terms of economic significance, we can infer that the adjusted volume of constrained firms decreased significantly by 0.142 to 0.175 percentage points in comparison to unconstrained firms in the period following the crisis at the tercile and quartile levels of AS index respectively at a 1% significance level. We also observe that the crisis had a positive impact on the adjusted volume significantly for firms in general at a 12-month and 24-month sample. Economically, we observe that the firms in general have a 0.0086 to 0.095 percentage point increase for adjusted volume at a 12-month and 24-month sample respectively.

As a robustness check, we use Whited Wu index as a measure of financial constraint instead of AS index. We observe that the price informativeness of constrained firms decreased significantly in comparison to unconstrained firms. We observe that the price informativeness of constrained firms decreased significantly by 53.2 percentage points at a 12-month level in comparison to unconstrained firms at a 10% percent significance level. We also observe that illiquidity of constrained firms increased significantly by 46 to 61 percentage points in the 12-month sample and 21 to 27.1 percentage points in the 24-month sample in comparison to unconstrained firms at a 1% significance level. We also observe that the adjusted volume of constrained firms decreased significantly by 0.384 to 0.422 percentage points and 0.24 to 0.28 percentage points in the 24-month and 12-month sample respectively in comparison to unconstrained firms at a 1% significance level.

Overall, from all these results we can validate that our first hypothesis that the financial crisis has had a negative impact on financially constrained firms and firms in general. These results also show that the financial crisis had influenced the trading patterns of investors, traders and other financial markets elements which had a negative impact on firms in general and even more on constrained firms than unconstrained firms.

We then deal with the next hypothesis which deals with the studying of impact on the market reaction to the policy announcements by the Federal Reserve. Table 11 analyzes the impact of the policy announcements on market reaction with respect to constrained firms across the 8 events between 2008 and 2012 where the Federal Reserve announced policies which could ease the financial constraints of firms. Table 12 analyzes the same for the first event alone.

[Table 11, Table 12]

From the column 1 of Table 11, the coefficient on the firm's AS index is 0.00406 is significant at a 1% significance level. Economically, a one standard deviation increase in the AS index increases the cumulative abnormal returns by 0.25 (0.00406 * 0.62) percentage points. When we add control variables we observe that the coefficient of the AS index is 0.00432. These coefficients are significant at a 1% significance level. In terms of economic significance, a one standard deviation increase in the AS index leads to an increase of 0.27 (0.00432 * 0.62) percentage points in the cumulative abnormal returns of constrained firms in comparison to unconstrained firms. We also observe that the constrained firms

display an increase of 0.682 to 0.653 percentage points in cumulative abnormal returns in comparison to unconstrained firms at a tercile and quartile level of AS index respectively from the column 2 and column 3 of Table 11 at a 1% significance level. When we add control variables to above the setup, we observe a 0.691 to 0.666 percentage points increase in cumulative abnormal returns for constrained firms in comparison to unconstrained firms at a tercile and quartile level respectively of AS index from the column 5 and column 6 of Table 11 at a 1% significance level.

From the column 1 of Table 12, the coefficient on the firm's AS index is 0.0194 is significant at a 1% significance level. Economically, a one standard deviation increase in the AS index increases the cumulative abnormal returns by 1.27 (0.0194 * 0.656) percentage points for constrained firms in comparison to unconstrained firms. When we add control variables we observe that the coefficient of the AS index is 0.0216. These coefficients are significant at a 1% significance level. In terms of economic significance, a one standard deviation increase in the AS index leads to an increase of 1.42 (0.0216 * 0.656) percentage points in the cumulative abnormal returns of constrained firms in comparison to unconstrained firms. We also observe that the constrained firms display an increase of 3.05 to 3.86 percentage points in cumulative abnormal returns in comparison to unconstrained firms at a tercile and quartile level of AS index respectively from the column 2 and column 3 of Table 12. When we add control variables to above the setup, we observe a 3.26 to 4.32 percentage points increase in cumulative abnormal returns for constrained firms in comparison to unconstrained firms at a tercile and quartile level of AS index respectively from the column 5 and column 6 of Table 12.

As a robustness check, we use a Whited and Wu index as a proxy of financial constraint instead of AS index. We observe that the financial constrained firms display an increase of 1.42 percentage points for Whited Wu index in comparison to the unconstrained firms at a 1% significance level. We also observe an increase of 1.58 percentage points with control variables added to this setup at a 1% significance level. Constrained firms display an increase of 3.3 to 3.9 percentage points in comparison to unconstrained firms and an increase of 3.6 to 4.2 percentage points when control variables are added to these setups for the treated variables at a 1% significance level. All the results are for the sample where we analyze the impact of policy intervention on market reaction for first event alone. For the impact across the 8 events, we observe that the constrained firms display an increase of 0.35 percentage points for the whited and Wu index and 0.36 percentage points with control variables at a 1% significance level. Constrained firms display an increase of 0.85 to 0.95 percentage points in comparison to unconstrained firms and an increase of 0.88 to 0.98 percentage points when control variables are added to these setups for the treated variables at a 1% significance level.

These observations clearly indicate that the market views that the policy announcements could ease the financial constraints of the firms and these results are consistent with the findings of Foley-Fischer et al (2016). Therefore, we can validate the second hypothesis that the markets have reacted positively to the policy announcements of the Federal Reserve. When it comes to the control variables,

we observe that cash flow, leverage and capital expenditure have a negative significance. These results are consistent with the results of Foley-Fischer et al (2016).

Table 13 and 14 display the impact of policy announcements by Federal Reserve on the financially constrained firms. Table 13 analyzes the impact of the policy announcements on constrained firms in a 12-month period centered on the financial crisis. Table 14 analyzes the same in a 24-month sample.

[Insert Table 13, Table 14]

We can observe that the price non-synchronicity of financially constrained firms has not been impacted significantly in the 24-month sample for both the quartile and tercile level. However, we also observe that the price informativeness of constrained firms has been improved significantly more than the unconstrained firms in the 12-month sample. This can be observed at both a quartile and tercile level. From column 1 of Table 13, we observe that the coefficient on the variable of interest (treated_asindex_t) is 0.142 at a 10% significance level. In terms of economic significance, we can infer that the policy announcements have improved the price informativeness of constrained firms at a tercile level of AS index by 46.45 percentage points more than the unconstrained firms. We can also observe that the coefficient in column 2 of Table 12 for the variable of interest is 0.158 at a 10% significance level. Economically, this can be inferred that the constrained firms measured by quartile level of AS index have been impacted positively by 46.06 percentage points in comparison to the unconstrained firms by the policy announcements. We also observe that the policy announcements failed to improve the price informativeness at a 12- month sample at a general firm level. However, over time we observe a trend reversal when the policy announcements did improve the price informativeness in the 24-month sample at a general firm level. Economically, we observe that an average firm has been negatively impacted significantly by 52.29 percentage points in the 12-month sample and positively impacted significantly by 49.18 percentage points in the 24-month sample at a 1% significance level.

We also observe that the amihud illiquidity had increased significantly for financially constrained firms in comparison to unconstrained firms both a tercile and quartile level for a 12-month sample and 24-month sample. From the column 4 and column 5 of Table 14, we observe a coefficient of 0.359 and 0.509 for the variables of interest (tercile and quartile respectively) at a 1% significance level. In terms of economic significance, we can infer that the illiquidity of constrained firms increased significantly by 35.9 to 50.9 percentage points in comparison to unconstrained firms despite the policy intervention at the tercile and quartile levels of AS index respectively. From the column 4 and column 5 of Table 13, we observe a coefficient of 0.727 and 0.925 for the variables of interest (tercile and quartile respectively) at a 1% significance level. In terms of economic significance, we can infer that the illiquidity of constrained firms increased significantly by 72.7 to 92.5 percentage points in comparison to unconstrained firms in the period following the crisis at the tercile and quartile levels of AS index respectively. We also observe that the policy announcement could still not alleviate liquidity problems significantly for firms in general at a

12-month or at a 24-month sample. Economically, we observe that the firms in general have a 45.5 to 27 percentage point increase in illiquidity at a 12-month and 24-month sample respectively.

We also observe that the adjusted volume had decreased significantly for financially constrained firms in comparison to unconstrained firms both a tercile and quartile level for the 12-month sample but not the 24-month sample. From the column 7 and column 8 of Table 13, we observe a coefficient of -0.000695 and -0.000649 for the variables of interest (tercile and quartile respectively) at a 1% significance level. In terms of economic significance, we can infer that the adjusted volume of constrained firms decreased significantly by approximately 0.07 percentage points in comparison to unconstrained firms in the period following the crisis at the tercile and quartile levels of AS index. We also observe that the policy announcements could not alleviate the adjusted volume significantly for firms in general at a 12-month and 24-month sample. Economically, we observe that the firms in general have a 0.066 to 0.102 percentage point decrease for adjusted volume at a 12-month and 24-month sample respectively.

As a robustness check, we use Whited Wu index as a measure of financial constraint instead of AS index. We observe that the price informativeness of constrained firms increased significantly by 48.35 percentage points at a 24-month level in comparison to unconstrained firms at a 10% significance level. We also observe that illiquidity of constrained firms increased significantly by 98.2 to 128.8 percentage points in the 12-month sample and 61.2 to 80.3 percentage points in the 24-month sample in comparison to unconstrained firms. We also observe that the adjusted volume of constrained firms decreased significantly by 0.062 to 0.053 percentage points and 0.067 to 0.082 percentage points in the 24-month and 12-month sample respectively in comparison to unconstrained firms.

Overall, we can validate the third hypothesis partially. While the adjusted volume and amihud illiquidity of constrained firms hasn't improved significantly, the price informativeness of the constrained firms increased significantly. This shows that the policy announcements of the Federal Reserve have helped ease the financial constraints of the firms to a certain extent in the post crisis period with respect to price informativeness.

Table 15 and 16 display the impact of policy announcements by Federal Reserve on the investment price sensitivity of financially constrained firms for the period between 2006 and 2011. We measure investment for capital expenditure in Table 15 and capital expenditure plus research and development expenses in the Table 16.

[Insert Table 15, Table 16]

We observe that the policy announcements have not made a significant impact on investment-price sensitivity of financially constrained firms. This is consistent for both the case when investment is measured by capital expenditure or capital expenditure plus research and development expenses. We also observe that the investment-price sensitivity is not impacted positively by the policy announcements when the financial constraint is measured at a tercile level or at a quartile level.

5. CONCLUSION

As we saw that there is a growing literature that study the impact of unconventional monetary policies announced by the Federal Reserve in 2008. They show that that there was a huge leap in investor sentiment following the announcements (Lutz, 2015). These policy announcements had alleviated the financial constraints of firms (Foley-Fischer et al, 2016). They were also able to show that the firms have expanded their investment, employment and took on more debt following the financial crisis. We are adding something new to the literature by examining the impact of policy announcements through the stock price channel. The stock price channel is important because of its direct correlation to corporate investment. The corporate investment has a real impact on the economy. We examine the impact of the policy announcements on investment-price sensitivity and price informativeness.

We initially were able to show how the financial crisis had impacted the financially constrained firms in the stock price channel. The price informativeness of constrained firms was negatively impacted by the financial crisis in comparison to unconstrained firms. In economic terms, they had a decrease in price informativeness by around 53 percentage points in comparison to the control group. We were also able to observe that the adjusted volume of the constrained firms was negatively impacted by the crisis. Also, the illiquidity of these firms increased significantly in the period following the crisis. The liquidity, price informativeness and adjusted volume of an average firm had decreased significantly in the period following crisis.

Through our studies we were also able to show that the stocks of financially constrained firms reacted positively to the policy announcements. We find that the cumulative abnormal returns of constrained firms increased by 0.25 to 0.27 percentage points with a one standard deviation increase in a firm's constraint measures across the 8 events. We also find that the cumulative abnormal returns of the constrained firms increased significantly by 1.5 to 2 percentage points with one standard deviation increase in firm's financial constraints in comparison to the unconstrained firms for the first event alone.

We were also able to show that the price informativeness of the constrained firms improved significantly in comparison to the unconstrained firms in the period following the policy announcement. Price informativeness of constrained firms increased by around 46.45 percentage points in comparison to unconstrained firms because of the policy announcements. Price informativeness at a general firm level was observed to increase significantly in the long run. We were however unable to see an improvement in the stock liquidity and adjusted volume in the period following the announcements. We were also unable to see an improvement in investment-price sensitivity of constrained firms despite the policy announcements by the Federal Reserve.

We believe we are the first paper to analyze the impact of unconventional monetary policies on the easing of financial constraints from a stock price channel. The above contributions are significant from

the perspective of the corporate sector. We believe that we also understood the reactions of the managers of these financially constrained firms to the policy announced. We also believe that our studies could help the central banks of various countries in understanding how they can tackle a potential global/local crisis in future. Overall, we were able to gain a better understanding of the unconventional monetary policies and the impact they have on financial markets from our paper.

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Table 1: Table 1 represents the summary statistics of the firms during the financial crisis. Panel A represents the summary statistics of firms for a 12-month sample centered on the financial crisis. Panel B represents the summary statistics of the firms for a 24-month sample centered on the financial crisis. 09-08-2007 is the day the news arrived from the financial markets that a financial crisis is imminent. We drop financial firms and utility firms from our sample. We also drop firms which have a market value of equity less than 10 million from our sample. The firm's *Nonprice* is the price non-synchronicity of the firm which is calculated by regressing the return of the stock on the return of the market and return of the sector (defined by 3-digit SIC code) on a semester basis. *Illiquidity* is the daily ratio of the absolute returns of a stock divided by dollar trading volume of the stock. *Adjusted volume* is the daily ratio of volume of a stock divided by the total number of outstanding shares.

Panel A: Summary statistics of the firms when the sample is 12 months centered on the financial crisis.

Stats	Mean	Sd	p5	p25	p50	p75	p95	N
Nonprice	1.61	1.69	-0.80	0.49	1.36	2.65	4.66	6942
Illiquidity	0.18	0.76	0.00	0.00	0.00	0.04	0.82	931996
Adjusted volume	0.01	0.01	0.00	0.00	0.01	0.01	0.03	931996

Panel B: Summary statistics of the firms when the sample is 24 months centered on the financial crisis.

Stats	Mean	Sd	p5	p25	p50	p75	p95	N
Nonprice	1.73	1.80	-0.85	0.53	1.46	2.84	4.94	13884
Illiquidity	0.22	1.09	0.00	0.00	0.00	0.04	0.89	1715476
Adjusted volume	0.01	0.01	0.00	0.00	0.01	0.01	0.03	1715476

Table 2: Table 2 represents the difference in means between the constrained firms and unconstrained firms for the periods where we have samples of 12 and 24-month sample centered on the financial crisis. We measure the constraint of the firm with the AS index and the value that the firms score in 2007. Firms which lie in the first tercile / quartile are defined to be unconstrained and firms which lie in the last tercile/quartile are defined to be unconstrained. Time frame of the samples are between 2006 and 2008. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

Panel A: Difference in means between constrained and unconstrained firms when the constraint measure is measured by the tercile levels of AS index and the sample is 12 months centered on the financial crisis.

Stats	*Mean*	*N*	*Constrained*	*Unconstrained*	*Difference*	*p-value*	*t-stat*
Nonprice	1.74	10516	2.62	0.61	-2.01***	-70.77	0.00
Illiquidity	0.23	648773	0.38	0.05	-0.33***	-160.00	0.00
Adjusted volume	0.009	648773	0.007	0.011	0.004***	130.860	0.000

Panel B: Difference in means between constrained and unconstrained firms when the constraint measure is measured by the quartile levels of AS index and the sample is 12 months centered on the financial crisis.

Stats	*Mean*	*N*	*Constrained*	*Unconstrained*	*Difference*	*p-value*	*t-stat*
Nonprice	1.81	7931	2.82	0.49	-2.33***	-72.35	0.00
Illiquidity	0.28	488243	0.46	0.05	-0.41***	-150.00	0.00
Adjusted volume	0.008	488243	0.007	0.011	0.004***	133.500	0.000

Panel C: Difference in means between constrained and unconstrained firms when the constraint measure is measured by the tercile levels of AS index and the sample is 24 months centered on the financial crisis.

Stats	*Mean*	*N*	*Constrained*	*Unconstrained*	*Difference*	*p-value*	*t-stat*
nonprice	1.72	19102	2.68	0.65	-2.03***	-94.92	0.00
Illiquidity	0.29	1177961	0.49	0.06	-0.43***	-190.00	0.00
Adjusted volume	0.009	1177961	0.007	0.011	0.004***	198.551	0.000

Panel D: Difference in means between constrained and unconstrained firms when the constraint measure is measured by the quartile levels of AS index and the sample is 24 months centered on the financial crisis.

Stats	*Mean*	*N*	*Constrained*	*Unconstrained*	*Difference*	*p-value*	*t-stat*
Nonprice	1.78	14286	2.89	0.53	-2.37***	-97.45	0.00
Illiquidity	0.34	879025	0.59	0.06	-0.53***	-190.00	0.00
adjusted volume	0.008	879025	0.006	0.011	0.004***	197.750	0.000

Table 3: Table 3 represent the summary statistics of firms for the event study to observe the impact of the Fed intervention on market reaction, volume and liquidity of constrained firms. We drop financial firms and utility firms from our sample. We also drop firms which have a market value of equity less than 10 million from our sample. *CAR_beta*is the cumulative abnormal return of the stock calculated by subtracting return of stock from return of the index over a 3-day interval (-1, 1) around the event which is the Fed intervention. *Capex* is the capital expenditure of the firm deflated by lagged total assets. *MTB* is the value of Tobin's Q is the market value of equity plus total assets minus shareholder's equity divided by total assets. *Leverage* is the long-term debt of a firm divided by lagged total assets. *CF* is the ratio of income before extraordinary items plus depreciation and amortization expenses deflated by lagged total assets. *Capital intensity* is the ratio of depreciation and amortization expenses divided by lagged total assets. The events are described in detail in Appendix A. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

Panel A: Summary statistics for the first event alone.

Variable	*N*	*Mean*	*Sd*	*p25*	*p50*	*p75*
CAR_beta	2934	1.41%***	9.65%	-3.59%	0.98%	5.35%
Capex	2934	5.93%***	7.46%	1.80%	3.53%	7.13%
MTB	2934	2.18****	1.52	1.26	1.70	2.53
Leverage	2934	17.8%***	20.19%	0.02%	11.85%	29.05%
CF	2934	1.28%***	22.50%	-4.31%	7.48%	13.18%
Capital intensity	2934	4.94%****	5.40%	2.48%	3.88%	5.90%

Panel B: Summary statistics for all the 8 events combined.

Variable	*N*	*Mean*	*Sd*	*p25*	*p50*	*p75*
CAR_beta	20455	0.073%***	5.50%	-2.36%	-0.05%	2.29%
Capex	20455	4.68%***	5.58%	1.42%	2.89%	5.71%
MTB	20455	1.8***	1.24	1.09	1.42	2.04
Leverage	20455	16.49%***	18.92%	0.00%	11.42%	26.31%
CF	20455	5.47%***	19.76%	3.11%	8.68%	14.00%
Capital intensity	20455	4.54%***	4.43%	2.38%	3.66%	5.55%

Table 4: Table 4 represents the difference in means between the constrained firms and unconstrained firms for the periods for the variables with which we test if constrained firms reacted better to the policy announcements in comparison to unconstrained firms. We measure the constraint of the firm with the AS index and the value that the firms score in 2007. Firms which lie in the last tercile/quartile are defined to be constrained and rest of the firms are defined to be unconstrained. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

Panel A: Differences in means of summary statistics of firms based on the classification by tercile of AS index values they take for first event alone.

Stats	*N*	*Mean*	*Constrained*	*Unconstrained*	*Difference*	*p-value*	*t-stat*
CAR_beta	2934	1.41%	3.66%	0.43%	-3.23%***	-8.43	0.00
Capex	2934	5.93%	5.35%	6.19%	0.85%***	2.84	0.00
MTB	2934	2.178	2.643	1.975	-0.667***	-11.213	0.00
Leverage	2934	17.80%	11.16%	20.70%	9.62%***	12.16	0.00
CF	2934	1.28%	-10.86%	6.60%	17.45%***	20.76	0.00
Capital intensity	2934	4.94%	5.26%	4.80%	-0.46%**	-2.13	0.033

Panel B: Differences in means of summary statistics of firms based on the classification by quartile of AS index values they take for the first event alone.

Stats	*N*	*Mean*	*Constrained*	*Unconstrained*	*Difference*	*p-value*	*t-stat*
CAR_beta	2934	1.41%	4.55%	0.50%	-4.05%***	-9.65	0.00
Capex	2934	5.93%	4.91%	6.23%	1.32%***	4.02	0.00
MTB	2934	2.178	2.778	2.004	-0.774***	-11.838	0.00
Leverage	2934	17.80%	9.25%	20.28%	11.03%***	12.7	0.00
CF	2934	1.28%	-14.79%	5.95%	20.74%***	22.59	0.00
Capital intensity	2934	4.94%	5.13%	4.88%	-0.25%	-1.03	0.30

Panel C: Differences in means of summary statistics of firms based on the classification by tercile of AS index values they take for all the 8 events combined.

Stats	*N*	*Mean*	*Constrained*	*Unconstrained*	*Difference*	*p-value*	*t-stat*
CAR_beta	20455	0.08%	0.64%	-0.15%	-0.79%***	-9.40	0.00
Capex	20455	4.68%	3.92%	4.98%	1.06%***	12.23	0.00
MTB	20455	1.804	2.166	1.663	-0.503***	-26.499	0.00
Leverage	20455	16.49%	8.85%	19.49%	10.64%***	37.41	0.00
CF	20455	5.47%	-4.18%	9.26%	13.42%***	45.92	0.00
Capital intensity	20455	4.54%	4.59%	4.52%	-0.06%	-0.90	0.37

Panel D: Differences in means of summary statistics of firms based on the classification by quartile of AS index values they take for all the 8 events combined.

Stats	*N*	*Mean*	*Constrained*	*Unconstrained*	*Difference*	*p-value*	*t-stat*
CAR_beta	20455	0.08%	0.71%	-0.09%	-0.80%***	-8.38	0.00
Capex	20455	4.68%	3.71%	4.94%	1.22%***	12.66	0.00
MTB	20455	1.804	2.301	1.676	-0.625***	-29.690	0.00
Leverage	20455	16.49%	7.18%	18.90%	11.71%***	36.93	0.00
CF	20455	5.47%	-7.06%	8.71%	15.77%***	48.73	0.00
Capital intensity	20455	4.54%	4.56%	4.54%	-0.02%	-0.39	0.75

Table 5: Table 5 represents the summary statistics of the firms during the policy announcements by Federal Reserve. Panel A represents the summary statistics of firms for a 12-month sample centered on the policy announcements. Panel B represents the summary statistics of the firms for a 24-month sample centered on the policy announcements. 25-11-2008 is the day the Federal Reserve made its first policy announcement to ease the financial constraints of firms. We drop financial firms and utility firms from our sample. We also drop firms which have a market value of equity less than 10 million from our sample. The firm's *Nonprice* is the price non-synchronicity of the firm which is calculated by regressing the return of the stock on the return of the market and return of the sector (defined by 3-digit SIC code) on a semester basis. *Illiquidity* is the daily ratio of the absolute returns of a stock divided by dollar trading volume of the stock. *Adjusted volume* is the daily ratio of volume of a stock divided by the total number of outstanding shares.

Panel A: Summary statistics of the firms when the sample is 12 months centered on the policy announcements.

Stats	*mean*	*sd*	*p5*	*p25*	*p50*	*p75*	*p95*	*N*
Nonprice	0.76	1.74	-1.71	-0.39	0.46	1.82	4.02	6606
Illiquidity	0.65	2.73	0.00	0.00	0.01	0.12	2.78	835720
Adjusted volume	0.01	0.01	0.00	0.00	0.01	0.01	0.04	835720

Panel B: Summary statistics of the firms when the sample is 24 months centered on the policy announcements.

Stats	*mean*	*sd*	*p5*	*p25*	*p50*	*p75*	*p95*	*N*
Nonprice	1.05	1.73	-1.47	-0.11	0.76	2.06	4.30	13219
Illiquidity	0.40	1.74	0.00	0.00	0.01	0.07	1.71	1633654
Adjusted volume	0.01	0.01	0.00	0.00	0.01	0.01	0.03	1633654

Table 6: Table 6 represents the difference in means between the constrained firms and unconstrained firms for the periods where we have samples of 12 and 24-month sample centered around the policy announcements. We measure the constraint of the firm with the AS index and the value that the firms score in 2007. Firms which lie in the first tercile/quartile are defined to be unconstrained and firms which lie in the last tercile/quartile are defined to be unconstrained. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

Panel A: Difference in means between constrained and unconstrained firms when the constraint measure is measured by the tercile levels of AS index and the sample is 12 months centered on the policy announcements.

Stats	*Mean*	*N*	*Constrained*	*Unconstrained*	*Difference*	*p-value*	*t-stat*
Nonprice	0.96	4598	1.80	-0.10	-1.90***	-60.24	0.00
Illiquidity	0.81	581272	1.31	0.22	-1.10***	-140.00	0.00
Adjusted volume	0.010	581272	0.006	0.014	0.007***	241.240	0.000

Panel B: Difference in means between constrained and unconstrained firms when the constraint measure is measured by the quartile levels of AS index and the sample is 12 months centered on the policy announcements.

Stats	*Mean*	*N*	*Constrained*	*Unconstrained*	*Difference*	*p-value*	*t-stat*
Nonprice	1.00	3402	2.05	-0.25	-2.29***	-63.96	0.00
Illiquidity	0.94	430568	1.60	0.18	-1.41***	-140.00	0.00
Adjusted volume	0.009	430568	0.005	0.014	0.008***	248.80	0.000

Panel C: Difference in means between constrained and unconstrained firms when the constraint measure is measured by the tercile levels of AS index and the sample is 24 months centered on the policy announcements.

Stats	*Mean*	*N*	*Constrained*	*Unconstrained*	*Difference*	*p-value*	*t-stat*
Nonprice	1.05	9199	1.98	0.11	-1.87***	-83.62	0.00
Illiquidity	0.50	1133397	0.80	0.15	-0.65***	-180.00	0.00
Adjusted volume	0.01	1133397	0.007	0.013	0.006***	255.05	0.00

Panel D: Difference in means between constrained and unconstrained firms when the constraint measure is measured by the quartile levels of AS index and the sample is 24 months centered on the policy announcements.

Stats	*Mean*	*N*	*Constrained*	*Unconstrained*	*Difference*	*p-value*	*t-stat*
Nonprice	1.16	6807	2.22	-0.04	-2.26***	-88.27	0.00
illiquidity	0.57	835679	0.98	0.13	-0.85***	-190.00	0.00
Adjusted volume	0.01	835679	0.006	0.013	0.006***	263.80	0.00

Table 7: Table 7 represents the summary statistics for the firms for the analysis where we test the impact of Fed intervention on investment price sensitivity. The timeframe of the sample is between 2006 and 2011. We drop financial firms and utility firms from our sample. We also drop firms which have a market value of equity less than 10 million from our sample. *Capex* is the capital expenditure of the firm deflated by lagged total assets. *Capexrd* is the ratio of sum of capital expenditure and research and development expenses deflated by lagged total assets. It should be noted that research and development expenses is considered to be zero if it has a missing value in Compustat. *MTB* is the value of Tobin's Q calculated by market value of equity plus total assets minus shareholder's equity divided by total assets. *Leverage* is the long term debt of a firm divided by lagged total assets. *CF* is the ratio of income before extraordinary items plus depreciation and amortization expenses deflated by lagged total assets. *Cash* is the ratio of cash and cash equivalents deflated by lagged total assets. *Dividend* is the amount of dividend paid by the firm to the shareholders deflated by lagged total assets.

Stats	*Mean*	*Sd*	*p5*	*p25*	*p50*	*p75*	*p95*	*N*
Capex	5.99%	7.55%	0.51%	1.73%	3.45%	7.14%	20.15%	12564
Capexrd	10.17%	10.43%	0.93%	3.41%	7.07%	13.15%	29.68%	12564
Cash	15.34%	17.13%	0.52%	3.70%	9.91%	20.52%	49.10%	12564
Leverage	16.47%	19.08%	0.00%	0.01%	11.33%	26.28%	54.13%	12564
Mtb	1.80	1.14	0.78	1.10	1.46	2.09	3.99	12564
Cf	8.09%	14.06%	-16.61%	4.20%	9.41%	14.73%	26.68%	12564
Dividend	1.37%	2.81%	0.00%	0.00%	0.00%	1.61%	6.71%	12564

Table 8: Table 8 compares the summary statistics of the financially constrained firms between 2006 and 2011 in comparison to firms which are not financially constrained. We do a difference of means test between the firm characteristics of constrained firms and firm characteristics of unconstrained firms. We measure the constraint of the firm with the AS index and the value that the firms score in 2007. Firms which lie in the last tercile / quartile are defined to be constrained, and firms otherwise are defined to be unconstrained. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

Panel A: Difference of means between constrained and unconstrained firms when the firms are classified by their position in the tercile of AS index.

Stats	*N*	*mean*	*Constrained*	*Unconstrained*	*Difference*	*p-value*	*t-stat*
Capex	8274	5.82%	5.75%	5.86%	0.10%	0.62	0.54
Capexrd	8274	10.40%	13.41%	8.41%	-4.9%***	-20.9	0.00
Cash	8274	16.06%	23.93%	10.86%	-13%***	-34.02	0.00
Leverage	8274	15.32%	9.53%	19.14%	9.61%***	24.51	0.00
MTB	8274	1.81	2.05	1.66	-0.39***	-15.11	0.00
Cf	8274	7.51%	3.65%	10.05%	6.4%***	19.58	0.00
Dividend	8274	1.41%	0.97%	1.70%	0.74%***	11.83	0.00

Panel B: Difference of means between constrained and unconstrained firms when the firms are classified by their position in the quartile of AS index.

Stats	*N*	*mean*	*Constrained*	*Unconstrained*	*Difference*	*p-value*	*t-stat*
Capex	6120	5.64%	5.53%	5.70%	0.17%	0.88	0.38
Capexrd	6120	10.32%	14.05%	8.13%	-5.9%***	-21.55	0.00
Cash	6120	16.20%	25.97%	10.48%	-16%***	-33.82	0.00
Leverage	6120	14.85%	6.71%	19.62%	13%***	30.77	0.00
MTB	6120	1.83	2.15	1.64	-0.51***	-16.62	0.00
Cf	6120	7.24%	2.45%	10.05%	7.6%***	19.35	0.00
Dividend	6120	1.42%	0.90%	1.73%	0.83%***	12.50	0.00

Table 9: Table 9 deals with the analysis of the impact of financial crisis on the financially constrained firms. We use a differences-in difference methodology to analyze the impact. Treated is a dummy variable which takes a value of one if the firm lies in the last tercile/quartile of AS index based on the value of AS index in 2007 and zero if the firm lies in the first tercile/quartile. Post is a dummy variable which takes a value of one if the observations are after 09-08-2007 and zero otherwise. Treatedxpost is the interaction term between treated and post dummies. The sample we use is 12 months centered on the crisis period. The firm's *Nonprice* is the price non-synchronicity of the firm which is calculated by regressing the return of the stock on the return of the market and return of the sector (defined by 3-digit SIC code) on a semester basis. In other words, we have two semesters before the crisis and 2 semesters after the crisis and we calculate the *Nonprice* with $\ln((1-R^2)/R^2)$ where R^2 is obtained from the regression. *Illiquidity* is the daily ratio of the absolute returns of a stock divided by dollar trading volume of the stock. *Adjusted volume* is the daily ratio of volume of a stock divided by the total number of outstanding shares. P-values are the values in the parentheses. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Nonprice	*Nonprice*	*Nonprice*	*Illiquidity*	*Illiquidity*	*illiquidity*	*adj_volume*	*adj_volume*	*adj_volume*
treatedxpost_t	-0.110			0.179***			-0.00142***		
	(0.124)			(0.000)			(0.000)		
treatedxpost_q		-0.116			0.213***			-0.00175***	
		(0.166)			(0.000)			(0.000)	
Post			-0.191***			0.0952***			0.0000857
			(0.000)			(0.000)			(0.253)
_cons	1.884***	1.944***	1.706***	0.174***	0.212***	0.136***	0.00890***	0.00847***	0.00943***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year semester fixed effects	Yes	Yes		Yes	Yes		Yes	Yes	
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4778	3574	6942	1177961	879025	1715476	1177961	879025	1715476
adj. R-sq	0.753	0.768	0.751	0.306	0.309	0.294	0.466	0.462	0.462

Table 10: Table 10 deals with the analysis of the impact of financial crisis on the financially constrained firms. We use a differences-in difference methodology to analyze the impact. Treated is a dummy variable which takes a value of one if the firm lies in the last tercile/quartile of AS index based on the value of AS index in 2007 and zero if the firm lies in the first tercile/quartile. Post is a dummy variable which takes a value of one if the observations are after 09-08-2007 and zero otherwise. Treatedxpost is the interaction term between treated and post dummies. The sample we use is 24 months centered on the crisis period. The firm's *Nonprice* is the price non-synchronicity of the firm which is calculated by regressing the return of the stock on the return of the market and return of the sector (defined by 3-digit SIC code) on a semester basis. In other words, we have two semesters before the crisis and 2 semesters after the crisis and we calculate the *Nonprice* with $\ln((1-R^2)/R^2)$ where R^2 is obtained from the regression. *Illiquidity* is the daily ratio of the absolute returns of a stock divided by dollar trading volume of the stock. *Adjusted volume* is the daily ratio of volume of a stock divided by the total number of outstanding shares. P-values are the values in the parentheses. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Nonprice	*Nonprice*	*Nonprice*	*illiquidity*	*illiquidity*	*illiquidity*	*adj_volume*	*adj_volume*	*adj_volume*
treatedxpost_t	-0.13***			0.406***			-0.0027***		
	(0.005)			(0.000)			(0.000)		
treatedxpost_q		-0.116**			0.502***			-0.0033***	
		(0.030)			(0.000)			(0.000)	
Post			-0.37***			0.197***			0.00095***
			(0.000)			(0.000)			(0.000)
_cons	2.303***	2.386***	1.915***	0.000***	0.000***	0.000***	0.00768***	0.00735***	0.00888***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year semester fixed effects	Yes	Yes		Yes	Yes		Yes	Yes	
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	9556	7148	13884	1177961	879025	1715476	1177961	879025	1715476
adj. R-sq	0.741	0.754	0.726	0.306	0.309	0.294	0.466	0.462	0.462

Table 11: In the table 11, we analyze the reaction of financially constrained firms to the policy announcements by Federal Reserve with an OLS regression. The dependent variable is 3 day cumulative abnormal returns and the variable of interest is the firm's financial constraints measured by the age-size index. We also measure the constraint of the firm with the AS index and the value that the firms score in 2007. Firms which lie in the last tercile/quartile are defined to be constrained and rest of the firms are defined to be unconstrained. In this table we just observe the reaction on stocks on the first day of Federal Reserve's policy announcements. All the variables are described in detail in Appendix 2. P-values are the values in the parentheses. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	CAR_beta	*CAR_beta*	*CAR_beta*	*CAR_beta*	*CAR_beta*	*CAR_beta*
Asindex	0.0194***			0.0217***		
	(0.000)			(0.000)		
treated_asindex_t		0.0305***			0.0326***	
		(0.000)			(0.000)	
treated_asindex_q			0.0386***			0.0422***
			(0.000)			(0.000)
Capex				-0.178***	-0.177***	-0.175***
				(0.000)	(0.000)	(0.000)
Mtb				-0.006***	-0.006***	-0.006***
				(0.000)	(0.000)	(0.000)
Leverage				0.00966	0.0121	0.0154
				(0.419)	(0.332)	(0.147)
Cf				-0.0114	-0.0130	-0.00701
				(0.273)	(0.213)	(0.520)
Capital intensity				-0.0238	-0.0246	-0.0218
				(0.559)	(0.551)	(0.574)
_cons	0.0805***	0.00482***	0.00543***	0.111***	0.0261***	0.0263***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Industrial fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	2934	2934	2934	2934	2934	2934
adj. R-sq	0.052	0.055	0.062	0.074	0.077	0.084

Table 12: In the table 12, we analyze the reaction of financially constrained firms to the policy announcements by Federal Reserve with an OLS regression. The dependent variable is 3 day cumulative abnormal returns and the variable of interest is the firm's financial constraints measured by the age-size index. We also measure the constraint of the firm with the AS index and the value that the firms score in 2007. Firms which lie in the last tercile/quartile are defined to be constrained and rest of the firms are defined to be unconstrained. In this table we just observe the reaction on stocks for all the 8 events of Federal Reserve's policy announcements between 2008 and 2012. All the variables are described in detail in Appendix 2. P-values are the values in the parentheses. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	CAR_beta	*CAR_beta*	*CAR_beta*	*CAR_beta*	*CAR_beta*	*CAR_beta*
Asindex	0.00406***			0.00432***		
	(0.000)			(0.000)		
treated_asindex_t		0.00682***			0.00691***	
		(0.000)			(0.000)	
treated_asindex_q			0.00653***			0.00666***
			(0.000)			(0.000)
Capex				-0.0841***	-0.0833***	-0.0833***
				(0.000)	(0.000)	(0.000)
Mtb				-0.0018***	-0.0017***	-0.0017***
				(0.000)	(0.000)	(0.000)
Leverage				-0.00421**	-0.00349*	-0.00412
				(0.037)	(0.089)	(0.108)
Cf				0.000434	0.000726	0.000366
				(0.834)	(0.707)	(0.898)
Capital intensity				0.0116	0.0114	0.0117
				(0.370)	(0.374)	(0.403)
_cons	0.0277***	0.0118***	0.0124***	0.0376***	0.0204***	0.0211***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Event fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industrial fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	20455	20455	20455	20455	20455	20455
adj. R-sq	0.034	0.035	0.035	0.040	0.041	0.040

Table 13: Table 13 deals with the analysis of the impact of policy announcements by the Federal Reserve on the financially constrained firms. We use a differences-in difference methodology to analyze the impact. Treated is a dummy variable which takes a value of one if the firm lies in the last tercile/quartile of AS index based on the value of AS index in 2007 and zero if the firm lies in the first tercile/quartile. Post is a dummy variable which takes a value of one if the observations are after 25-11-2008 and zero otherwise. Treatedxpost is the interaction term between treated and post dummies. The sample we use is 12 months centered on the period of policy announcements. The firm's *Nonprice* is the price non-synchronicity of the firm which is calculated by regressing the return of the stock on the return of the market and return of the sector (defined by 3-digit SIC code) on a semester basis. In other words, we have one semester before the crisis and one semester after the crisis and we calculate the *Nonprice* with $\ln((1-R^2)/R^2)$ where R^2 is obtained from the regression. *Illiquidity* is the daily ratio of the absolute returns of a stock divided by dollar trading volume of the stock. *Adjusted volume* is the daily ratio of volume of a stock divided by the total number of outstanding shares. P-values are the values in the parentheses. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	nonprice	*nonprice*	*nonprice*	*Illiquidity*	*Illiquidity*	*illiquidity*	*adj_volume*	*adj_volume*	*adj_volume*
treatedxpost_t	0.142*			0.727***			-0.0007***		
	(0.055)			(0.000)			(0.000)		
treatedxpost_q		0.158*			0.925***			-0.0007***	
		(0.071)			(0.000)			(0.004)	
Post			-0.09***			0.455***			-0.001***
			(0.004)			(0.000)			(0.000)
_cons	0.958***	1.000***	0.808***	0.540***	0.638***	0.427***	0.0102***	0.00962***	0.0111***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year semester fixed effects	Yes	Yes		Yes	Yes		Yes	Yes	
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4598	3402	6606	581272	430568	835720	581272	430568	835720
adj. R-sq	0.751	0.766	0.738	0.363	0.364	0.361	0.614	0.616	0.610

Table 14: Table 14 deals with the analysis of the impact of policy announcements by the Federal Reserve on the financially constrained firms. We use a differences-in difference methodology to analyze the impact. Treated is a dummy variable which takes a value of one if the firm lies in the last tercile/quartile of AS index based on the value of AS index in 2007 and zero if the firm lies in the first tercile/quartile. Post is a dummy variable which takes a value of one if the observations are after 25-11-2008 and zero otherwise. Treatedxpost is the interaction term between treated and post dummies. The sample we use is 24 months centered on the period of policy announcements. The firm's *Nonprice* is the price non-synchronicity of the firm which is calculated by regressing the return of the stock on the return of the market and return of the sector (defined by 3-digit SIC code) on a semester basis. In other words, we have two semesters before the crisis and 2 semesters after the crisis and we calculate the *nonprice* with $\ln((1-R^2)/R^2)$ where R^2 is obtained from the regression. *Illiquidity* is the daily ratio of the absolute returns of a stock divided by dollar trading volume of the stock. *Adjusted volume* is the daily ratio of volume of a stock divided by the total number of outstanding shares. P-values are the values in the parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Nonprice	*nonprice*	*nonprice*	*Illiquidity*	*Illiquidity*	*illiquidity*	*adj_volume*	*adj_volume*	*adj_volume*
treatedxpost_t	0.0205			0.395***			-0.0000944		
	(0.571)			(0.000)			(0.661)		
treatedxpost_q		0.0342			0.509***			0.000115	
		(0.428)			(0.000)			(0.647)	
Post			0.0327**			0.27***			-0.0007***
			(0.031)			(0.000)			(0.000)
_cons	1.611***	1.677***	1.03***	0.208***	0.246***	0.271***	0.00953***	0.00897***	0.0107***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year semester fixed effects	Yes	Yes		Yes	Yes		Yes	Yes	
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	9199	6807	13219	1133397	835679	1633654	1133397	835679	1633654
adj. R-sq	0.819	0.829	0.760	0.345	0.345	0.336	0.528	0.516	0.534

Table 15: We analyze the impact of policy announcements of Fed on the investment-price sensitivity with a differences-in difference framework. The timeframe of the sample is between 2006 and 2011. We measure investment with capital expenditure in this model Treated is a dummy variable which takes a value of one if the firm lies in the last tercile/quartile of AS index based on the value of AS index in 2007 and zero if the firm lies in the first tercile/quartile. Fed is a dummy variable which takes a value of one if the observations are after 2009 and zero otherwise. Treatedxfed is the interaction term between treated and Fed dummies. MTBxtreatedxFed is a third level interaction between MTB, treated and Fed dummies. MTBxFed is an interaction term between Fed and MTB. MTBxtreated is an interaction term between MTB and treated variables. All the other control variables are explained in detail in the appendix 2. P-value is the value inside the parenthesis

	(1)	(2)	(3)	(4)
	capex	*capex*	*capex*	*Capex*
mtbxtreatedxasindexfed_t	-0.000156		-0.000414	
	(0.929)		(0.815)	
mtbxtreatedxasindex_t	0.00133		0.000829	
	(0.447)		(0.639)	
treatedxasindexpost_t	-0.00448		-0.00349	
	(0.248)		(0.366)	
mtbxtreatedxasindexfed_q		0.000520		0.000105
		(0.785)		(0.957)
mtbxtreatedxasindex_q		0.00249		0.00101
		(0.214)		(0.617)
treatedxasindexpost_q		-0.00356		-0.00210
		(0.414)		(0.630)
Mtb	0.000745	-0.000642	0.00144	0.00109
	(0.593)	(0.697)	(0.311)	(0.514)
Mtbxfed	0.00381***	0.00341**	0.00295***	0.00285**
	(0.001)	(0.010)	(0.008)	(0.032)
Cf			0.0442***	0.0291***
			(0.000)	(0.000)
Leverage			0.0712***	0.0743***
			(0.000)	(0.000)
Dividend			0.0713	0.00505
			(0.156)	(0.891)
Cash			0.00832	0.0171
			(0.198)	(0.024)
_cons	0.0690***	0.0689***	0.0507***	0.0502***
	(0.000)	(0.000)	(0.000)	(0.000)
Firm fixed effects	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes
N	8274	6120	8274	6120
adj. R-sq	0.668	0.686	0.682	0.698

Table 16: In the table 16, we analyze the impact of policy announcements of Fed on the investment-price sensitivity with a differences-in difference framework. The timeframe of the sample is between 2006 and 2011. We measure investment with capital expenditure plus research and development expenses in this model. Treated is a dummy variable which takes a value of one if the firm lies in the last tercile/quartile of AS index based on the value of AS index in 2007 and zero if the firm lies in the first tercile/quartile. Fed is a dummy variable which takes a value of one if the observations are after 2009 and zero otherwise. Treatedxfed is the interaction term between treated and Fed dummies. MTBxtreatedxFed is a third level interaction between MTB, treated and Fed dummies. MTBxFed is an interaction term between Fed and MTB. MTBxtreated is an interaction term between MTB and treated variables. All the other control variables are explained in detail in the appendix 2. P-value is the value inside the parenthesis.

	(1)	(2)	(3)	(4)
	capexrd	*capexrd*	*capexrd*	*capexrd*
mtbxtreatedxasindexfed_t	-0.00252		-0.00211	
	(0.408)		(0.477)	
mtbxtreatedxasindex_t	0.00365		0.000557	
	(0.304)		(0.876)	
treatedxasindexpost_t	-0.00419		-0.00287	
	(0.467)		(0.612)	
mtbxtreatedxasindexfed_q		0.000883		0.00101
		(0.796)		(0.763)
mtbxtreatedxasindex_q		0.000710		-0.00369
		(0.869)		(0.403)
treatedxasindexpost_q		-0.00790		-0.00511
		(0.226)		(0.425)
Mtb	0.00744**	0.00832**	0.0103***	0.0125***
	(0.015)	(0.038)	(0.001)	(0.003)
Mtbxfed	0.000768	-0.00119	-0.000293	-0.00185
	(0.721)	(0.657)	(0.889)	(0.482)
Cf			-0.0290*	-0.0505***
			(0.064)	(0.003)
Leverage			0.122***	0.122***
			(0.000)	(0.000)
Dividend			0.0851	-0.00546
			(0.218)	(0.902)
Cash			0.0622***	0.0711***
			(0.000)	(0.000)
_cons	0.102***	0.102***	0.0721***	0.0722***
	(0.000)	(0.000)	(0.000)	(0.000)
Firm fixed effects	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes
N	8274	6120	8274	6120
adj. R-sq	0.707	0.738	0.725	0.756

Appendix 1: Description of the 8 events

Date	Program	Event	Announcement
1/12/2008	QE1	Ben Bernanke speech	Bernanke announces that the Federal Reserve could buy long term Treasury or agency securities
10/08/2010	QE2	FOMC meeting	The FOMC announces that it will keep hold of the Fed's securities by reinvesting the principal payment from agency debt, agency MBS in long term treasury securities.
27/08/2010	QE2	Ben Bernanke speech	Bernanke suggests there will be an additional QE.
21/09/2010	QE2	FOMC meeting	The FOMC is prepared to provide additional accommodation if needed
03/11/2010	QE2	FOMC meeting	The FOMC intends to purchase 600 billion worth of longer term Treasury securities by the end of second quarter of 2011, at a pace of about $75 billion per month.
21/09/2011	QE3 (Maturity extension program)	FOMC meeting	The FOMC intends to purchase 400 billion of Treasury securities with remaining maturities of 6 years to 30 years and sell an equal amount of Treasury securities with remaining maturities of 3 years or less.
20/06/2012	QE3	FOMC meeting	The FOMC decides to continue through the end of the year its program to extend average maturity of its holdings of securities.
12/12/2012	QE3	FOMC meeting	The FOMC will purchase longer—term Treasury securities after OT is completed at the end of the year, initially at a pace of $45 billion per month.

Appendix 2: Variable definitions

Variable Name	Definition	Formula	Database
Adjusted volume	Ratio of volume to that of number of shares outstanding	Item (vol/shrout*1000)	CRSP
Age	Number of years the firm has been listed in Compustat		Compustat
Amihud Illiquidity	Ratio of absolute value of returns to that of dollar volume of trades	Abs(Item(ret/prc*vol)*1000000))	CRSP
AS Index	A measure which states if the firm is constrained or not based on the AS index suggested by Charles Hadlock and Joshua Pierce (2006). It should be noted that if the firm has a size greater 4.5 billion dollars and/or age greater than 37 years we winsorize the values to take a size of 4.5 billion dollars and age of 37 years. AS index is calculated as (−0.737* Size) + (0.043* $Size^2$) − (0.040*Age).	(−0.737* Size) + (0.043* $Size^2$) − (0.040*Age)	Compustat
Capex	Ratio of Capital expenditure deflated by total assets	Item Capex/at_{t-1}	Compustat
Capexrd	Sum of capital expenditure plus research and development expenses to that of total assets	Item (Capex + rd)/at_{t-1}	Compustat
Capital Intensity	Ratio of depreciation expenses in an year to that of total assets	Item dp/at_{t-1}	Compustat
CAR_beta	The cumulative abnormal return calculated over a 3 day window (-1,1) around the 8 event dates where the Federal Reserve targets improvement of financial constraints with the help of a beta one model		CRSP
Cash	Cash and cash equivalents deflated by lagged total assets	Item che/at[t-1]	Compustat
CF	Ratio of income before extraordinary items plus depreciation and amortization deflated by lagged total assets	Item (ib + dp)/at_{t-1}	Compustat
Dividend	Ratio of dividend with respect to total assets	Item dv/at_{t-1}	Compustat
Leverage	Long term debt deflated by total assets	Item dltt/at_{t-1}	Compustat

Variable Name	Definition	Formula	Database
MTB	Tobin's Q calculated by market value of equity plus total assets minus shareholder's equity divided by total assets	Item (at +csho*prcc - seq)/at	CRSP, Compustat
Nonprice	Measures the price informativeness as suggested by Qi chen et al (RFS, 2007) . We regress the return of the stock on the return of the market and return of the sector . The R-squared obtained from the process is used in calculating price non-synchronicity by using ln((1-R2)/R2)	Ln((1-R2)/R2)	CRSP
RD	Ratio of research and development expenses to that of total assets. Takes a value of zero if missing value	Item rd/at_{t-1}	Compustat
Size	Logarithmic value of total assets	Ln (Item at)	Compustat
Treated	Dummy variable which takes a value equal to one if the firm is constrained and zero otherwise (as measured by Asindex and whited index)		Compustat
Whited index	A measure which states if the firm is constrained or not based on the whited and wu index suggested by the whited and wu	whited = -0.091*cf -0.062*divpos +0.21*leverage - 0.44*size +0.102*isg -0.035*sg	Compustat
Winsorization	All the ratios have been winsorized between the 1st and the 99th percentile by each year for the second and third hypothesis and by event for the first hypothesis		
Screening	All financial firms (SIC 6000-6999) and utility (SIC 4900) firms are excluded		

CHAPTER FOUR: What do Private Acquirers learn from Public acquirers: Case of M&A?

ABSTRACT

The objective of this paper is to study the behavioral response of private acquirers to the acquisition strategies of public firms. We find that private firms tend to acquire more in terms of number and value of deals in the sectors of public acquirers and targets which have higher growth opportunities in terms of valuations in the sector. Whenever the public firms are observed to have higher investor reaction for the deals they completed and the sector has higher merger activity, the private firms are observed to mimic the acquisition strategies of private firms. These results are in sync with the imitation hypothesis, where private firms tend to learn from the public firms through stock-market valuations and investor reaction to the investments by public firms. The private firms then choose to imitate the acquisition behavior of public firms for their own benefits. [5]

Keywords: Mergers and Acquisitions, Stock price Informativeness, Managerial Learning

[5]We would like to thank Prof Mathieu Luypaert of Vlreick Business School for his inputs during the course of this project.

1. INTRODUCTION

Financial markets play a key role in producing information. This information is reflected in the prices of commodities, stocks, exchange rates and other class of assets. Also, decision makers such as managers of firm, traders, consumers, central bankers etc could use these prices to make various decisions including investment decisions. While most of the literature focuses on how stock prices play a major role in decisions taken by the managers of public firms (Bond, Edmans, and Goldstein (2012)), very few focus on how private firms (Foucault and Fresard (2018)) tackle this problem because their firms are not listed on the stock market.

In this paper, we try to show how private firms learn from the public firms through stock market valuations and investor reaction to investments of public firms and see if they replicate the acquisition strategies of public firms. Our paper is in line with the paper of Foucault and Fresard (2018) who show that managers of an average firm (public or private) can raise firm value by imitating the strategies of public firms because it improves the efficiency of their investment decisions. The rationale they provide is that by imitating strategies of public firms, the results for these firms are value enhancing because they learn about the informativeness of their own stock prices and this enables the managers of these firms to make better decisions after gauging their future options more effectively. Also, by imitating the correlation between the cash flow of his firm and the cash flow of the firm he is imitating is likely to increase. Therefore he is likely to improve the profitability of his firm by imitating a more successful firm. They also demonstrate that this effect is stronger for private firms imitating the strategies of public firms. Foucault and Fresard (2018) also show that private firms who go public later on differentiate more rather than continue with the imitation strategies. This effect is more pronounced for firms with better informed managers or whose peers have less informative stocks. These results show that managers of private firms are able to create more value for their firms by imitating the strategies of public firms.

The literature is in agreement with the findings of Foucault and Fresard (2018) when it points to positive correlation between investment related decisions made by managers and the amount of information conveyed to them by the stock prices (For example: Chen, Goldstein and Jiang (2006)). The information is conveyed to the managers through trades made by participants unrelated to the firm and the sector in the financial markets (Dow and Gorton, 1997; Subrahmanyam and Titman, 1999; Chen et al, 2006). The reasons for this phenomenon is that while the manager is in control of the signals coming from inside the firm, investment decisions are equally dependent on external information such as the state of the economy, strategies of rival firms, demand and supply etc (Bond et al, 2012). Also, managers should look to make the best out of every available information provided to them to forecast the cash flows of their investment (Foucault and Gehrig, 2008, Foucault and Fresard, 2012).

The paper of Foucault and Fresard (2018) deals with the imitation strategies pertaining to product placement in the market. We would however like to differentiate ourselves by trying to observe whether

the private firms imitate the acquisition strategies of public firms after learning about the growth potential of the sector (from either the acquirer's sector or target's sector) and observing the merger activity of public acquirers. The growth potential could be defined with respect to the acquirer or target sector's Tobin's Q valuations. This is in synchronous with the neoclassical Q-theory which suggests that firms invest as a response to reallocation of investment opportunities and redeployment of assets towards more effective uses (Jovanovic and Rousseau (2002); Rajamani and Schlingemann (2018)). While, managers of private firms cannot observe their valuations or information from their stock prices because they don't have a primary or secondary markets for them to observe it; they can however learn more about their own investment decisions by learning or imitating from the strategies of public acquirers. Thus, it makes sense for the private acquirers to make more deals from sectors of public acquirers or targets which have high valuations in terms of Tobin's Q. A sector with a high Tobin's Q ratio is an indicator that the value of the assets in that sector grows in comparison to the price it was acquired for. Therefore a sector with higher Tobin's Q ratio means higher growth opportunity priced by the sector and hence it makes sense for private firms to acquire in these sectors. These postulations are in sync with the findings of Yan (2018) who show that there is a positive correlation between the investments of private firms and the valuations prevalent in that particular sector.

We also would also like to observe if private firms imitate the acquisition strategies of public firms after learning from the investor reaction to f public firms. Investor reaction to investments by public firms is measured by the acquirer or target sector's average cumulative abnormal returns of acquirer (CAR) alone or CAR of the whole deal. CAR of a deal or of a bidder signifies the expected value that an acquirer is likely to get out of the deal. Hence a higher CAR in a sector signifies a higher expected value that a public acquirer might get out of the deal which might prompt private acquirers to invest more in that particular sector.

We would initially like to analyze the research question by seeing if private acquirers mimic the acquisition patterns of the public acquirers. We measure the imitation pattern with the help of an interaction term between acquisition activities of public firms and growth opportunities in that particular sector. We would then try to analyze if the private acquirers sense an opportunity in a given sector (acquirer's sector or target's sector) by observing the investment opportunities as explained above (Tobin's Q, CAR of bidder, CAR of deal) in the previous years and then investing in the current year in terms of number or value of deals.

When we test for the imitation hypothesis, we observe that the number and value of deals made by private acquirers is positively correlated to the interaction term between merger activity of public acquirers and the acquirer's sectors' mean CAR of bidder. This signifies that the private acquirers actively invest more in the acquirer's sectors in the current year, which have higher cumulative abnormal returns for public acquirers along with higher merger activity of public acquirers. A higher CAR of bidder could mean that the market perceives that the acquisition of the public firm is a good investment. Also, a higher

CAR of bidder represents a higher net present value for the target acquired by the bidder. Hence, it gives a signal to the private firm that the acquisition strategy of the public acquirers might be worth mimicking.

The number and value of deals made by private acquirers is also positively correlated to the interaction term between number/value of deals made by public acquirers and the acquirer's sectors' Tobin's Q. Private acquirers imitate the acquisition strategies of public acquirers when the acquirer's sectors have high growth opportunity valuations along with public acquirers making a lot of investment in its sectors in the previous year. Overall, we find a positive link between acquisition strategies of private acquirers and public acquirers which is in line with the demonstration of Foucault and Fresard (2018) and results of Yan (2018). Our results are also backed by the neo-classical Q theory where we could observe that private acquirers invest more when presented with an opportunity for investment reallocation and redeployment of assets towards more effective uses.

When we test for the second hypothesis, where we test if the private acquirers acquire based on the growth opportunities of the acquirer's or target's sectors, we find a positive correlation between investment in terms of number of deals and value of deals of private acquirers and growth opportunities of a particular sector. We observe that the number of deals made by private acquirers is positively correlated to the acquirer sector's Tobin's Q ratio of public firms. In terms of economic sense, we observe that a one standard deviation increase in the acquirer's sectors' growth opportunity valuations result in an increase of about 18% more deals above the unconditional number of deals made by private acquirers in the current year in the same sector. We also observe that the value of deals made by private acquirers in the current year is positively correlated to the acquirer sector's Tobin's Q ratio of public firms. A one standard deviation increase in the acquirer sector's Tobin's Q ratio in the previous year results in an increase of 0. 5% above the unconditional value of deals made by the private acquirers in the acquirer's sector and the current year. Hence a higher Tobin's Q of a particular sector signifies that the assets in that sector are more valuable, which therefore generates a higher interest from private acquirers. Therefore the positive correlation between number and value of deals of private acquirers and the sector's Tobin's Q signifies that the merger activity of private firms is dependent on the growth opportunities in the sector of the acquirer. We observe similar results when we analyze the links between the merger activity of private firms and the targets' sector's Tobin's Q ratio.

The structure of the paper is as follows. The hypothesis development, literature review are explained in the section 2. The data collection, the corresponding descriptive statistics and the regression model are explained in the section 3 and the results that we obtained are explained in the section 4. We finally summarize the results and conclude in the section 5.

2. LITERATURE REVIEW AND HYPOTHESES

Chen, Goldstein and Jiang (2006) postulate that one of the principal functions of the financial markets is production and aggregation of information for various entities, who are dependent on them. The transmitted information is then used by traders for their own speculative trades which is eventually reflected in market prices (Glosten and Milgrom (1985), Kyle (1985), Chen et al,. (2006)). In other words, there are a lot of participants who indirectly participate in the trading channels despite not having any communications with the firm and yet they add to the information channel that the stock prices contain (Dow and Gorton, 1997; Subrahmanyam and Titman, 1999; Chen et al, 2006). Hence, the information component added by these participants to the stock price gives managers a source of information which he did not have access to previously.

Also, optimal real decisions might not only depend on the internal information of a firm which the manager might possess, but also on the external information such as the state of the economy, market share of competitors, demand for the product from consumers etc (Bond et al, 2012). For example: Roll (1984) demonstrates that the private information of orange future trades regarding weather conditions is reflected directly into the price of orange future's price. This signifies that the private information of players not related to either the production or consumption of orange fruits play a key role in deciding the prices of orange fruits. Therefore, the usefulness of the information, that a stock price provides a manager for decision making, increases as soon as the complexity of the production processes increased (Allen, 1993, Bond et al, 2012).

The traditional explanation for this correlation between corporate investment and stock prices is that stock prices reflect the marginal product of capital (Tobin, 1969, von Furstenberg, 1977, Baker et al, 2003). Another line of reasoning why stock price information and corporate investments are related is that value maximizing managers should use every relevant information to forecast the cash flows of their investment project when they make capital allocation for various projects (Foucault and Gehrig, 2008, Foucault and Fresard, 2012). They further add that these forecasts of the cash flows depend on the amount of private information the manager has and the information that could be obtained from the stock prices. Hence, the forecasts and allocation of capital puts more weight on the information signals.

While most of the literature focuses on the link between stock prices and corporate investment, we should realize that this link could be established only for publicly traded firms which have a secondary market for their stock prices. Private firms do not have a secondary market from where they could obtain new information from players not related to the process and use it for their decision making. However, if private firms imitate the strategies of public firms with respect to investment decisions, they would be able to learn better from their own imitated investment decisions and hence make better follow up investment decisions based on it. This facilitates the managers to make a better assessment of the future growth options more effectively (Foucault and Fresard, 2018). Ultimately, this leads to enhancement of firm

values of firms who display imitation behavior according to Foucault and Fresard (2018). It should also be noted that sometimes the activities of public firms have an impact on the investments of private firms. Baderschter et al (2013) with the help of the Sageworks database show that the disclosure of financial statements by public firms have an impact on the investment levels of private firms. Also, it would be interesting to see if private firms, which display a higher sensitivity of investment to growth opportunities in a sector with respect to Tobin's Q (Asker et al (2015); Feldman et al (2018), Yan (2018)), are equally sensitive to higher merger activity by public acquirers. This leads to our first hypothesis (H1): ***Private acquirers acquire more by imitating public acquirers when they see public acquirers acquire more in that particular sector and there are higher growth opportunities in that sector.*** We test this hypothesis by defining the variable of interest as the interaction term between the growth opportunity of a certain sector and the merger activity of public firms that year in that sector. This interaction term signifies that when there is a growth opportunity and higher merger activity of public firms in a certain sector and certain time, the private firms might imitate the acquisition strategies of public firms. The rationale is that when there is a higher merger activity of public firms and higher growth opportunities in the sector, this is likely to entice the private firms to learn from the public firms and replicate the acquisition strategies of public firms for their own benefits.

In the absence of merger activity of public acquirers there must be certain key attributes which signal growth opportunities for private firms to invest in. Neo-classical Q literature suggests that firms invest in response to redistribution of assets in response to investment opportunities and productive use of assets (Jovanovic and Rousseau (2002); Rajamani and Schlingemann (2018)). Capital should ideally flow from low Tobin's Q assets to higher Tobin's Q assets according to them. Hence, firms should always look for better investments whenever the opportunity arises. Although these observations are from the perspective of public acquirers, it would be interesting to observe whether the observations hold true for private acquirers. Also, investor reaction to the stock of the acquirer or the combined effect of the stock of acquirer and target to the acquisitions made by public firms in general gives an idea about the quality of the deal. A higher investor reaction in the form of cumulative abnormal returns signals that there is a higher expected deal in the offering for the acquirer or for the combined firm. Private acquirers learning from public firms are likely to observe this and hence make more deals based on the learning.

While publicly available data on investments made by private firms has been a major empirical problem, there are a few papers which show that private and public acquirers invest differently. Feldman et al (2018) from a data of corporate tax returns show that public firms invest more than private firms overall. They also show that these investments are because of the public firms' access to stock markets. Asker et al (2015) show that private firms display a higher sensitivity to growth opportunities to measures of investment opportunities like sales growth or Tobin's Q ratio in comparison to public firms. There are also other evidences of differences in investment pattern of public and private firms. Sheen (2016) shows that private chemical producers time investments to take advantage of shocks in demand. Firms which go private via leveraged buyouts register more patents than what they did previously (Lerner et al 2011,

Feldman et al (2018)). Similar to this, Bernstein (2015) finds that the quality of patents of firms go down after it goes public. These papers clearly show a stark difference in investment patterns between private firm and public firms. Therefore, it would be interesting to see if private firms invest the same way when an opportunity arises in the manner public firms invest when they observe growth opportunities in a sector. Dong Yan (2018) in their paper show that the corporate investment of private firms is positively correlated to the stock valuation of a particular industry. In terms of economic sense, Yan finds that a one standard deviation increase in industrial valuations results in a 1.4% increase in corporate investment. While Yan measures corporate investment in the form of capital expenditure expenses, in this paper we measure the investment of private firms from the perspective of mergers and acquisitions with the number and value of deals made by them in a particular year. This leads to our second hypothesis (H2): ***Private firms acquire more in sectors where they observe growth opportunities in a certain sector***.

3. DATA AND METHODOLOGY

Our data consists of a sample of acquisitions made by US private and public acquirers between 1980 and 2016 from Thomson SDC. We use a criterion that the acquirers and targets should be either public or private firms. We restrict our sample size to only deals which have minimum deal value of at least 10 million dollars. Deals with less than 10 million are dropped to have only significant deals as a part of our sample. We also drop financial firms (SIC code 6000 – 6999) and regulatory authorities (9100 – 9999) from our sample. The financial firms and regulatory authorities are dropped from our sample in the same spirit as it is done in the literature. We also drop acquisition of subsidiaries and other assets from our sample. We also collect data from CRSP/Compustat merged database for the same period to calculate the variables of interest and other control variables. Overall, we have 11934 observations of public and private acquisitions of firms between 1980 and 2016 from a total of 335935 observations at the start.

From the summary statistics of Table 1, we observe that 84.51% of the deals were completed. 93.2 % of the sample consisted of public acquirers and 52.55% of the sample consisted of public targets. We also observe that 87.29 % of the mergers were domestic deals and 21.86% of the deals were in the same sector as defined by the 4-digit SIC code. Around 36.51% of all the deals were horizontal mergers. We can also observe that 32.53 % of the deals were financed with 100% stock and 30.97% of the deals were financed with 100% cash. The average deal size was found to be around 887 million dollars by the firms in the sample.

In our Table 2, we report time series variations of the deal-specific statistics of the acquisitions made by private and public acquirers between 1980 and 2016. We observe that the maximum amount of acquisitions in terms of number of deals and value of deals were made in 1998 and the minimum amount of acquisitions in terms of number and value of deals made were in 1980. We also observe that the proportion of the 100% stock deals as a percentage of the total deals in the year were made between 1990 and 2000. We also notice an increase in the proportion of 100% cash deals made as a percentage of

the total number of deals in the year has been on the increase from 2005 onwards till 2016. We also observe that public firms dominate the proportion of total number of deals made in a year. The probability of deal success for an average firm has also been on an upward trajectory from 1990 onwards till 2016.

[Insert Table 1 and Table 2]

There are various measures of how merger activity of firms are measured. One way of measuring it is the number of deals and the value of deals made by firms. The dependent variable in our analysis is the number of deals and value of deals made by private firms aggregated at a sector level in a given year. As explained earlier we don't have a lot of information about investments made by private firms and hence we chose the available ones which are number and value of deals. We define the sector of a firm based on the 2-digit SIC code classification. We initially tried using FF49 and FF12 classifications but the overall number of observations per sector per year were very small and hence we chose to stick with 2-digit SIC code. We also measure from the perspective of the acquirer's sector and target's sector. The reason why we differentiate the perspective of the acquirer's sector and target's sector is that the learning that a manager of a private firm is different from the two cases.

We calculate the number of deals by private acquirers as a ratio of the number of deals by private acquirers in a particular year divided by total number of firms in Compustat that year. We also calculate the value of deals by private acquirers as a ratio of value of deals by private acquirers in the sector divided by the total value of assets in the sector in Compustat for that particular year. If there are no deals by private acquirers in a certain year for a certain sector we define the number of deals and value of deals in that particular year to be zero. The merger activity of public firms are calculated the same way, in terms of number and value of public deals in a given year. We calculate the number of deals by public acquirers as a ratio of the number of deals by public acquirers in a particular year divided by total number of firms in Compustat that year. We also calculate the value of deals by public acquirers as a ratio of value of deals by public acquirers in the sector divided by the total value of assets in the sector in Compustat for that particular year. Our definition of total value of deals by public and private acquirers is inspired by the paper of Rajamani and Schlingemann (2018). The number or value of private or public deals in a particular year is calculated as follows from equations 1 to 4:

$$(Num\_priv)_{j,t} = \frac{(Aggregate\ number\ of\ private\ deals)_{j,t}}{(Total\ number\ of\ firms\ in\ compustat)_t} \text{ - (1)}$$

$$(Num\_pub)_{j,t} = \frac{(Aggregate\ number\ of\ public\ deals)_{j,t}}{(Total\ number\ of\ firms\ in\ compustat)_t} \text{ – (2)}$$

$$(Value\_Priv)_{j,t} = \frac{(Aggregate\ value\ of\ private\ deals)_{j,t}}{(Aggregate\ value\ of\ assets)_{j,t}} \text{ - (3)}$$

$$(Value\_Pub)_{j,t} = \frac{(Aggregate\ value\ of\ public\ deals)_{j,t}}{(Aggregate\ value\ of\ assets)_{j,t}} \text{ - (4)}$$

Where t is the particular year and j is the sector that a particular private or public acquirer are operating in represented by 2 digit sic code. Num_priv is the total number of deals by private acquirers belonging to a certain sector in the current year. Value_priv is the total value of deals by private acquirers belonging to a certain sector in the current year. Num_pub is the total number of deals by public acquirers belonging to a certain sector in the current year. Value_pub is the total value of deals by public acquirers belonging to a certain sector in the current year.

We observe that on an average a private acquirer makes a total of 0.28 deals per sector per year with a maximum of 12 deals per sector per year. We also observe that they make deals worth 71 million per sector per year with a maximum observed observation of 22 billion per sector in a year. We also observe that public firms make a total of 3.93 deals per sector per year with a maximum of 394 deals for a sector in a year. They also made deals worth 3.6 billion a year with a maximum observed observation of 449.3 billion for a sector in a year.

We then calculate the independent variables used in our analyses. Cumulative abnormal returns are another measure of merger and acquisition activity of public firms. The first two independent variables we choose are cumulative abnormal returns (CARs) of bidder and deals. Cumulative abnormal returns of bidder measure the reaction of stock market to the stock of the acquirer pertaining to a particular deal by public acquirer around the announcement date. The CAR of deal measures the combined effect of the stock market reaction to the stocks of public acquirer and public target pertaining to the deal made by the acquirer and target. The rationale behind why we choose CAR of deal or acquirer as an independent variable is that private acquirers are likely to perceive that a sector is worth investing in based on the investor reaction to public announcement of mergers. Hence the private acquirers are more likely to perceive sectors with higher CARs as more valuable sectors to invest in. Also, a higher CAR of bidder is a signal that the perceived net present value of cash flows from the acquisition is going to be higher and hence the acquisition is perceived to give higher returns to the bidder. Therefore, the CAR of bidder and deal is a sign of high growth opportunities in that particular sector.

We calculate the cumulative abnormal returns (CARs) for every deal for the public acquirers and targets using a beta one model for the acquisitions from this sample. We obtain the variables such as return of stock i ($R_{i,t}$) and market return ($R_{m,t}$) from CRSP database for all the public acquirers and targets between 1980 and 2016. With the help of this we calculate the CARs of acquirers, targets and the deal for each deal and each acquirer. We use a market adjusted return model for calculating the CAR returns over a 3 day (-1, 1) interval. Therefore, the short-term announcement abnormal returns of a stock i in response to a merger event t on the announcement dates are estimated using market adjusted return models are estimated as in equation 5[6]:

[6]Our choice of methodology to determine the cumulative abnormal returns in this case is not an issue. As shown by Brown and Warner (1980) a methodology as simple as market model performs well under a wide variety of conditions.

$$AR_{i,t} = R_{i,t} - R_{m,t} - (5)$$

Where $AR_{i,t}$ is the abnormal returns for a firm i on event t, $R_{i,t}$ is the returns of a firm i at a time t and $R_{m,t}$ is the returns of the market at a time t. The cumulative abnormal returns for an acquirer/target i is the sum of abnormal returns over a 3-day interval (t - 1 to t + 1) around the merger announcement date (t=0) as shown in equation 6:

$$CAR_{i,t} = \sum_{t-1}^{t+1} AR_{i,t} - (6)$$

We then calculate the CAR of acquirer at a sector level with the help of a weighted mean where the weights are determined by the market value of every acquirer at a sector level. The weighted mean CAR of acquirer for a sector j is calculated as:

$$(CAR\ of\ acquirer)_{j,t} = \sum_{i=1}^{n} \frac{(CAR\ of\ acquirer)_{i,t} * (MV\ of\ acquirer)_{i,t}}{(MV\ of\ acquirer)_{j,t}} \text{ - (7)}$$

Where CAR of acquirer is the weighted mean of CAR of acquirers for a particular sector j in the year t, i represents each firm in the particular sector j (measured by 2-digit SIC code). Therefore the numerator represents the product of market value of each firm i and CAR of firm i. The denominator represents the market value of the whole sector j which is the sum of the market value of all firms i in that particular sector.

The CAR of a particular deal is calculated as a weighted sum of CAR of acquirer and CAR of target (if the target is a public firm) where the weights assigned to each firm is the proportion added by market value of acquirer or target to the market value of the combined entity. Therefore CAR of deal is calculated as:

$$(CAR\ of\ deal)_{i,t} = \frac{[(CAR\ of\ acquirer)_{i,t} * (MV\ of\ acquirer)_{i,t} + (CAR\ of\ target)_{i,t} * (MV\ of\ target)_{i,t}]}{[(MV\ of\ acquirer)_{i,t} + (MV\ of\ target)_{i,t}]} - (8)$$

where CAR of deal is the CAR of the combined entity, i is the firm (acquirer/target) and t is the particular merger event. MV represents the market value of acquirer or target and CAR of acquirer or target represents the cumulative abnormal returns of the acquirer or target for that particular merger event. The CAR of deal at a sector level is calculated in the same spirit as it was calculated for the CAR of acquirer at a sector level. We observe that an average public acquirer has a mean CAR of deal of 6.37% and a CAR of acquirer as 1.17% at a sector level. The statistics are discussed in detail in table 3.

We obtain variables such as total assets (at), number of shares outstanding (csho), closing price (prcc_f) and common equity (ceq) from the CRSP/Compustat merged database between 1980 and 2016. These are used to calculate the other independent variables which measures growth opportunity in a sector such as Tobin's Q of that particular sector. Valuations of a sector measured by Tobin's Q ratio signifies how the market perceives the growth opportunities of a sector. Higher valuations means the assets in a certain sector grew by that proportion in comparison to the cost at which they were acquired

for. Therefore private acquirers are more likely to be attracted to make acquisitions in a certain sector where the assets they acquire are likely to grow higher in comparison to the costs they acquired them at. Hence, private firms are likely to acquire in sectors which have higher valuation ratios. Our motivation of usage of Tobin's Q ratio is provided by the neo-classical Q theorists. Our usage of Tobin's Q ratio as independent variables is motivated by the paper of Rajamani and Schlingemann (2018).

We calculate the Tobin's Q of the sector by calculating the sum of assets, market value and subtract the common equity from this sum for all firms in a particular sector for the year and deflate the resulting product by total assets for the sector in the same year. The growth opportunity of an acquirer/target' sector in a particular year are:

$$Tobin's\ Q_{j,t} = \frac{(Total\ assets)_{j,t} + (Market\ value)_{j,t} - (Common\ equity)_{j,t}}{(Total\ assets)_{j,t}} \text{ - (9)}$$

Where t is the particular year and j is the sector that a particular private or public firm are operating in represented by 2 digit sic code. All the ratios are winsorized annually between the 1st and the 99th percentile to essentially avoid the problem of outliers.

[Insert Table 3]

Table 3 represents the summary statistics of characteristics of aggregate value of attributes at a sectoral level of acquirer or target at a 2-digit SIC code level between 1980 and 2016. We have a total of 2886 aggregate sector-year observations between 1980 and 2016. We have a total of 79 sectors considering we left out observations from certain sector. We observe that an average public acquirer has a mean CAR of deal of 6.37% and a median CAR of deal of 3.84% with a standard deviation of 14.11% at a sector level. However most of the value creation stems from the target and not from the acquirer and therefore an average public acquirer has a mean CAR of 1.17% for itself alone with a standard deviation of 5.49%. The acquirer has a median CAR of 0.45%. We also observe that the sector's Tobin Q has a mean value of 1.57 and a median value of 1.49 with a standard deviation of 0.57.

We define the regression models and the specifications used in the following subsections in order to test the two hypotheses defined:

3.1 Imitation behavior of private firms in response to merger activities of public firms and growth opportunities in that sector: We then study our next hypothesis (H1) if private acquirers at a 2-digit SIC code level imitate in the following year by imitating the acquisition strategies of public acquirers. We try to analyze this study from the 2-digit SIC code of both the acquirers and targets. We control for market concentration, merger wave year and prevailing interest rates in the market in our regressions. In addition, we also control for the returns of the stocks in a particular sector for the whole year and also the standard deviation of returns with-in these industries. Our control variables are of the same specifications as used by Harford (2005). We also use an acquirer or target sector fixed effects and annual fixed effects. We also use cluster standard error by the acquirer or target sector's 2-digit SIC code. The dependent

variable in our model is the number of deals or value of deals by private acquirers in year t. The variables of interest are interaction terms between merger activity of public acquirers and the growth opportunities in that particular sector in the year t-1. Our empirical model to study the hypothesis H1 is as follows:

$$(Num\_priv\ (or)\ Value\_priv)_{j,t} = \alpha + \beta_1 * (Acquirer\ (or)\ Target\ sector\ fixed\ effects) + \beta_2 * (Annual\ fixed\ effects) + \beta_3 * (Growth\ opportunity)_{j,t-1} * (Num\_pub\ (or)\ Value\_pub)_{j,t-1} + \beta_4 * (Num\_pub\ (or)\ Value\_pub)_{j,t-1} + \beta_5 * (Growth\ opportunity)_{j,t-1} + \beta_6 * (HHindex)_{j,t-1} + \beta_7 * (ret)_{j,t-1} + \beta_8 * (Sigma)_{j,t-1} + \beta_9 * (Interest\_rate)_{t-1} + \beta_{10} * (Wave)_{t-1} + \varepsilon_{j,t} - (10)$$

Where HH index is the market concentration, Returns are the annual returns of the sector in a certain year, sigma signifies the intra-industry standard deviation of returns for that particular year, wave is a dummy variable which takes a value of one if it's a merger wave year and zero otherwise, interest rate is the prevailing Federal fund interest rates in the market and j denotes the 2-digit SIC code of an acquirer or target and t signifies that particular year. The growth opportunity in equation 12 is measured by CAR of deal, CAR of acquirer, the sector's Tobin's Q ratio. Num_priv is the total number of deals by private acquirers belonging to a certain sector in the current year. Value_priv is the total value of deals by private acquirers belonging to a certain sector in the current year. Num_pub is the total number of deals by public acquirers belonging to a certain sector in the current year. Value_pub is the total value of deals by public acquirers belonging to a certain sector in the current year.

3.2 Investment reaction of private acquirers in response to growth opportunities of a particular sector: When it comes to our first hypothesis (H2) where we test if private acquirers acquire in sectors where there are growth opportunities, we control for market concentration, merger wave year and prevailing interest rates in the market in our regressions.

In addition, we also control for the returns of the stocks in a particular sector for the whole year and also the standard deviation of returns with-in these industries. Our control variables are of the same specifications as used by Harford (2005). We also use an acquirer or target sector fixed effects and annual fixed effects. We also use cluster standard error by the acquirer or target sector's 2-digit SIC code. The dependent variable in our model is the number of deals or value of deals by private acquirers in year t. The variables of interest are average CAR of acquirer or deal in the sector of the acquirer or target, the sector's Tobin's Q of the sector in the year t-1. By observing, a positive correlation between the dependent variable and the variable of interest we would be able to validate the Q-theory which suggests that firms invest as a response to reallocation of investment opportunities and redeployment of assets towards more effective uses.

With these variables, we initially study if private acquirers at a 2-digit SIC code level acquire firms in the following year after observing the growth opportunities in the sector. The dependent variable is the merger activity of private firms in the current year t measured by number of deals or value of deals. The

variable of interest is the growth opportunity in that particular sector. We try to analyze this study from the 2-digit SIC code (sectors) of both the acquirers and targets. Our empirical model to study H2 is as follows:

$$(Num\_Priv\ (or)\ Value\_priv)_{j,t} = \alpha + \beta_1 * (Acquirer\ (or)\ Target\ sector\ fixed\ effects) + \beta_2 * (Annual\ fixed\ effects) + \beta_3 * (Growth\ opportunity)_{j,t-1} + \beta_4 * (HHindex)_{j,t-1} + \beta_5 * (ret)_{j,t-1} + \beta_6 * (Sigma)_{j,t-1} + \beta_7 * (Interest\_rate)_{t-1} + \beta_8 * (Wave)_{t-1} + \varepsilon_{j,t} - (11)$$

Where HH index is the market concentration, ret are the annual returns of the sector in a certain year, sigma signifies the intra-industry standard deviation of returns for that particular year, wave is a dummy variable which takes a value of one if it's a merger wave year and zero otherwise, interest_rate is the prevailing Federal fund interest rates in the market and j denotes the 2-digit SIC code of an acquirer or target and t signifies that particular year. The growth opportunity in equation 13 is measured by CAR of deal, CAR of acquirer and the sector's Tobin's Q ratio. Num_priv is the total number of deals by private acquirers belonging to a certain sector in the current year. Value_priv is the total value of deals by private acquirers belonging to a certain sector in the current year.

4. RESULTS

We discuss the results of our analysis of the hypothesis through the following two subsections:

[Insert Table 4, Table 5]

4.1 Imitation behavior of private firms in response to merger activities of public firms and growth opportunities in that sector: From column 2 of Table 4 we find that the variable of interest is significant at a 5% significance level. Therefore, we could infer that private acquirers imitate the acquisition strategies of public acquirers whose sectors have higher Tobin's Q in the previous year by making more number of deals in the current year. When we add control variables to the setup of column 2, we observe that the variables of interest continues to be significant in column 4. Acquirer's sectors with higher valuations and higher merger activity from public acquirers are likely to attract more future deals from private acquirers in terms of number of deals. This is possibly happening because higher valuations in the sector means better growth in the value of assets acquired by private firms which they observed happening for public firms in the previous year.

From column 1 of Table 5 we observe that the variable of interest is positively significant at a 1% significance level. This shows that private acquirers imitate the acquisition strategies of public acquirers whose sectors have higher mean value of acquirer CARs in the previous year by making more number of deals in the current year. When we add control variables to the setup of column 1, we observe that the variables of interest continues to be significant in column 3. This signifies that private acquirers imitate the acquisition strategies of public acquirers whose sectors have higher mean value of acquirer CARs in the previous year by making more number of deals in the current year. These results show that when the

merger activity of public firms is high and also results in higher expected value creation for public acquirers, private acquirers are more likely to follow suit by making more deals for themselves.

From column 2 of Table 5 we observe that the variable of interest is significant at a 1% significance level. Private acquirers imitate the acquisition strategies of public acquirers whose sectors have higher Tobin's Q in the previous year by making more number of deals in the current year. When we add control variables to the setup of column 2, we observe that the variables of interest continues to be significant in column 4. This signifies that private acquirers imitate the acquisition strategies of public acquirers whose sectors have higher Tobin's Q in the previous year by making more number of deals in the current year.

From the results of table 4 and table 5 we could observe that the private acquirers imitate the acquisition strategies of public acquirers in terms of number of deals made by private acquirers. We infer that private acquirers make more number of deals after observing the patterns of public acquirers in sectors which have high valuations and higher investor reactions in the previous years. These results are consistent with the results of Rajamani and Schlingemann (2018) who find that there is a positive link between valuations of the industry and the merger activity in a particular sector. These are also consistent with the hypothesis of neoclassical Q theorists. Yan (2018) also show the same by showing investment of private firms is positively correlated to the valuations prevalent in the sector.

In addition to the variables of interest we observe that the number of deals by private acquirers is positively correlated to the market concentration in the previous year.

[Insert Table 6 and Table 7]

From column 1 of Table 6 we observe that the variable of interest is positively significant at a 5% significance level. This signifies that private acquirers imitate the acquisition strategies of public acquirers whose sectors have higher mean value of acquirer CARs in the previous year and higher number of deals in the previous year by making more acquisitions in terms of value of deals in the current year. When we add control variables to the setup of column 1, we observe that the variables of interest continues to be significant in column 3. Private acquirers imitate the acquisition strategies of public acquirers whose sectors have higher mean value of acquirer CARs in the previous year by making more acquisitions in terms of value of deals in the current year is what we could infer. In other words, private acquirers make high value acquisitions when the expected value of public acquisitions in the previous years are higher and the acquisition activities are higher.

Column 2 of Table 6 signifies that private acquirers imitate the acquisition strategies of public acquirers whose sectors have higher Tobin's Q in the previous year by making more acquisitions in terms of value of deals in the current year. When we add control variables to the setup of column 2, we observe that the variables of interest continues to be significant in column 4. This signifies that private acquirers imitate the acquisition strategies of public acquirers whose sectors have higher Tobin's Q in the previous

year by making more acquisitions in terms of value of deals in the current year. Therefore, private acquirers make high value deals when they notice that the assets they purchase is more valuable in future provided public acquirers have higher merger activity in the previous years.

From column 1 of Table 7 we observe a positive coefficient at a 5 per cent significance level for the variable of interest. This signifies that private acquirers imitate the acquisition strategies of public acquirers whose sectors have higher mean value of acquirer CARs in the previous year by making more acquisitions in terms of value of deals in the current year. When we add control variables to the setup of column 1, we observe that the variables of interest continues to be significant in column 3. This signifies that private acquirers imitate the acquisition strategies of public acquirers whose sectors have higher mean value of acquirer CARs in the previous year by making more acquisitions in terms of value of deals in the current year. Therefore, private acquirers make higher value acquisitions when the perceived value that acquirers will get is going to be higher for the public acquirers and they also have higher acquisition activity.

Column 2 of the Table 7 signifies that private acquirers imitate the acquisition strategies of public acquirers whose sectors have higher Tobin's Q in the previous year by making more acquisitions in terms of value of deals in the current year. From column 4 and 5 of Table 7 we observe negative coefficients at a 5 per cent significance level for the variables of interest. When we add control variables to the setup of column 2, we observe that the variables of interest continues to be significant in column 4. This signifies that private acquirers imitate the acquisition strategies of public acquirers whose sectors have higher Tobin's Q in the previous year by making more acquisitions in terms of value of deals in the current year. Therefore, private acquirers make high value deals when they notice that the assets they purchase is more valuable in future provided public acquirers have higher merger activity in the previous years.

From the results of table 6 and table 7 we could observe that the private acquirers imitate the acquisition strategies of public acquirers by acquiring more in terms of value of deals which is consistent with the demonstrations of Foucault and Fresard (2018). We infer that private acquirers make more value of deals after observing the patterns of public acquirers in sectors which have high valuations and higher investor reactions for deals acquired in the previous years. These findings are consistent with the results of Rajamani and Schlingemann (2018), Yan (2018) and reasoning provided by neo-classical Q theorists. We measure the valuations of the acquirers sector with the values of Tobin's Q.

[Insert Table 8, Table 9, Table 10 and Table 11]

However, when we tried to analyze the acquisition strategies of private acquirers, we observe that we don't find any significant results to validate the imitation hypothesis from the perspective of the sector of the target firms. Therefore, we could not find any proof for private acquirers imitating acquisition strategies of public acquirers in the previous years.

4.2 Investment reaction of private acquirers in response to growth opportunities of a particular sector: When we analyze the first hypothesis (H1) where we test the reaction of private acquirers in terms of number of deals and value of deals as a reaction to the growth attributes of acquirer's sector in the previous year, we observe that the variable of interest, Tobin's Q is positively significant at a 10% confidence interval from column 1 of Table 12. This indicates that the number of deals by private acquirers is positively correlated to the acquirer sector's Tobin's Q. In terms of economic significance, a one standard deviation increase in a sector's Tobin's Q in the previous year results in an increase of 17.82% over the unconditional number of deals made by private acquirers in the current year. When we control for market concentration, interest rates, merger wave conditions, return of the markets and the volatility of returns in the previous year for the above Tobin's Q we observe that it continues to be positively significant at a 1% significance level. This signifies that the number of deals by private acquirers in the current year is positively correlated to the acquirer sector's Tobin's Q in the previous year. Economically speaking, a one standard deviation increase in the sector's Tobin's Q of the previous year results in an increase of 48.92% number of deals above the unconditional number of deals made by private acquirers in the current year. These results indicate that private acquirers learn that the valuations in the acquirer's sector is high indicating growth potential of the sector. This gives a positive signal to the managers of the private firms that they should probably go for an acquisition in these sectors. With respect to the control variables, we observe that the number of private deals are positively correlated to the prevailing interest rates in the market in the previous year when analyzed from the perspective of the acquirer's sector.

[Insert Table 12, Table 13]

In the table 13, we analyze the reaction of private acquirers to the growth potential of the acquirer's sector in terms of value of deals. We observe that the sector's Tobin's Q ratio is positively significant at a 10% significance level from the column 1 of Table 13. This indicates that the value of deals by private acquirers in the current year is positively correlated to the acquirer sector's Tobin's Q in the previous year. In terms of economic significance, a one standard deviation increase in a sector's Tobin's Q in the previous year results in an increase of 0.3% dollars' worth of deals above the unconditional value of deals made by private acquirers in the current year. When you add control variables to the above setup, we observe that Tobin's Q continues to be positively significant. In terms of economic significance, a one standard deviation increase in a sector's Tobin's Q in the previous year results in an increase of 0.54% value of dollars' worth of deals above the unconditional value of deals made by private acquirers made by private acquirers in the current year. This signifies that the private acquirers see a growth potential in the acquirer's sector after observing it in the previous year and see this potential as an opportune moment to capitalize on and grow inorganically. Our results are consistent with the results of Rajamani and Schlingemann (2018) and Yan (2018) who show that there is a strong positive association with the valuations of an industry and the merger activity in that region.

With respect to control variables, we observe that the overall value of deals by private acquirers in the current is positively correlated to the market concentration and the interest rates prevailing in the market in the previous year.

[Insert Table 14, Table 15]

From column 1 of Table 14, we observe that the sector's mean CAR of the acquirer is negatively significant. This indicates that the number of deals by private acquirers is negatively correlated to the target sector's CAR of the acquirer. In terms of economic significance, a one standard deviation increase in a sector's CAR of acquirer in the previous year results in a decrease of 17.82% in terms of number of deals by private acquirers in the current year. When we control for market concentration, interest rates, merger wave conditions, return of the markets and the volatility of returns in the previous year for the above setup, we notice that CAR of the acquirer continues to be negatively significant. This signifies that the number of deals by private acquirers in the current year is negatively correlated to the target sector's CAR of acquirer in the previous year. Economically speaking, a one standard deviation increase in the sector's CAR of acquirer in the previous year results in a decrease of 15.59% in terms of number of deals made by private acquirers in the current year. This could be a deterrent that a higher expected value for public acquirers in a target's sector for private acquirers.

We observe that the coefficient of the variable of interest which is the sector's Tobin's Q ratio is positively significant at a 1% significance level. This indicates that the number of deals by private acquirers is positively correlated to the target sector's Tobin's Q. In terms of economic significance, a one standard deviation increase in a sector's Tobin's Q in the previous year results in an increase of 28.95% number of deals above the unconditional number of deals made by private acquirers in the current year. When we control for market concentration, interest rates, merger wave conditions, return of the markets and the volatility of returns in the previous year for the above setup, we observe that the Tobin's Q continues to be positively significant at a 1% significance level. This signifies that the number of deals by private acquirers in the current year is positively correlated to the target sector's Tobin's Q in the previous year. Economically speaking, a one standard deviation increase in the sector's Tobin's Q of the previous year results in an increase of 24.45% number of deals above the unconditional number of deals made by private acquirers in the current year. These results indicate that private acquirers learn that when the valuations in the target's sector is high, it indicates growth potential of the sector. This gives a positive signal to the managers of the private firms that they should probably go for an acquisition in these sectors. With respect to control variables, we observe that the number of deals is negatively correlated to the market concentration of the sector in the previous year. These results are consistent with the hypothesis of the neo classical Q theorists who suggest that firms will reallocate their assets towards better economic uses if they perceive that the reallocation of resources will yield better results for them. This is also in line with the results of Yan (2018) who shows that investment of private firms is positively correlated to the valuations in that particular sector.

In the table 15, we analyze the reaction of private acquirers to the growth potential of the target's sector in terms of value of deals. We observe a coefficient of 0.0118 from the column 1 of the table 15 for the variable of interest which is the sector's CAR of deal at a 1% significance level. This indicates that the value of deals by private acquirers in the current year is positively correlated to the target sector's CAR of deal in the previous year. In terms of economic significance, a one standard deviation increase in a sector's CAR of deal in the previous year results in an increase of 0.22% value of dollars' worth of deals made by private acquirers above the unconditional value of deals made by private acquirers in the current year. We also observe a coefficient of 0.0127 from the column 4 of Table 15 for the variable of interest which is CAR of deal at a 1% significance level. In terms of economic significance, a one standard deviation increase in a sector's CAR of the acquirer in the previous year results in an increase of 0.22% value of dollars' worth of deals made by private acquirers above the unconditional value of deals made by private acquirers in the current year.

We also observe a coefficient of -0.0132 from the column 2 of Table 15 at a 10% significance level for the variable of interest which is the sector's mean CAR of the acquirer. This indicates that the number of deals by private acquirers is negatively correlated to the target sector's CAR of the acquirer. In terms of economic significance, a one standard deviation increase in a sector's CAR of acquirer in the previous year results in a decrease of 0.22% value of dollars' worth of deals made by private acquirers below the unconditional value of dollars in the current year. When you add control variables to the above setup, we notice a coefficient of -0.0133 at a 10% significance level from the column 5 of Table 15 CAR of the acquirer respectively. Also, a one standard deviation increase in a sector's CAR of deal in the previous year results in a decrease of 0.216% value dollars' worth of deals below the unconditional value of deals made by the private acquirers in the current year.

We observe a coefficient of -0.00288 from the column 3 of Table 15 at a 1% significance level for the variable of interest which is the sector's Tobin's Q ratio. This indicates that the value of deals by private acquirers is negatively correlated to the target sector's Tobin's Q. In terms of economic significance, a one standard deviation increase in a sector's Tobin's Q in the previous year results in a decrease of 0.56% value dollars' worth of deals made by private acquirers below the unconditional value of dollars in the current year. When we control for market concentration, interest rates, merger wave conditions, return of the markets and the volatility of returns in the previous year for the above setup, we notice a coefficient of -0.00270 at a 5% significance level from the column 6 of Table 15 for Tobin's Q. Economically speaking, a one standard deviation increase in the sector's Tobin's Q of the previous year results in a decrease of 0.55% dollars' worth of deals made by private acquirers below the unconditional value of dollars in the current year. These results are in line with the results we observed with the CAR results. While the number of deals are positively correlated with the CAR of deals, Tobin's Q, we could observe that the value of deals are negatively correlated with the CAR of deals, Tobin's Q of the sector. These results could further reinforce the theory that the private acquirers acquire more in terms of number

of deals based on observing the growth potential of the sector in the previous year, they are more cautious in their acquisition strategy in terms of value of deals.

Overall, we could say that the managers of the private acquirers have observed the growth potential available in a certain sector based on the attributes of acquirer's sector like the sector's Tobin's Q ratio. Having observed these attributes in the previous year, they make more acquisitions in terms of number of deals and value of deals. However, when the managers of private acquirers observe the growth potential of a target's sector, they observe that the value creation of deal in terms of CAR is pretty high for acquirers and hence in the following year decide to make more acquisitions in terms of value of deals. They also observe that the target sector's Tobin's Q is pretty high indicating growth potential and hence make more number of deals and value of deals in the following year. This signifies that we can validate the second hypothesis that private acquirers acquire more in terms of number and value of deals when they observe growth opportunities and higher investor reaction in a certain sector. This is in line with the postulations of the neo-classical Q theorists.

5. CONCLUSION

There is a growing literature which explains the effects that a secondary stock market has on managerial decisions and the real economy. One of the ways how it happens is that the secondary stock market provides managers with information which aids them in their decision making. The decisions the managers could make includes investment related decisions which have potential ramifications for the economy at large. However, the pertinent question we have raised through this paper is about the strategies executed by private firms, which do not have a secondary stock market for their shares. The absence of a secondary market will deprive managers of private firms a source of information which could potentially aid them in their decision making.

The answer to these questions are provided by Foucault and Fresard (2018) who demonstrate that by imitating the successful strategies of public firms, firms can enhance value creation for their own shareholders. They also show that this effect is more pronounced for private firms when they imitate the acquisition behavior of public firms. Neoclassical Q theorists also posit that firms invest whenever a potential opportunity arises that seems lucrative to them. We try to explore the above two rationales by investigating if private firms acquire other firms in sectors where they observe higher valuations and investments. We also try to observe, if the private acquirers imitate the acquisition behavior of public firms in order to learn from their own stock price.

Consistent with the postulations of the neoclassical Q theorists and the results of Rajamani and Schlingemann (2018) we find that there is a positive link between the number and value of deals by private acquirers in the current year and the prevailing valuations of the acquirer and target's sector in the previous years. This signifies that private acquirers are piqued by the valuations of a certain sector, which encourages them to make more number and value of deals. Private acquirers are also more likely to make more deals and valuable deals if they observe higher CAR of deals for acquirers in the previous years.

We were also able to contribute to the findings of Foucault and Fresard (2018) by showing that the private acquirers indeed imitate the acquisition patterns of public acquirers. We observe that private acquirers make more acquisitions in terms of number of deals and value of deals when they observe that the public acquirers make more acquisitions in terms of number and value of deals in the previous year and the prevailing valuations are high in the acquirer's sector. They also imitate the acquisition patterns of public acquirers when they observe higher investor reaction for acquirers in the previous years.

We believe that our paper contributes to the growing literature which investigates the links between stock price sensitivity to investment levels of a firm. The contributions are particularly significant from the perspective of private firms because of the absence of a secondary stock market which could aid

the managers of a firm in decision making. Overall through this paper, we were able to get a better insight on the investment strategies of private firms.

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Table 1: Table 1 represents the summary statistics of the merger deals and the deal characteristics by the private and public acquirers between 1980 and 2016. All the variables are described in Appendix A.

Stats	*Mean*	*Median*	*sd*	*N*	*min*	*Max*
Deals Completed	84.51%	1	36.18%	11934	0	1
Acquirer Public	93.20%	1	25.17%	11934	0	1
Acquire rprivate	6.80%	0	25.17%	11934	0	1
Target public	52.55%	1	49.94%	11934	0	1
Target private	47.45%	0	49.94%	11934	0	1
Domestic	87.29%	1	33.31%	11934	0	1
Same sector	21.86%	0	41.33%	11934	0	1
Horizontal	36.51%	0	48.15%	11934	0	1
Deal value	887.66	81.10	4755.77	11934	10	164746.90
All stock	32.53%	0	46.85%	11934	0	1
All cash	30.97%	0	46.24%	11934	0	1

Table 2: Table 2 represents the time series statistics of the merger deals and deal characteristics of the private and public acquirers every year between 1980 and 2016. All the variables are described in Appendix A.

Year	*Number of deals*	*Value of deals ('000)*	*Stock deals (%)*	*Cash deals (%)*	*Private deals (%)*	*Public deals (%)*	*Deal Completion (%)*
1980	35	11299	28.57%	14.29%	20.00%	80.00%	80.00%
1981	181	74789	28.73%	30.39%	16.57%	83.43%	76.80%
1982	165	32193	23.03%	25.45%	20.61%	79.39%	78.18%
1983	189	36176	35.98%	22.75%	17.46%	82.54%	85.19%
1984	256	59029	25.39%	23.83%	18.36%	81.64%	74.61%
1985	171	108774	26.90%	49.71%	10.53%	89.47%	69.01%
1986	196	70285	19.39%	48.47%	12.76%	87.24%	74.49%
1987	200	74506	27.00%	38.00%	11.00%	89.00%	71.00%
1988	218	76993	17.89%	48.17%	15.14%	84.86%	67.43%
1989	180	96336	30.00%	34.44%	14.44%	85.56%	66.67%
1990	103	29407	44.66%	21.36%	5.83%	94.17%	78.64%
1991	130	20208	44.62%	10.77%	3.08%	96.92%	81.54%
1992	178	29774	47.19%	16.29%	4.49%	95.51%	83.71%
1993	243	117053	34.16%	17.70%	5.35%	94.65%	81.89%
1994	341	107007	43.70%	22.29%	5.57%	94.43%	83.28%
1995	481	162800	47.82%	21.41%	4.37%	95.63%	83.99%
1996	552	297951	47.83%	15.94%	3.08%	96.92%	85.87%
1997	645	323481	45.43%	19.53%	3.41%	96.59%	85.12%
1998	1476	1332565	41.46%	22.76%	6.10%	93.90%	87.40%
1999	724	1040644	48.48%	21.41%	4.97%	95.03%	87.85%
2000	735	821951	51.56%	17.41%	3.67%	96.33%	88.03%
2001	381	309758	35.17%	24.41%	6.30%	93.70%	87.93%
2002	267	124840	29.96%	36.33%	6.37%	93.63%	87.64%
2003	285	107938	25.61%	36.14%	6.32%	93.68%	89.12%
2004	334	283311	22.75%	35.63%	3.29%	96.71%	88.02%
2005	383	385317	18.28%	42.82%	5.48%	94.52%	90.60%
2006	371	408037	16.44%	47.71%	8.89%	91.11%	86.52%
2007	389	278048	16.45%	44.22%	7.97%	92.03%	87.66%
2008	284	263033	14.44%	45.42%	7.75%	92.25%	80.28%
2009	208	293331	23.56%	37.50%	5.29%	94.71%	86.06%
2010	255	188539	16.47%	50.20%	6.67%	93.33%	87.45%
2011	236	270980	12.29%	51.27%	6.36%	93.64%	87.29%
2012	226	162142	13.27%	54.87%	5.31%	94.69%	90.27%
2013	198	212603	12.12%	51.52%	5.05%	94.95%	88.89%
2014	260	882582	17.31%	40.77%	2.69%	97.31%	86.54%
2015	263	866625	11.79%	47.53%	3.04%	96.96%	83.65%
2016	195	632972	10.26%	55.90%	8.21%	91.79%	81.54%

Table 3: Table 3 represents the summary statistics of the public and private deals by private and public acquirers and the acquirer level characteristics at a two-digit sic code level between 1980 and 2016. *Num_priv* is the ratio of number of deals by private acquirers at a 2-digit SIC code level deflated by total number of Compustat firms in that particular year. *Value_ priv* is the ratio of value of deals made by private acquirers in year n divided by total value of deals in the acquirer's or target's 2 digit sic in that year. All the variables are described in Appendix A.

stats	*p25*	*Median*	*p75*	*Mean*	*sd*	*N*
num_priv	0	0	0	0.00%	0.01%	2886
value_ priv	0	0	0	0.17%	1.47%	2886
CAR_deal_sic2	-0.96%	3.84%	11.23%	6.37%	14.11%	792
CAR_bidder_sic2	-1.49%	0.45%	3.06%	1.17%	5.49%	1297
TobinQ_sic2	1.21	1.45	1.79	1.57	0.57	2225
HHindex	731.38	1299.45	2698.94	2210.48	2380.44	2237
Interest rate	2.10%	4.92%	6.20%	4.66%	3.25%	2886
SD_returns_sic2	0.05%	0.06%	0.09%	0.09%	0.12%	2176
Return_sic2	0.06%	0.09%	0.12%	0.09%	0.07%	2077
wave	0	0	0	10.81%	31.06%	2886

Table 4: We analyze the acquisition strategies of private firms in response to the growth opportunities in the sector of the acquirer. We use a linear regression model in order to analyze it. The dependent variable *Num_priv* is the ratio of number of deals by private acquirers at a 2-digit SIC code level deflated by total number of Compustat firms in that particular year. The variable of interest is the interaction term between growth opportunities in a sector and the merger activity of public firms in that year. We also cluster the standard error by 2-digit sic code of the acquirer. We also include acquirer sector fixed effects and annual fixed effects. All the variables are described in Appendix A. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

	(1) *num_priv*	*(2)* *num_priv*	*(3)* *num_priv*	*(4)* *num_priv*
num_pub_prev	0.00670	-0.00142	0.00196	-0.0117
	(0.326)	(0.918)	(0.766)	(0.380)
num _pubxCAR_bidder_prev	0.163		0.139	
	(0.204)		(0.262)	
CAR_bidder _prev	-0.0000282		-0.0000297	
	(0.204)		(0.165)	
num _pubxtobinq _prev		0.0160**		0.0203***
		(0.035)		(0.006)
tobinq _prev		0.00000345		0.00000396
		(0.335)		(0.277)
HHindex_prev			-1.30e-09	-9.41e-11
			(0.426)	(0.953)
interest_rate_prev			0.000253***	0.000317****
			(0.000)	(0.000)
sigma_sic2_prev			0.0205	0.0183
			(0.503)	(0.558)
ret_sic2_prev			0.00293	0.000578
			(0.165)	(0.790)
wave_prev			-0.00000371	-0.00000397
			(0.691)	(0.674)
_cons	0.0000465***	0.0000407***	-0.0000119	-0.0000193
	(0.000)	(0.000)	(0.455)	(0.262)
Acquirer Sector fixed effects (2 digit sic code)	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes
N	1085	1184	1064	1160
adj. R-sq	0.186	0.193	0.164	0.175

Table 5: We analyze the acquisition strategies of private firms in response to the growth opportunities in the sector of the acquirer. We use a linear regression model in order to analyze it. The dependent variable *Num_priv* is the ratio of number of deals by private acquirers at a 2-digit SIC code level deflated by total number of Compustat firms in that particular year. The variable of interest is the interaction term between growth opportunities in a sector and the merger activity of public firms in that year. We also cluster the standard error by 2-digit sic code of acquirer. We also include acquirer sector fixed effects and annual fixed effects. All the variables are described in Appendix A. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

	(1) *num_priv*	*(2)* *num_priv*	*(3)* *num_priv*	*(4)* *num_priv*
value_pub_prev	-0.0000185***	-0.0000905***	-0.0000192***	-0.0000950***
	(0.000)	(0.003)	(0.000)	(0.001)
value_pubxCAR_bidder_prev	0.000403***		0.000442***	
	(0.008)		(0.002)	
CAR_bidder_prev	-0.0000274		-0.0000311*	
	(0.149)		(0.087)	
value_pubxtobinq_prev		0.0000590***		0.0000619***
		(0.004)		(0.002)
tobinq_prev		0.00000329		0.00000401
		(0.360)		(0.274)
HHindex_prev			-1.28e-09	-5.95e-10
			(0.428)	(0.708)
interest_rate_prev			0.000258***	0.000339***
			(0.000)	(0.000)
sigma_prev			0.0243	0.0197
			(0.425)	(0.530)
ret_prev			0.00316	0.000847
			(0.130)	(0.697)
wave_prev			-0.00000417	-0.00000494
			(0.652)	(0.602)
_cons	0.0000479***	0.0000438***	-0.0000136	-0.0000193
	(0.000)	(0.000)	(0.390)	(0.264)
Acquirer Sector fixed effects (2 digit sic code)	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes
N	1085	1184	1064	1160
adj. R-sq	0.195	0.186	0.177	0.170

Table 6: We analyze the acquisition strategies of private firms in response to the growth opportunities in the sector of the acquirer. We use a linear regression model in order to analyze it. The dependent variable *Value_priv* is the ratio of total value made of deals by private acquirers at a 2-digit SIC code level deflated by total value of assets aggregated at a 2-digit sic code of acquirer in that particular year. The variable of interest is the interaction term between growth opportunities in a sector and the merger activity of public firms in that year. We also cluster the standard error by 2-digit sic code of acquirer. We also include acquirer sector fixed effects and annual fixed effects. All the variables are described in Appendix A.

	(1)	*(2)*	*(3)*	*(4)*
	value_priv	*value_priv*	*value_priv*	*value_priv*
num_pub_prev	-3.707	-4.079	-4.095	-4.026
	(0.302)	(0.586)	(0.265)	(0.597)
num_pubxCAR_bid_prev	162.0**		133.3*	
	(0.017)		(0.054)	
CAR_bidder_prev	-0.0194*		-0.0191	
	(0.098)		(0.107)	
num_pubxtobinq_prev		8.168**		8.221*
		(0.049)		(0.050)
tobinq_prev		0.00132		0.00192
		(0.498)		(0.355)
HHindex_prev			-0.000000689	0.000000457
			(0.447)	(0.613)
interest_rate_prev			0.0292	0.0873
			(0.382)	(0.015)
sigma_prev			-0.392	-1.928
			(0.982)	(0.914)
ret_prev			-0.283	-1.093
			(0.809)	(0.377)
wave_prev			-0.0000961	-0.000287
			(0.985)	(0.957)
_cons	0.00684	0.00420	0.00142	-0.00293
	(0.103)	(0.389)	(0.873)	(0.765)
Acquirer Sector fixed effects (2 digit sic code)	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes
N	1085	1184	1064	1160
adj. R-sq	0.030	0.037	0.020	0.032

Table 7: We analyze the acquisition strategies of private firms in response to the growth opportunities in the sector of the acquirer. We use a linear regression model in order to analyze it. The dependent variable *Value_priv* is the ratio of total value made of deals by private acquirers at a 2-digit SIC code level deflated by total value of assets aggregated at a 2-digit sic code of acquirer in that particular year. The variable of interest is the interaction term between growth opportunities in a sector and the merger activity of public firms in that year. We also cluster the standard error by 2-digit sic code of acquirer. We also include acquirer sector fixed effects and annual fixed effects. All the variables are described in Appendix A.

	(1)	*(2)*	*(3)*	*(4)*
	value_priv	*value_priv*	*value_priv*	*value_priv*
value_pub_prev	-0.00476*	-0.0753***	-0.00461	-0.0748***
	(0.088)	(0.000)	(0.100)	(0.000)
value_pubxCAR_bidder_prev	0.168**		0.166**	
	(0.037)		(0.040)	
CAR_bidder_prev	-0.00860		-0.0109	
	(0.392)		(0.282)	
value_pubxtobinq_prev		0.0527***		0.0526***
		(0.000)		(0.000)
tobinq_prev		-0.000402		0.000122
		(0.836)		(0.953)
HHindex_prev			-0.000000650	0.000000380
			(0.471)	(0.671)
interest_rate_prev			0.0249	0.0850
			(0.451)	(0.017)
sigma_prev			0.874	-1.769
			(0.959)	(0.920)
ret_prev			-0.165	-0.973
			(0.887)	(0.428)
wave_prev			-0.000285	-0.000956
			(0.956)	(0.858)
_cons	0.00666	0.00734	0.000581	0.000290
	(0.111)	(0.130)	(0.948)	(0.976)
Acquirer Sector fixed effects (2 digit sic code)	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes
N	1085	1184	1064	1160
adj. R-sq	0.029	0.049	0.021	0.044

Table 8: We analyze the acquisition strategies of private firms in response to the growth opportunities in the sector of the target. We use a linear regression model in order to analyze it. The dependent variable *Num_priv* is the ratio of number of deals by private acquirers at a 2-digit SIC code level deflated by total number of Compustat firms in that particular year. The variable of interest is the interaction term between growth opportunities in a sector and the merger activity of public firms in that year. We also cluster the standard error by 2-digit sic code of target. We also include target sector fixed effects and annual fixed effects. All the variables are described in Appendix A.

	(1) *num_priv*	*(2)* *num_priv*	*(3)* *num_priv*	*(4)* *num_priv*	*(5)* *num_priv*	*(6)* *num_priv*
num_pub_prev	-0.00715	0.00414	-0.00435	-0.00314	0.00587	0.00110
	(0.629)	(0.450)	(0.750)	(0.832)	(0.297)	(0.936)
num_pubxCAR_deal_prev	0.163			0.139		
	(0.204)			(0.262)		
CAR_deal_prev	0.0000267**			0.0000288**		
	(0.040)			(0.023)		
num_pubxCAR_bid_prev		-0.0314			-0.0348	
		(0.628)			(0.582)	
CAR_bidder_prev		-0.0000121			-0.00000272	
		(0.713)			(0.933)	
num_pubxtobinq_prev			0.00477			0.00211
			(0.552)			(0.789)
tobinq_prev			0.00000597*			0.00000699*
			(0.098)			(0.050)
HHindex_prev				-4.46e-09	-1.43e-09	-8.76e-10
				(0.138)	(0.452)	(0.581)
interest_rate_prev				0.00127	0.00933	0.0104
				(0.989)	(0.882)	(0.861)
sigma_prev				0.0297	0.00257	0.00294
				(0.413)	(0.694)	(0.641)
ret_prev				0.00298	0.00442	0.00392
				(0.515)	(0.197)	(0.225)
wave_prev				0.000118	0.00114	0.00128
				(0.992)	(0.886)	(0.866)
_cons	0.0000614***	0.0000584***	0.0000578***	-0.000151	-0.00122	-0.00137
	(0.000)	(0.000)	(0.000)	(0.991)	(0.886)	(0.864)
target Sector fixed effects (2 digit sic code)	Yes	Yes	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	765	1080	1155	742	1052	1126
adj. R-sq	0.086	0.107	0.113	0.089	0.113	0.113

Table 9: We analyze the acquisition strategies of private firms in response to the growth opportunities in the sector of the target. We use a linear regression model in order to analyze it. The dependent variable *Num_priv* is the ratio of number of deals by private acquirers at a 2-digit SIC code level deflated by total number of Compustat firms in that particular year. The variable of interest is the interaction term between growth opportunities in a sector and the merger activity of public firms in that year. We also cluster the standard error by 2-digit sic code of target. We also include target sector fixed effects and annual fixed effects. All the variables are described in Appendix A.

	(1) *num_priv*	*(2)* *num_priv*	*(3)* *num_priv*	*(4)* *num_priv*	*(5)* *num_priv*	*(6)* *num_priv*
value_pubxCAR_deal_prev	0.0000174			0.00000465		
	(0.862)			(0.962)		
Value_pub_prev	-0.00000680	-0.00000817	-0.0000213	-0.00000517	-0.00000786	-0.0000166
	(0.526)	(0.307)	(0.453)	(0.619)	(0.314)	(0.548)
CAR_deal_prev	0.0000292**			0.0000309**		
	(0.020)			(0.012)		
value_pubxCAR_bidder_prev		0.000195			0.000186	
		(0.414)			(0.423)	
CAR_bidder_prev		-0.0000194			-0.0000112	
		(0.549)			(0.725)	
value_pubxtobinq_prev			0.0000109			0.00000782
			(0.543)			(0.654)
tobinq_prev			0.00000627*			0.00000742**
			(0.081)			(0.037)
HHindex_prev				-4.42e-09	-7.25e-10	-2.55e-10
				(0.141)	(0.681)	(0.866)
interest_rate_prev				0.00224	0.00830	0.0104
				(0.981)	(0.895)	(0.861)
sigma_prev				0.0295	0.00253	0.00299
				(0.415)	(0.698)	(0.636)
ret_prev				0.00318	0.00408	0.00373
				(0.489)	(0.235)	(0.248)
wave_prev				0.000240	0.00101	0.00127
				(0.984)	(0.899)	(0.866)
_cons	0.0000610***	0.0000587***	0.0000575***	-0.000281	-0.00108	-0.00137
	(0.000)	(0.000)	(0.000)	(0.982)	(0.899)	(0.864)
Target Sector fixed effects (2 digit sic code)	Yes	Yes	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	765	1080	1155	742	1052	1126
adj. R-sq	0.086	0.108	0.113	0.089	0.112	0.113

Table 10: We analyze the acquisition strategies of private firms in response to the growth opportunities in the sector of the target. We use a linear regression model in order to analyze it. The dependent variable *Value_prop_priv* is the ratio of total value of deals by private acquirers at a 2-digit SIC code level deflated by total value of assets by 2-digit sic code in that particular year. The variable of interest is the interaction term between growth opportunities in a sector and the merger activity of public firms in that year. We also cluster the standard error by 2-digit sic code of target. We also include target sector fixed effects and annual fixed effects. All the variables are described in Appendix A.

	(1) *value_priv*	*(2)* *value_priv*	*(3)* *value_priv*	*(4)* *value_priv*	*(5)* *value_priv*	*(6)* *value_priv*
num_pub_prev	-39.49			-49.18**		
	(0.104)			(0.049)		
num_pubxCAR_deal_prev	1.086	3.794**	0.312	3.137	4.599**	1.275
	(0.699)	(0.040)	(0.947)	(0.296)	(0.020)	(0.793)
CAR_deal_prev	0.0169***			0.0193***		
	(0.002)			(0.001)		
num_pubxCAR_bid_prev		-12.47			-12.61	
		(0.568)			(0.569)	
CAR_bidder_prev		-0.00493			-0.00371	
		(0.657)			(0.744)	
num_pubxtobinq_prev			1.845			1.312
			(0.502)			(0.642)
tobinq_prev			0.000640			0.000717
			(0.605)			(0.574)
HHindex_prev				-0.000000929	-0.000000609	9.63e-08
				(0.323)	(0.360)	(0.865)
interest_rate_prev				1.833	5.875	0.699
				(0.951)	(0.790)	(0.974)
sigma_prev				1.816	0.335	0.398
				(0.873)	(0.883)	(0.860)
ret_prev				1.542	1.270	0.997
				(0.282)	(0.291)	(0.388)
wave_prev				0.228	0.741	0.0832
				(0.952)	(0.791)	(0.975)
_cons	0.00788*	0.00748*	0.00656	-0.243	-0.786	-0.0913
	(0.085)	(0.084)	(0.125)	(0.951)	(0.791)	(0.975)
Target Sector fixed effects (2 digit sic code)	Yes	Yes	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	765	1080	1155	742	1052	1126
adj. R-sq	0.060	0.068	0.065	0.060	0.070	0.065

Table 11: We analyze the acquisition strategies of private firms in response to the growth opportunities in the sector of the target. We use a linear regression model in order to analyze it. The dependent variable *value_prop_priv* is the ratio of total value of deals by private acquirers at a 2-digit SIC code level deflated by total value of assets by 2-digit sic code in that particular year. The variable of interest is the interaction term between growth opportunities in a sector and the merger activity of public firms in that year. We also cluster the standard error by 2-digit sic code of target. We also include target sector fixed effects and annual fixed effects. All the variables are described in Appendix A.

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
	value_priv	*value_priv*	*value_priv*	*value_priv*	*value_priv*	*value_priv*
value_pubxCAR_deal_prev	0.0197			0.0150		
	(0.509)			(0.619)		
value_pub_prev	-0.00244	-0.00277	-0.00619	-0.00191	-0.00277	-0.00590
	(0.445)	(0.305)	(0.525)	(0.557)	(0.313)	(0.551)
CAR_deal_prev	0.00120			0.00117		
	(0.749)			(0.759)		
value_pubxCAR_bidder_prev		0.0593			0.0583	
		(0.460)			(0.474)	
CAR_bidder_prev		-0.00696			-0.00660	
		(0.524)			(0.556)	
value_pubxtobinq_prev			0.00314			0.00282
			(0.610)			(0.652)
tobinq_prev			0.000777			0.000981
			(0.529)			(0.440)
HHindex_prev				-0.000000870	-8.90e-09	0.000000506
				(0.355)	(0.989)	(0.348)
interest_rate_prev				2.452	5.215	0.541
				(0.934)	(0.814)	(0.980)
sigma_prev				1.552	0.354	0.445
				(0.891)	(0.877)	(0.844)
ret_prev				1.625	1.102	0.899
				(0.258)	(0.362)	(0.437)
wave_prev				0.305	0.656	0.0623
				(0.936)	(0.815)	(0.982)
_cons	0.00786*	0.00774*	0.00658	-0.325	-0.696	-0.0699
	(0.085)	(0.074)	(0.124)	(0.935)	(0.815)	(0.981)
Target Sector fixed effects (2 digit sic code)	Yes	Yes	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	765	1080	1155	742	1052	1126
adj. R-sq	0.057	0.065	0.061	0.058	0.066	0.062

Table 12: We analyze the acquisition strategies of private firms in response to the growth opportunities of acquirer's sector. We use a linear regression model in order to analyze it. The dependent variable *Num_priv* is the ratio of number of deals aggregated by private acquirers at a 2-digit SIC code level deflated by total number of Compustat firms in that particular year. We also cluster the standard error by 2-digit sic code of acquirer. We also include acquirer sector fixed effects and annual fixed effects. All the variables are described in Appendix A. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

	(1)	*(2)*
	num_priv	*num_priv*
tobinq_sic2_prev	0.0000139*	0.0000389***
	(0.065)	(0.006)
HHindex_prev		-9.89e-10
		(0.872)
interest_rate_prev		0.00153***
		(0.000)
sigma_sic2_prev		0.122
		(0.380)
ret_sic2_prev		-0.0138
		(0.141)
wave_prev		-0.00000348
		(0.934)
_cons	0.0000897***	-0.000101
	(0.000)	(0.174)
Acquirer Sector fixed effects	Yes	Yes
Annual fixed effects	Yes	Yes
N	2165	1381
adj. R-sq	0.362	0.339

Table 13: We analyze the acquisition strategies of private firms in response to the growth opportunities of acquirer's sector. We use a linear regression model in order to analyze it. The dependent variable *Value_priv* is the ratio of total value of deals aggregated by private acquirers in year n divided by total value of assets in the acquirer's 2 digit sic in that year. We also cluster the standard error by 2-digit sic code of acquirer. We also include acquirer sector fixed effects and annual fixed effects. All the variables are described in Appendix A. *, **, and *** denote an estimate significantly different from 0 at the 10%, 5%, and 1% level, respectively.

	(1)	*(2)*
	value_priv	*value_priv*
tobinq_sic2_prev	0.00184*	0.00327*
	(0.078)	(0.096)
HHindex_prev		0.00000207**
		(0.015)
interest_rate_prev		0.191***
		(0.000)
sigma_sic2_prev		12.52
		(0.515)
ret_sic2_prev		-0.897
		(0.489)
wave_prev		-0.00194
		(0.739)
_cons	0.00391	-0.0154
	(0.118)	(0.135)
Acquirer Sector fixed effects	Yes	Yes
Annual fixed effects	Yes	Yes
N	2165	1381
adj. R-sq	0.034	0.055

Table 14: We analyze the acquisition strategies of private firms in response to the growth opportunities in the sector of the target. We use a linear regression model in order to analyze it. The dependent variable *Num_prop_priv* is the ratio of number of deals by private acquirers at a 2-digit SIC code level deflated by total number of Compustat firms in that particular year. The variable of interest are CAR of deal, CAR of acquirer and Tobin's Q. We also cluster the standard error by 2-digit sic code of target. We also include target sector fixed effects and annual fixed effects. All the variables are described in Appendix A.

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
	num_ priv	*num_ priv*	*num_ priv*	*num _priv*	*num_ priv*	*num_ priv*
CAR_deal_prev	-0.00001			-0.00001		
	(0.250)			(0.483)		
CAR_bidder_prev		-0.0002***			-0.0002**	
		(0.009)			(0.035)	
tobinq_prev			0.00003***			0.00002***
			(0.001)			(0.008)
HHindex_prev				-1.65e-08**	-1.22e-08***	-8.12e-09**
				(0.028)	(0.005)	(0.032)
interest_rate_prev				0.303	0.106	0.139
				(0.202)	(0.568)	(0.434)
sigma_sic2_prev				0.00608	0.0128*	0.0119*
				(0.496)	(0.054)	(0.061)
ret_sic2_prev				0.00430	0.00696	0.00530
				(0.725)	(0.461)	(0.553)
wave_prev				0.0380	0.0132	0.0173
				(0.206)	(0.576)	(0.442)
_cons	0.000323***	0.000298***	0.000257***	-0.0402	-0.0140	-0.0183
	(0.000)	(0.000)	(0.000)	(0.207)	(0.577)	(0.441)
Target Sector fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	1569	2121	2337	1425	1935	2116
adj. R-sq	0.739	0.706	0.703	0.438	0.405	0.413

Table 15: We analyze the acquisition strategies of private firms in response to the growth opportunities in the sector of the target. We use a linear regression model in order to analyze it. The dependent variable *Value_priv* is the ratio of value of deals made by private acquirers in year n divided by total value of deals in the target's 2 digit sic in that year. The variable of interest are CAR of deal, CAR of acquirer and Tobin's Q ratio. We also cluster the standard error by 2-digit sic code of target. We also include target sector fixed effects and annual fixed effects. All the variables are described in Appendix A.

	(1) *value_priv*	*(2)* *value_priv*	*(3)* *value_priv*	*(4)* *value_priv*	*(5)* *value_priv*	*(6)* *value_priv*
CAR_deal_prev	0.0118***			0.0127***		
	(0.009)			(0.007)		
CAR_bidder_ prev		-0.0132*			-0.0133*	
		(0.064)			(0.067)	
tobinq _prev			-0.0029***			-0.00270**
			(0.005)			(0.012)
HHindex_prev				-3e-06	3.81e-08	1.7e-06
				(0.513)	(0.913)	(0.000)
interest_rate_prev				14.70	17.77	13.91
				(0.427)	(0.240)	(0.476)
sigma_sic2_prev				-0.268	0.0630	1.039
				(0.700)	(0.907)	(0.138)
ret_sic2_prev				2.155**	2.051***	2.085**
				(0.024)	(0.008)	(0.034)
wave_prev				1.859	2.242	1.751
				(0.427)	(0.242)	(0.479)
_cons	0.0223***	0.0189***	0.0229***	-1.969	-2.377	-1.856
	(0.000)	(0.000)	(0.000)	(0.428)	(0.242)	(0.479)
Target Sector fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Annual fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	1569	2121	2337	1425	1935	2116
adj. R-sq	0.196	0.156	0.526	0.204	0.162	0.542

Appendix A: Variable Definitions

Variable	Description	Formula
Acquirer private	A dummy variable which takes a value equal to 1 if the acquirer is a private firm and 0 otherwise	
Acquirer public	A dummy variable which takes a value equal to 1 if the acquirer is a public firm and 0 otherwise	
All cash	A dummy variable which takes a value equal to 1 if the deal is all cash and 0 otherwise	
All stock	A dummy variable which takes a value equal to 1 if the deal is all stock and 0 otherwise	
CAR_deal	CAR_deal is the average CAR for the deals done by the public acquirers with respect to the sector of the acquirer or target measured by 2 digit sic code in year n	
CAR_deal_prev	CAR_deal is the average CAR for the deals done by the public acquirers with respect to the sector of the acquirer or target measured by 2 digit sic code in year n-1	
CAR_bidder	CAR_bidder is the average CAR for the bidders done by the public acquirers with respect to the sector of the acquirer or target measured by 2 digit sic code in year n	
CAR_bidder_prev	CAR_bidder is the average CAR for the bidders done by the public acquirers with respect to the sector of the acquirer or target measured by 2 digit sic code in year n-1	
Deal value	Value of the deals	
Deals completed	A dummy variable which takes a value equal to 1 if the deal is completed and 0 otherwise	
Domestic	A dummy variable which takes a value equal to 1 if the deal is domestic and 0 otherwise	
EBIT_sales	EBIT_sales is the average EBIT to sales ratio of the sector of the acquirer or target based on their 2 digit sic code in year n	
EBITDA_sales	EBITDA_sales is the average EBIT to sales ratio of the sector of the acquirer or target based on their 2 digit sic code in year n	
HHindex	Market concentration by 2 digit sic code of acquirer or target's industry in year t	
HHindex_prev	Market concentration by 2 digit sic code of acquirer or target's industry in year t -1	
Horizontal	A dummy variable which takes a value equal to 1 if the acquirer and target share the same SIC and 0 otherwise	
Interest rate	Fed rate in the year t	
Interest rate prev	Fed rate in the year t-1	
num_priv	num_prop_priv is the ratio of number of deals made by private acquirers in year n divided by total number of firms in compustat in year n	
Number of deals	Number of deals completed	
ret_sector	Return of the sectors by 3 digit sic code in year t	
ret_sector_prev	Return of the sectors by 3 digit sic code in year t-1	
Target private	A dummy variable which takes a value equal to 1 if the target is a private firm and 0 otherwise	
Target public	A dummy variable which takes a value equal to 1 if the target is a public firm and 0 otherwise	
Tobinq	tobinq is the average tobinq for the public acquirers by FF12 or FF49 in the current year	$Item(at_t + csho_t*prc_t - ceq_t)/at_t$
Value _priv	value_prop_priv is the ratio of value of deals made by private	

Variable	Description	Formula
	acquirers in year n divided by total value of deals in the acquirer's or target's 2 digit sic/FF49/FF12 code in year n	

CHAPTER FIVE: CONCLUSION

General Conclusions and contributions of the thesis

In a growing literature on feedback effect which shows the effect of how asset prices influence investment decisions of managers our thesis aims to fill the gaps in the literature by studying, understanding and analyzing the importance of information and the role it plays in the decision making of managers pertaining to investment. We mainly focus on how certain events provides new sources of information to the managers of firms, how they learn from those events and how this learning shapes up their investment decisions. The thesis starts with how sources of information from block investments in other firms' influences potential follow up investments in the same set of firms (in terms of mergers and acquisitions). We then move on to how financial crisis hampered the amount of information available to managers and how monetary policies of central banks helped ease the constraint in information level available to managers. We also analyze how private acquirers learn from the strategies of public acquirers and use this learning in their own investment decisions pertaining to mergers and acquisitions. The thesis is a compilation of three independent papers which studies the learning of managers when presented with a source of information and how they use these information to make investment decisions.

From these papers, the thesis provides new empirical evidence that managers do make important investment decisions from the sources of information provided to them. In the first paper with the help of social network methodology and logistic regression models, we were able show that the likelihood of a firm becoming a potential acquirer increases because of the block investments it has in other firms. This increase in likelihood was because of the social connections which the manager of the blockholder was able to gain through the investment in other firms The main variables with which we measure the social network connections is degree centrality and eigenvector centrality measures. In addition, through the social connections, the likelihood of the blockholder completing the deal with the firm it had invested in also increased in the process. Firms that have been invested in also have a higher likelihood of being a target and the social connections they develop through these investments help them complete the deal with the blockholder. Through these findings, we were able to establish that a network of block investments significantly influences the managerial investment decisions from the perspective of mergers and acquisitions. With these findings, we were able to contribute to the growing social network literature.

The second empirical paper analyzes the impact of the unconventional monetary policies on the investment pattern of financially constrained firms. With the help of Hadlock and Pierce's Age-Size index (2010), we were able to define if a firm is financially constrained or not. With the help of differences in difference methodology, we were able to show that the financial crisis of 2007-08 had significantly and negatively impacted the trading volume, liquidity and price informativeness of an average firm. This effect was even more pronounced for financially constrained firms in comparison to unconstrained firms. Hence the financial crisis hampered the amount of information that the manager of a financially constrained firm has for his investment decisions. In order to ease the financial constraints of firms and the frictions created by the crisis in the economy, unconventional monetary policies were announced by the Federal

Reserve. With the help of an event study, we were able to observe that the market perceived the unconventional monetary policies of Federal Reserve to be more beneficial for the stocks of financially constrained firms. The stocks of the financially constrained firms reacted more positively than the unconstrained firms. With a differences in difference methodology, we were also able to show that the Federal Reserve were able to ease the constraints of an average firm from the perspective of liquidity and price informativeness. This easing effect is much higher for financially constrained firm in comparison to their unconstrained counterparts. A higher price informativeness indicates that the amount of information available to managers of financially constrained firms had increased and therefore the managers can now make investment decisions with the information available to them. We also find that the investment price sensitivity of constrained firms did not improve significantly following the policy announcements. This signifies that despite the improvement of price informativeness of their stocks, the managers of constrained firms were not ready to invest more in the period following the policy announcements of the Federal Reserve. The conditions were probably not conducive enough for investment from their learning. With these findings, we understood the policy implications of Federal Reserve better.

However, there is one major policy implication we understood through this paper. The reliance of managers of some firms on the stock market channel for access to information for their own decision making has also been underlined through various instances in this thesis. However, at certain times like the financial crisis of 2007-08, this reliance of the managers of those firms on the stock market channel for access of information becomes a bane as the stock market takes a beating. Through our thesis, we understood that the financially constrained firms take a bigger beating in terms of firm performance, investment and liquidity in comparison to unconstrained firms. Though we find that the Federal Reserve were able to alleviate the price informativeness and liquidity of the stocks of financially constrained firms, we did not find evidence for improvement in their investment in the period following the unconventional monetary policies. This is perhaps a signal that the central banks could have done more in terms of alleviating these frictions of the financially constrained firms. In addition, since most of the financially constrained firms are young firms, if the central banks and government could formulate policies which facilitates these firms with better access to debt capital, they would perhaps reduce their dependence on the stock market channel. This way these firms become much more resistant to fluctuations in the stock market and are not as affected by financial crises of the future.

The third paper of the thesis analyzes the learning of managers of private firms from the acquisition strategies of public firms and their investment response to that. The paper also analyzes the investment response of private acquirers to the growth opportunities in the sector of the public acquirers. We find that private acquirers imitate the acquisition strategies of public acquirers whenever their sector has higher merger activity and valuations. We also find that the private acquirers are attracted by the investor response to the acquisitions made by public acquirers in the previous years and make more acquisitions in the current year as a response to that. With the help of these results, we were able to add

to the feedback literature which show that managers use information from lagged asset prices. We were also able to show that private firms have a high investment price sensitivity despite having no source of information from their own stocks because of them not being listed and not having a secondary stock market for their stocks. Through these results, we were able to add to the neo-classical Q theorists, who show that firms will always redeploy assets whenever an investment opportunity arises. Our results are also supported by the findings of Foucault and Fresard (2018) where they demonstrate that private firms augment value creation by replicating the strategies of public firms though they do this from the perspective of product market strategies.

Limitations of the thesis and further research

In our first paper, our timeframe for the sample was from 2007 to 2012. One of the reasons for that the BVD Orbis database had data available only till 2012 when the paper was written. It would be better to see if the results which hold true for this timeframe, holds true for a bigger timeframe. We also could not establish that there is a direct correlation between cumulative abnormal returns of an acquirer, target or deal and the importance of that acquirer or target in the social network with the help of an event study. With a bigger sample and timeframe, it would be interesting to see if there is a link between the investor reaction to the merger announcement of a firm and its importance in the network. We could also see if the price informativeness of a public firm is correlated to the position of the firm in the social network.

Publicly available data of investments by private firms has been a major empirical problem in corporate finance. If data were available, it would be interesting to see if private firms made more capital investments in response to the growth opportunities in a sector instead of just looking at investments in the form of mergers and acquisitions. It would also be interesting to see if there is a tendency of private firms to imitate the investment patterns of public firms rather than acquisition strategies. We could also test if the private acquirers invest more in sectors which have higher investment price sensitivity. Also, we could analyze this more easily at a firm level rather than a sector level if the data was available. Therefore, our future research should focus on these aspects of investment price sensitivity once the data become available.

Sources Externes d'Information, Apprentissage et Décisions d'Investissement des Entreprises

Résumé

Comment les gestionnaires utilisent les sources externes d'information à leur disposition ? La thèse construite sur trois articles apporte une réponse à cette question du point de vue de l'investissement des entreprises. Le premier article montre qu'un réseau de blocs d'actionnariat, mis en place par des acquéreurs, a un impact significatif sur la probabilité de succès de ses futures acquisitions. Cet effet de réseau aide également les sociétés cibles lors de ces opérations. Le deuxième document examine l'impact des politiques monétaires non conventionnelles de la Réserve fédérale américaine sur les entreprises souffrant de contraintes financières. Alors que l'informativité des prix des titres de ces entreprises avait été considérablement entravée pendant la crise financière, celle-ci est revenue à son niveau d'avant crise suite aux mesures d'assouplissement quantitatif prises par la Réserve fédérale américaine. Le troisième article étudie la manière dont les entreprises non-cotées apprennent des stratégies d'acquisition mises en place par les entreprises cotées et comment elles les mettent ensuite en œuvre. Cet article démontre, également, que les entreprises non-cotées tirent parti des opportunités de croissance valorisées par les marchés financiers dans des secteurs donnés, en investissant dans ces derniers.

Mots clefs français : Apprentissage managérial, fusions et acquisitions, investissement, information

External Sources of Information, Managerial Learning and Investment decisions of firms

Abstract

How do managers utilize the sources of information available to them? The thesis provides an answer for this question from the perspective of corporate investment in the form of three papers. The first paper shows that a network of block investments by acquirers has a significant impact on the probability of deal success. This network effect is observed to help the targets as well from the perspective of mergers and acquisitions. The second paper investigates the impact of unconventional monetary policies of the Federal Reserve on the financially constrained firms. While the price informativeness of financially constrained firms were significantly hampered during the financial crisis, the price informativeness of the stocks has rebounded to normalcy thanks to the quantitative easing measures by the Federal Reserve. The third paper provides an answer on how private firms learn from the acquisition strategies of public firms and then implement their strategies for their own benefit. The paper also provides evidence for the private firms to learn from growth opportunities for public firms in a certain sector and invest in those sectors based on these learnings.

Keywords: Managerial Learning, Mergers and Acquisitions, Investment, Sources of Information

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