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**The effects of
financing constraints
on firms' use of trade
credit and other
alternative financing
sources**

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Abstract

This thesis consists of four essays investigating the effects of financing constraints on firms' use of trade credit (TC) and other alternative financing sources. We aim to contribute to the debate in the literature about the relationship between bank loan (BL) and TC, to add new insights into the usage of alternative financing sources by Small and Medium-sized Enterprises (SMEs), and to provide the first evidence on the choice of large listed firms between commercial paper (CP) and TC. In the first essay, we investigate the effects of BL constraints on the use of TC by Vietnamese firms across size. We find that bank-constrained large firms rely on TC more than bank-constrained SMEs. Particularly, we find that denied large firms use more TC whereas denied SMEs use less of it. In the second essay, we study the effects of BL constraints on firm's use of TC across size, age and institutional development by using an international sample. Our results suggest that TC and BL tend to be substitutes for larger, older firms and those in developed countries with stronger institutional development; and complements for smaller, younger firms and those in developing countries with weaker institutional development, especially when constraints relate to credit denial. In our third essay, we investigate the effects of BL constraints on the use of six alternative financing sources by SMEs worldwide, i.e. TC, leasing, credit cards, informal finance, sources from family and friends and equity. Our results generally suggest that bank-constrained SMEs tend to rely more on sources from family and friends and those from money lenders. We also find that they use alternative financing to finance working capital requirement to a greater extent as compared to new investments. In the last essay, by using a sample of nonfinancial S&P 500 firms, we examine the interplay between the use of CP, bank credit lines (CL) and TC for the period 2003-2014. Our results suggest that firms with higher rollover risk borrow more from CL and TC relative to CP with a stronger effect for CL. We also find that higher level of asymmetric information is associated with more usage of CL and TC relative to CP while more severe moral hazard problems are associated with more usage of CP relative to CL and TC. Besides, our results indicate that firms tend to use less TC and more CL during the financial crisis. Overall, the first and second essays highlight the impact of size and financial development on the relationship between BL and TC, the third essay emphasizes the heavy reliance on informal sources of SMEs, and the last essay provides evidence on the substitutability between CP, CL and TC.

Keywords: bank loan constraints, discouraged firms, trade credit, alternative financing sources, bank credit lines, commercial paper, Small and Medium-sized Enterprises (SMEs)

Résumé

Cette thèse se compose de quatre essais portant sur les effets des contraintes de financement bancaire sur l'utilisation du crédit commercial (TC) et d'autres sources alternatives de financement des entreprises. Nous visons à contribuer au débat ayant lieu dans la littérature sur la relation entre l'emprunt bancaire (BL) et le TC, d'ajouter de nouvelles connaissances sur l'utilisation de sources alternatives de financement par les petites et moyennes entreprises (PME), et à fournir la première étude sur le choix par les grandes entreprises cotées en bourse entre le papier commercial (CP) et le TC. Dans le premier essai, nous étudions les effets des contraintes sur BL sur l'utilisation du TC par les entreprises vietnamiennes. Nous étudions plus particulièrement l'effet de la taille sur le choix entre les deux types de financement. Nous constatons que les grandes entreprises lorsqu'elles sont rationnées sur les BL comptent plus sur le TC que les PME. En particulier, nous constatons que les grandes entreprises dont la demande de crédit a été refusée utilisent plus de TC tandis que les PME dans la même situation en utilisent moins. Dans le deuxième essai, nous étudions les effets des contraintes sur les BL sur l'utilisation du TC en fonction de la taille et de l'âge des entreprises ainsi que du développement institutionnel des différents pays. Nos résultats suggèrent que le TC et le BL ont tendance à être des substituts pour les entreprises les plus grandes, les plus âgées et lesquelles situées dans les pays développés (développement institutionnel plus fort). En revanche, le TC et le BL sont complémentaires pour les entreprises les plus jeunes, les plus petites et lesquelles situées dans les pays en développement (développement institutionnel faible). Ce résultat est particulièrement net dans le cas où la demande de crédit est refusée. Dans notre troisième essai, nous étudions les effets des contraintes sur les BL sur l'utilisation de six sources alternatives de financement par les PME dans le monde entier. Les formes de financement étudiées sont : le TC, le crédit-bail, les cartes de crédit, la finance informelle, les fonds provenant de la famille et des amis et les capitaux propres. Nos résultats suggèrent généralement que les PME rationnées par les banques ont tendance à compter davantage sur les fonds de la famille et des amis et sur les prêts des usuriers. Nous trouvons aussi qu'elles utilisent les modes de financement alternatifs plutôt pour financer le fonds de roulement que pour financer de nouveaux investissements. Dans le dernier essai, à partir d'un échantillon d'entreprises non financières du S&P 500, nous examinons l'interaction entre l'utilisation du CP, des lignes de crédit bancaire (CL) et du TC sur la période 2003 à 2014. Nos résultats suggèrent que les entreprises avec le risque de refinancement le plus élevé empruntent plus sous la forme de CL et de TC que sous la forme de CP. Cet effet est plus fort pour les CL. Nous constatons également que plus le niveau d'asymétrie d'information est fort, plus les entreprises utilisent les CL et le TC par rapport à CP. En revanche, plus les problèmes d'aléa moral sont graves, plus les entreprises favorisent les CP par rapport aux CL et TC. En outre, nos résultats indiquent que les entreprises ont tendance à utiliser moins de TC et plus CL pendant la crise financière. Dans l'ensemble, les premier et deuxième essais mettent en évidence l'impact de la taille et du développement financier sur la relation entre BL et TC, le

troisième essai souligne la forte dépendance des PME aux sources informelles de financement, et le dernier essai fournit des preuves de la substituabilité entre CP, CL et TC.

Mots clés: contraintes sur l'emprunt bancaire, entreprises découragées, crédit commercial, sources alternatives de financement, lignes de crédit bancaire, papier commercial, Petites et Moyennes Entreprises (PME)

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Introduction Générale

Introduction Générale

Dans le monde des affaires, il est bien connu que les sources de financement externes sont l'un des principaux moteurs de la croissance de l'entreprise (Beck et al., 2005; Demirgüç-Kunt et Maksimovic, 1998; Fisman et l'Amour, 2003; Vermoesen et al., 2013). En particulier, le crédit bancaire (BC) est la source la plus commune de financement externe, notamment pour les Petites et Moyennes Entreprises (PME). Les estimations suggèrent qu'aux États-Unis les petites entreprises empruntent en moyenne environ 57% de leur dette auprès des banques et que cette fraction augmente à mesure que la taille des entreprises augmente (Petersen et Rajan, 1994). Partout dans le monde, en moyenne, 19,41% des investissements des entreprises sont financés par la dette bancaire tandis que les fonds propres, le crédit-bail, le crédit fournisseur, le financement du développement et de sources informelles financent respectivement 5,68%, 2,55%, 6,72%, 2,95% et 1,76% de l'investissement de l'entreprise (Beck et al., 2008b).

Cependant, de nombreuses entreprises dans le monde entier citent l'accès insuffisant au financement externe, en particulier le BC, comme l'une des contraintes les plus importantes pour le fonctionnement et la croissance de leur entreprise. Ces contraintes de financement sont particulièrement importantes pour PME en raison de leur manque de transparence informationnelle et de leur nature risquée. Le Rapport sur le Développement dans le monde 2004 (IBRD, Banque mondiale, 2004) indique que les petites entreprises sont 50 pour cent plus susceptibles que les grandes entreprises de se plaindre de difficulté d'accès au financement et d'un coût de financement trop élevé comme un obstacle majeur ou grave à leur fonctionnement. Selon l'enquête sur l'accès au financement des PME de la zone euro qui a été menée à l'été 2009 par la Banque Centrale Européenne (BCE) et la Commission européenne, 43% des PME qui sollicitent un prêt bancaire ont enregistré une baisse de la disponibilité des prêts bancaires durant la première moitié de l'année 2009, alors que seulement 10% ont indiqué une amélioration de leur situation financière.

En outre, la littérature financière a montré de façon constante que les PME sont plus susceptibles d'être financièrement contraintes que les grandes entreprises (Beck et al., 2008b, 2005; Berger et al., 2001; Berger et Udell, 1998; Canton et al., 2013; Joeveer 2013; Vermoesen et al., 2013). L'explication la plus convaincante est que les PME sont plus informationnellement opaques que les grandes entreprises. Elles font donc face à des problèmes plus graves de sélection adverse et d'aléa moral et par conséquent, sont plus susceptibles d'être rationnées (Stiglitz et Weiss, 1981). A part le rationnement du crédit, les banques peuvent mettre en place d'autres mécanismes pour faire face à l'asymétrie d'information et à ses conséquences. En effet, les banques peuvent appliquer des mécanismes d'auto-sélection en utilisant différents contrats afin de distinguer les bons des mauvais emprunteurs. Ces derniers peuvent être obligés de fournir des garanties et payer le taux d'intérêt correspondant à leur niveau de risque (Bester, 1985). Lorsque les entreprises ne sont pas en mesure de remplir ces conditions, elles peuvent choisir de ne pas postuler pour un

financement bancaire. Autrement dit, ces entreprises sont découragées par les conditions d'accès au crédit, ce qui représente un autre type de contrainte de financement (Kon et Storey, 2003).

De plus, comme les PME ont un accès limité ou inexistant aux marchés des capitaux, leur dépendance aux institutions financières pour le financement externe aggrave leur vulnérabilité aux chocs du système bancaire (Berger et Udell, 2002). De même, puisque les PME ont moins de possibilités de financement, une réduction de la disponibilité du financement bancaire est susceptible d'avoir un impact plus grand sur les PME que sur les grandes entreprises (Beck et al., 2008b, 2005). En particulier, lorsque l'accès aux prêts bancaires est limité, les PME ont tendance à compter sur des sources de financement alternatives, telles que le crédit commercial (TC) ou des sources informelles.

Au cours des dernières années, les liens entre l'accès au BC et de l'utilisation du TC ont constitué un sujet important de la recherche sur le financement des entreprises. L'explication de cet intérêt réside dans le fait que le TC se révèle être le premier substitut à court terme à un prêt bancaire. Les estimations suggèrent que les comptes créditeurs représentent 26% du passif des entreprises américaines à la fin de 1992 (Mian et Smith, 1992), et 17,8% des actifs totaux pour toutes les entreprises américaines en 1991 (Petersen et Rajan, 1995). Plus de 80% des transactions business-to-business au Royaume-Uni sont faites en utilisant un TC (Wilson et Summers, 2002), tandis que 70% des petites entreprises américaines offrent du crédit à leurs clients (Petersen et Rajan, 1997). Alors que le ratio de la dette bancaire à court terme sur l'actif total pour les PME italiennes est de 10,69%, le ratio de la dette commerciale (dette à court et à long terme) sur l'actif total est de 17,24% (Agostino et Trivieri, 2014). À l'échelle internationale, l'utilisation des TC est encore plus élevée et peut dépasser le BC (Blasio, 2005; Petersen et Rajan, 1995).

La littérature a montré que le TC est particulièrement important pour les entreprises petites et jeunes qui sont souvent contraintes financièrement par les banques (Allen et al., 2005; Blasio, 2005; Casey et O'Toole, 2014; Petersen et Rajan, 1995, 1994; Van Horen, 2004; Walker, 1989; Yang, 2011), et dans les pays avec un niveau faible de développement financier et de protection juridique (Burkart et Ellingsen, 2004; Demirgüç-Kunt et Maksimovic, 2001; Fisman et Love, 2003). Cependant, bien que la relation entre la disponibilité et l'utilisation de BC et de TC ait attiré l'attention des chercheurs, il existe de nombreuses approches et théories différentes pour explorer cette relation.

D'une part, plusieurs études suggèrent que le TC a un potentiel pour servir de financement de dernier recours pour les entreprises financièrement contraintes (Cuñat, 2007; Mateut et al, 2006; Nilsen, 2002; Petersen et Rajan, 1997, 1995, 1994). Le fait que le TC puisse être disponible pour les entreprises lorsque l'accès au financement bancaire est rationné suggère un effet de substitution (une corrélation négative) entre ces deux sources de financement. Ce courant de recherche postule généralement que le TC est plus cher que le BC, mais représente une meilleure solution pour surmonter les problèmes d'asymétrie d'information et d'agence. L'hypothèse de substitution entre TC et BC soulève la question de savoir pourquoi TC est

disponible lorsque le prêt bancaire ne l'est pas. Une explication courante est que, par rapport aux institutions financières, les fournisseurs de TC peuvent avoir plusieurs avantages, comme une meilleure acquisition de l'information (Emery, 1984; Jain, 2001; Mian et Smith, 1992; Smith, 1987), un meilleur processus de liquidation (Frank et Maksimovic, 2005; Mian et Smith, 1992), un meilleur contrôle de l'emprunteur (Cuñat, 2007), une meilleure résolution des problèmes d'aléa moral (Burkart et Ellingsen, 2004), ou des conditions plus favorables liées à la renégociation grâce aux relations commerciales entre l'acheteur et le vendeur (Wilner, 2000).

D'autre part, un autre courant de recherche suggère que le BC et le TC sont complémentaires, ce qui implique que l'utilisation de deux sources de financement est positivement corrélée. Plus précisément, le TC permet de transférer les informations positives qu'ont les fournisseurs sur leurs clients aux banques. L'accord d'un TC est donc une information qui induit les banques à prêter. La disponibilité du BC augmente donc à mesure que l'utilisation du TC augmente (Agostino et Trivieri, 2014; Biais et Gollier, 1997; Burkart et Ellingsen, 2004; Cook, 1999). Les études empiriques mettent en évidence le rôle informationnel des TC notamment pour les petites entreprises puisque ces entreprises sont plus informationnellement opaque et sont plus dépendantes du financement bancaire (Berger et Udell, 1995; Cole, 1998; Petersen et Rajan, 1997, 1995, 1994).

Comme nous pouvons le voir, la discussion sur la nature de la relation entre le BC et le TC est typiquement une question empirique. La littérature fournit des résultats mitigés, et la question de savoir si le BC et le TC sont des substituts ou des compléments est encore un débat ouvert.

Les entreprises financièrement contraintes, notamment les PME, peuvent également compter sur des sources alternatives telles que le crédit-bail (Cosci et al., 2015; Severin et Filareto-Deghaye, 2007), les sources informelles, y compris les fonds des famille et des proches (Allen et al., 2012a, 2012b; Bell, 1990; Ghosh et al., 2000; Petersen et Rajan, 1994), subventions publiques (Beck et al., 2010; Oh et al., 2009), ou le financement par le marché (Kashyap et al., 1993; Leary, 2009; Myers et Majluf, 1984). L'utilisation et la disponibilité des sources informelles jouent un rôle important pour la croissance de l'entreprise et sa performance, en particulier dans le contexte des pays en développement, où le développement financier et la protection juridique sont relativement faibles (Allen et al., 2012a, 2012b, 2005; Yiu et al., 2013). Ces sources sont particulièrement répandues parmi les petites entreprises qui sont souvent contraintes financièrement par les banques et sont moins susceptibles de se voir offrir d'autres sources de financement (par exemple, financement de marché). Cependant, dans la littérature il y a peu de recherche sur l'effet des contraintes de crédit sur l'utilisation de ces sources.

Alors que les petites entreprises sont susceptibles d'être financièrement contraintes même en période de fonctionnement normal des systèmes financiers, les grandes entreprises peuvent faire face à de sévères contraintes en matière de financement dans les moments difficiles, tels que les crises financières. Les études suggèrent que les nouveaux prêts aux gros emprunteurs

ont diminué de 47% au cours de la période de pointe de la crise financière (quatrième trimestre 2008) par rapport au trimestre précédent et de 79% par rapport au deuxième trimestre de 2007 (Ivashina et Scharfstein, 2010). En outre, les contraintes de financement rencontrées par les PME concernent principalement les financements bancaires alors que pour les grandes entreprises, les contraintes de financement peuvent également concerner la restriction de l'accès aux marchés de capitaux tels que le marché du papier commercial (CP), les marchés obligataires ou les marchés boursiers. CP offre la source de financement à court terme au coût le plus bas et est donc généralement préféré par les grandes entreprises dans des circonstances normales (Gatev et Strahan, 2006; Kahl et al., 2015). Pour compenser une réduction des emprunts en CP lors d'un choc financier, les entreprises peuvent emprunter dans leur ligne de crédit de sauvegarde (CL) (Demiroglu et James, 2011; Gao et Yun, 2009; Gatev et Strahan, 2006). Toutefois, les entreprises plus fragiles financièrement peuvent rencontrer des difficultés dans le renouvellement de leur CL pendant les crises financières (Demiroglu et James, 2011).

En outre, alors que le TC a tendance à être particulièrement important pour les petites entreprises, la littérature suggère également que les grandes entreprises sont plus susceptibles de se voir offrir plus de TC par leurs fournisseurs parce qu'ils ont un meilleur risque de crédit et un plus grand pouvoir de négociation (Danielson et Scott, 2004; Giannetti et al., 2011; Petersen et Rajan, 1997; Wilson et Summers, 2002). Une question se pose donc: est-ce que les grandes entreprises utilisent le TC comme un substitut à la baisse des émissions de CP et des emprunts de CL, surtout en temps de crise, quand la liquidité du marché est rare et les spreads des CP se creusent? Alors que la substituabilité entre dette bancaire et le TC, et entre le CL et le CP a été documentée dans la littérature financière, il n'y a aucune étude mettant en lumière la relation entre l'utilisation de CP et le TC ainsi que le lien entre ces trois alternatives potentielles.

L'objectif de ce travail est de fournir, d'une part, un éclairage supplémentaire sur la relation entre le rationnement du BC et l'utilisation du TC et d'autres sources alternatives de financement (un accent particulier sera mis sur les PME); et, d'autre part, de faire la lumière sur la relation entre le CP, la CL et le TC dans le cas des grandes entreprises cotées en bourse. Notre problématique de recherche est donc formulée comme suit:

Quels sont les effets des contraintes de financement sur l'utilisation du TC et d'autres sources de financement alternatives par les entreprises?

Comme indiqué précédemment, la littérature sur le TC montre généralement que les grandes entreprises grâce à leur solvabilité élevée et un pouvoir de négociation plus fort peuvent emprunter davantage auprès de leurs fournisseurs alors que les PME sont souvent demandeurs de TC. Dans leur modèle théorique, Burkart et Ellingsen (2004) ont montré que les entreprises les plus riches n'ont pas besoin d'avoir recours au TC alors que les entreprises ayant un niveau intermédiaire de richesse peuvent utiliser le TC comme substitut aux prêts bancaires et finalement pour les entreprises les moins riches le TC et le BC peuvent être complémentaires. En outre, un courant important de la littérature a montré que les problèmes

de la petite entreprise sont spécifiques et que leurs modes de financement sont significativement différents de ceux des grandes entreprises (Beck et al., 2008b, 2005; Canton et al., 2013; Psillaki et Daskalakis, 2009; Vermoesen et al., 2013). Par conséquent, on peut s'attendre à ce que la distinction et la comparaison entre les grandes entreprises et les PME peuvent fournir des indications supplémentaires sur la relation entre le BC et le TC. Dans la littérature, l'impact potentiel de la taille sur cette relation entre les deux formes de financement reste insuffisamment exploré.

La plupart des études sur la relation entre les contraintes sur les financements bancaires et l'utilisation des TC ont été réalisées dans les pays développés. Ainsi, une enquête plus poussée sur les pays en développement fournira une contribution essentielle à cette question. En outre, le niveau d'utilisation de TC peut varier d'un pays à l'autre. Une comparaison des données comptables des pays industrialisés montre que les comptes clients ont une médiane comprise entre 13% et 40% des ventes (Seifert et al., 2013). Dans les pays où la protection juridique est plus faible et qui connaissent un moindre développement des intermédiaires financiers, l'accès aux prêts bancaires est plus difficile. Dans ces pays, les TC semblent être plus fréquente (Burkart et Ellingsen, 2004; Demirgüç-Kunt et Maksimovic, 2001; Fisman et Love, 2003). On peut donc s'attendre à ce que les effets des contraintes bancaires dépendent également du développement institutionnel des pays. Ce point n'a pas été exploré dans les études précédentes.

En outre, les sources informelles de financement comme les prêts d'usuriers et les fonds apportés par la famille et les parents sont plus susceptibles d'être utilisés par les PME. Par conséquent, dans notre étude de l'effet des contraintes sur les BC sur l'utilisation d'autres sources de financement, nous nous concentrons sur les PME. Cependant, nous étudierons le lien entre le CP, les CL et le TC pour les grandes entreprises cotées, puisque ces entreprises sont plus susceptibles d'avoir accès au marché du CP.

Notre problématique de recherche conduit donc à de multiples questions, qui sont synthétisées comme suit :

Quels sont les effets des contraintes sur les BC sur l'utilisation de TC par les entreprises? Le TC et le BC sont-ils des substituts ou des compléments? Y a-t-il des différences entre les différents types de contraintes bancaires? Est-ce que la taille des entreprises affecte la relation entre les contraintes bancaires et l'utilisation de TC?

Est-ce que le développement institutionnel du pays affecte la relation entre les contraintes bancaires et l'utilisation de TC?

Quels sont les effets des contraintes bancaires dans l'utilisation par les PME d'autres sources de financement? Est-ce qu'il y a des différences dans l'utilisation de ces sources pour financer les besoins en fonds de roulement ou de nouveaux investissements?

Quels sont les déterminants de l'utilisation du CP, des CL et du TC par les grandes entreprises cotées en bourse? Quelle est la relation entre ces trois sources?

Pour répondre à ces questions, notre thèse comprend quatre essais sur les effets des contraintes de financement sur l'utilisation du TC et d'autres sources de financement alternatives. Dans le chapitre 1, nous fournissons une revue de la littérature sur les contraintes sur les prêts bancaires et le lien avec l'utilisation du TC et d'autres sources de financement alternatives avec un accent mis sur les PME. Nous commençons par fournir une discussion sur les imperfections du marché des capitaux qui expliquent pourquoi les contraintes de financement peuvent exister et montrent comment les PME sont plus touchées négativement par ces imperfections. En examinant à la fois la littérature théorique et empirique concernant l'existence du TC, nous montrons que la nature différente de la relation (complémentaire ou substituable) entre BC et TC reste non résolue et doit être approfondie. Nous identifions également les limites dans les études précédentes, afin de déterminer les points qui seront abordés dans le reste de la thèse. En outre, les effets potentiels des contraintes bancaires sur l'utilisation du TC nous incitent à faire une enquête similaire pour d'autres sources de financement alternatives. En outre, en montrant que l'asymétrie d'information et les problèmes d'aléa moral sont au cœur de la notion de contraintes de financement, nous proposons une recherche sur le lien entre les contraintes de financement liés aux CP et TC.

Dans le chapitre 2, nous examinons les effets des contraintes bancaires sur l'utilisation des TC par des entreprises vietnamiennes et si ces effets varient selon la taille de l'entreprise et le type de contrainte bancaire. Cet essai fait trois principales contributions à la littérature en gestion financière. Tout d'abord, nous étudions pour la première fois le lien entre les contraintes de financement et l'utilisation du TC par les entreprises vietnamiennes. Deuxièmement, en utilisant les données à partir d'une enquête auprès des entreprises menée par la Banque mondiale en 2005 (World Bank Enterprise Survey-WBES), nous sommes en mesure de distinguer, pour la première fois, trois types de contraintes financières, à savoir le refus de crédit, les entreprises découragées et celles qui ont des demandes en attente de réponse; et quatre types d'entreprises découragées, à savoir ceux qui ne demandent un prêt bancaire en raison de la lourdeur des procédures de demande de prêts, des exigences trop strictes de garanties, des taux d'intérêt élevés et de l'attente d'un refus. Cette distinction nous permet de fournir de nouvelles connaissances sur le lien entre les contraintes bancaires et l'utilisation du TC ainsi que de contribuer à littérature embryonnaire sur les entreprises découragées. Troisièmement, nous ajoutons quelques indications supplémentaires sur l'impact de la taille (grande entreprises et PME) sur le lien entre le BC et le TC. De cette façon, nous étendons la littérature existante sur l'effet des contraintes de financement sur l'utilisation des TC en montrant que la nature de la relation, substitution ou complémentarité, entre les deux sources de financement est entraînée par taille des entreprises. Alors que les deux sources de financement ont tendance à être des substituts pour les grandes entreprises, ils semblent être des compléments pour les PME.

Dans le chapitre 3, nous étudions l'effet des contraintes sur les prêts bancaires sur l'utilisation du TC selon la taille et l'âge de l'entreprise et le développement institutionnel des pays. L'utilisation d'une base de données internationale de 36 pays compilée à partir de deux enquêtes WBES en 2005, nous permet d'examiner séparément les effets de refus de prêt, des demandes en instance et des entreprises découragées. Ce chapitre fournit d'une part une

preuve supplémentaire de l'effet de la taille et de l'âge des entreprises sur la relation entre l'emprunt bancaire et le TC. D'autre part, alors qu'il y a peu de recherches analysant les effets de la disponibilité des prêts bancaires sur l'utilisation des TC au niveau international, nous avons étudié l'impact du développement institutionnel des pays sur la relation entre les deux sources de financement. La principale contribution de l'essai est de montrer que la relation entre emprunt bancaire et TC reflète le développement institutionnel du pays. Nous constatons que l'effet de substitution domine dans les pays au développement institutionnel plus élevé tandis que l'effet complémentaire domine dans les pays au développement institutionnel faible. Cet effet est particulièrement net lorsque les entreprises font face à un refus de crédit.

Dans le chapitre 4, nous fournissons une étude internationale sur les effets des contraintes bancaires sur l'utilisation de six sources de financement alternatives. L'étude porte sur les PME et les sources de financement suivantes: TC, crédit-bail, cartes de crédit, la finance informelle, les fonds fournis par la famille et les amis et les fonds propres. Dans cet essai, nous étudions également si ces effets diffèrent selon les formes de financement, le type de contrainte financière et objectif du financement. Bien que des études antérieures portant sur les effets de la disponibilité du BC sur l'utilisation du financement alternatif se concentrent souvent sur un seul pays (Allen et al., 2012; Bell, 1990; Cosci et al., 2015; Petersen et Rajan, 1997), cet essai ajoute à la littérature des analyses internationales sur ce sujet. Une autre contribution de cet essai est de comparer deux objectifs du financement, à savoir le besoin en fonds de roulement ou de nouveaux investissements. Nos résultats indiquent que les PME contraintes utilisent plus les canaux de financement alternatifs pour financer le fonds de roulement que pour financer de nouveaux investissements.

Dans le chapitre 5, nous examinons le choix entre l'utilisation du CP, des CL et du TC par des entreprises non financières du S&P 500 pendant la période 2003-2014, qui comprend la période de la crise financière mondiale. Cet essai est basé sur l'étude de Kahl et al. (2015) sur l'utilisation du financement par les CP des entreprises et la substituabilité entre le CP et les CL. La principale contribution de l'essai est de faire un premier pas dans l'exploration du lien entre le TC et le CP en comparant le crédit interentreprises à un instrument du marché monétaire. Nous fournissons en effet des preuves sur la substituabilité entre le CP et le TC. L'essai contribue également à la littérature sur le lien entre le CP et le BC et enrichit la littérature sur la comparaison entre le TC et le BC.

Chapter 1: Bank Loan Constraints, Trade Credit and Other Alternative Financing Sources: A Review of Literature

Abstract

This chapter aims to review the literature on the link between bank loan (BL) constraints and firm's usage of alternative sources with a focus on trade credit (TC). We begin by showing that capital market imperfections are at the root of financing constraints and explaining why SMEs are affected more adversely by these imperfections. In particular, we provide a discussion on two main types of BL constraints including credit rationing and self-credit rationing. Then, we examine both theoretical and empirical literature concerning the existence of TC with a focus on the link between BL constraints and TC usage. We highlight that the different nature of the relationship, substitute or complement, between BL and TC remains open to debate and needs further investigation. We also identify knowledge gaps in the literature linking BL constraints to the usage of other alternative financing sources, which we would like to address in the rest of the thesis.

Résumé

Ce chapitre se propose de fournir une revue de la littérature sur le lien entre les contraintes sur les prêts bancaires (BL) et l'utilisation des sources de financement alternatives par les entreprises avec un accent mis sur le crédit commercial (TC). Nous commençons par montrer que les imperfections du marché des capitaux se trouvent au cœur des contraintes de financement et expliquer pourquoi les PME sont plus touchées négativement par ces imperfections. Nous offrons particulièrement une discussion sur deux principaux types de contrainte bancaire: rationnement et autorationnement du crédit. En outre, nous examinons à la fois la littérature théorique et empirique concernant l'existence du TC avec un accent mis sur le lien entre les contraintes sur les BL et l'utilisation du TC. Nous soulignons que la nature différente de la relation, complémentaire ou substituable, entre le BL et le TC reste non résolue et doit être approfondie. Nous identifions également les limites dans la littérature sur le lien entre les contraintes bancaires et d'autres sources de financement alternatives, afin de déterminer les points qui seront abordés dans le reste de la thèse.

Chapter 1: Bank Loan Constraints, Trade Credit and Other Alternative Financing Sources: A Review of Literature

1.1 Introduction

In recent years, a topic of much interest in corporate finance research concerns the connections between access to bank loan (BL) and trade credit (TC) usage, which is to a large extent driven by the recognition that TC is the leading short-term substitute for BL, especially for Small and Medium-sized Enterprises (SMEs) (Casey and O'Toole, 2014; Mian and Smith, 1992; Petersen and Rajan, 1997, 1995; Van Horen, 2004; Walker, 1989; Wilson and Summers, 2002). However, many different approaches and theories exist to explore this relationship. Therefore, in this chapter, we examine both relevant theoretical and empirical literature.

A large body of literature demonstrates that informational asymmetries lie at the root of BL constraints (Stiglitz and Weiss, 1981). As a result, SMEs are more likely to be affected by financing constraints than large firms, since they are subject to more severe adverse selection and moral hazard problems due to their informational opaqueness (Beck et al., 2008b, 2005; Berger and Udell, 1998). Moreover, SMEs rely more on bank credit than large firms because they have no or restricted access to capital markets. They therefore have fewer finance options and thus have to rely on alternative sources such as TC when they are financially constrained by banks. Previous studies have indeed shown that younger, smaller firms have a higher demand for TC (Blasio, 2005; Mateut et al., 2006; Nilsen, 2002; Van Horen, 2004). Furthermore, there has been an increased interest in studies focusing on the SMEs sector, largely because SMEs worldwide are important engines of economic growth, innovation, and employment (Lawless, 2014; Levenson and Willard, 2000; Wit and Kok, 2014). Therefore, we provide a literature review on BL constraints with a focus on SMEs.

While several studies show the important role of TC as a credit source for firms, existing literature provides mixed evidence on the relationship between BL constraints and firm's use of TC. By describing BL constraints as consequence of asymmetric information, we show that TC can either a) compensate for a reduction in bank lending because TC is better than BL in resolving informational asymmetry and agency problems; or b) facilitate BL because TC may have an informational content for banks.

On the one hand, many theories of TC provision posit that compared to formal lenders, trade creditors have several advantages, e.g., in information acquisition, in renegotiation/liquidation process, and enforcement (Burkart and Ellingsen, 2004; Cuñat, 2007; Demirgüç-Kunt and Maksimovic, 2001; Fisman and Love, 2003; Jain, 2001; Smith, 1987). These arguments imply that TC may be available to firms when the access to bank

finance is restricted, suggesting a substitution effect with a negative correlation between the use of bank finance and the use of TC. The substitution effect finds empirical support in several studies that show that financially constrained firms rely more on TC (Cuñat, 2007; Mateut et al., 2006; Nilsen, 2002; Petersen and Rajan, 1997, 1995, 1994).

On the other hand, there is a strand of research suggesting that BL and TC are complements, implying that the usage of two sources is positively correlated. More specifically, TC may work as a signaling mechanism by revealing suppliers' private information to banks, thus enhances BL availability. This argument is theoretically suggested by Biais and Gollier (1997) and Burkart and Ellingsen (2004) and finds empirical evidence in a number of studies (Agostino and Trivieri, 2014; Biais and Gollier, 1997; Burkart and Ellingsen, 2004; Cook, 1999).

As we can see, the discussion of the nature of the relationship between BL constraints and TC usage is typically an empirical issue. We propose in this chapter to review the literature that has addressed this relationship. We show that the literature provides mixed results, and that the question as to whether BL and TC are substitutes or complements is still an open debate. Furthermore, in spite of the considerable research on BL constraints and their effects on firm's usage of TC, there is no study dedicated to reviewing this literature body. Seifert et al. (2013) provide a review of TC literature by analyzing four areas of inquiry: TC motives, order quantity decisions, credit term decisions, and settlement period decisions. In this chapter, our primary interest concerns the first area, i.e. TC motives, and the link with BL availability. Besides, we provide a review of TC literature from the perspective of both suppliers (supply side) and buyers (demand side) since most, if not all, studies on TC usage are drawn on TC provision research, an understanding of TC provision therefore can provide a better understanding of TC usage.

Besides, several studies demonstrate that financially constrained firms, especially SMEs, may also rely on other alternative sources such as informal finance provided by money lenders or by family and relatives (Allen et al., 2012a, 2012b, 2005; Beck et al., 2008b; Casey and O'Toole, 2014). Therefore, we also provide a summary of literature on firm's usage of those sources in relation with bank constraints.

We further observe that a recent trend of research is to link the literature in law and institutions to financial literature and to emphasize the effect of a country's legal and financial environment on the access to external financing of firms (Demirgüç-Kunt and Maksimovic, 1998; La Porta et al., 1997; Rajan and Zingales, 1998). In addition, many studies show that the development of financial markets and institutions should disproportionately benefit small firms (Beck et al., 2008a, 2008b, 2005). By providing a summary of this research strand, we point out that the question concerning the impact of institutional development on the relationship between BL constraints and TC use remains unexplored.

This chapter is organized as follows. The second section is dedicated to presenting the theoretical foundations and empirical evidence of BL constraints by highlighting a greater relevance to SMEs. We begin by providing a discussion on capital market imperfections that explain why financing constraints may occur to firms and showing how SMEs are affected more adversely by these imperfections. We also discuss different solutions that may be implemented by banks to overcome capital market imperfections and explain why credit rationing and self-credit rationing occur. Then, we attempt to provide a summary of studies on financing constraints of SMEs and show how the development of institutions facilitates the access to external finance of SMEs. In the third section, we discuss both theoretical and empirical literature concerning the existence of TC with a focus on the link between BL constraints and TC usage. We begin by reviewing theories of TC provision and related empirical evidence. Then, we attempt to provide a summary on theories of TC use. In the two last subsections, we provide a review of empirical evidence on the different nature of the relationship, substitute or complement, between BL constraints and TC usage. In the third section, we provide a summary of studies on firms' use of other alternative sources in connection with BL constraints. In the last section, we identify limitations and knowledge gaps in the literature, and we propose avenues for future research.

1.2 BL Constraints: Theoretical Explanations and Empirical Evidence with a focus on SMEs

In this section, we discuss BL constraints as a consequence of capital market imperfections arising from asymmetric information between lender and borrower with a focus on SMEs. Hence, we provide in subsection 1.2.1 a summary of theoretical foundations on asymmetric information and its consequences including adverse selection and moral hazard problems in the lending relationship. Our intent is to show how asymmetric information drives the lending relationship and induces banks to implement different solutions to overcome its consequences. Next, we discuss in subsection 1.2.2 non-rationing solutions including collateral requirement, debt maturity, covenants and renegotiations, and relationship lending. Then we discuss in subsections 1.2.3 and 1.2.4 two main types of BL constraints, i.e. credit rationing and self-credit rationing. In subsection 1.2.5, we provide a summary of studies emphasizing SMEs' financing constraints. We also show how institutional development affects the access to external finance of SMEs.

1.2.1 Asymmetric Information and Agency Costs

In the corporate finance literature, the lending relationship is characterized by informational asymmetry between lender and borrower (Diamond, 1991; Flannery, 1986; Myers and Majluf, 1984), which generates two well-known problems, namely adverse selection (Myers and Majluf, 1984; Stiglitz and Weiss, 1981) and moral hazard (Dewatripont and Tirole, 1994; Zwiebel, 1996). Informational asymmetries may arise from private information observed only by the borrower about their future credit rating (Diamond, 1991), or about the value of the investment project (Flannery, 1986), or about the borrower's risk (Myers and Majluf, 1984). Particularly, credit contract terms provided by financial institutions depend largely on

whether the latter are able to collect sufficient information to evaluate the firm's risk. Lack of information is often considered as one of the most important constraints that prevent firms from obtaining a BL, especially in the case of SMEs.

Indeed, imperfect and asymmetric information problems lie at the heart of financing SMEs as they are recognized as more informationally opaque than large firms (Beck et al., 2008b, 2005; Berger et al., 2001; Berger and Udell, 1998; Canton et al., 2013; Vermoesen et al., 2013). Therefore, the collection of private information, such as the risk type of small business borrowers, is more costly (Ang, 1991). Unlike large firms, small firms have less information disclosure requirements. For instance, many of the smallest firms do not have audited financial statements. In addition, they do not issue traded securities that are continuously priced in public markets and are unlikely to be monitored by rating agencies or the financial press. Hence, small firms may have difficulty conveying their quality as well as building reputation. Therefore, problems of adverse selection, moral hazard, and credit rationing are more pronounced for SMEs than for large firms (Beck et al., 2008b; Berger and Udell, 1998).

In the lending relationship, agency costs may arise due to asymmetric information between the manager of the firm and its creditors. Jensen and Meckling (1976) define an agency relationship as:

"a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent. If both parties to the relationship are utility maximizers there is good reason to believe that the agent will not always act in the best interests of the principal".

Agency costs in debt contracts are generated by a conflict of interest between lenders and borrowers, i.e. the borrowers cannot typically commit themselves to credibly act in the interest of lenders. For SMEs, conflict of interest between creditors and shareholders-managers appears to be more severe than conflict of interest between shareholders and managers because most of SMEs are managed by the owner. That is, asymmetric information between shareholders and creditors is more severe in SMEs. Because of this informational opaqueness, banks and other financial institutions as well as potential shareholders may be reluctant to lend to the firm or invest in its stocks.

To compensate for asymmetric information and agency costs, banks may increase bank fees and/or interest rates on loans. However, this solution may cause adverse selection problem that was first addressed by Akerlof (1970). Accordingly, adverse selection is the situation where the lender cannot distinguish safe borrowers from risky ones; he therefore increases the cost of his funds to compensate for this unknown risk. However, higher interest rates tend to attract risky borrowers; since those borrowers are more likely to default on their loan, and hence they are less affected by a rise in the interest rate than safe borrowers.

More specifically, a higher interest rate may reduce the borrower's stake in the project; however, an interest rate increase has no effect on the borrower's income in the case of bankruptcy if the borrower is protected by limited liability but it decreases the borrower's

income in the absence of bankruptcy (Tirole, 2010). As a result, risky borrowers will accept a higher rate because they have a lower chance of a successful project (and typically a higher return if successful), and thus a lower chance of repayment whereas this induces the safe borrowers to invest in a more risky project (Stiglitz and Weiss, 1981). Therefore, increased cost of financing may also worsen moral hazard problems. Lenders may then want to keep interest rates low in order to attract better borrowers.

1.2.2 Non-Rationing Solutions

As above-discussed, higher interest rates may have adverse effects under asymmetric information by generating the adverse selection problem or worsening the moral hazard problem of borrowers choosing riskier projects. Therefore, to mitigate asymmetric information and agency costs arising from bank debt as well as the default risk, banks may also rely on alternative solutions including collateral requirement, debt maturity, specific constraint clauses and renegotiations, use of private information from a relationship between bank officer and owner-manager, or credit rationing. We will discuss the solution of credit rationing in subsection 1.2.3. In this subsection, we focus on the others to which we refer as non-rationing solutions.

Collateral Requirement

The first solution is to require the firm to provide its assets as collateral such as land, buildings, and equipments. Theoretical research highlights the disciplinary role of collateral pledges in mitigating the scope for moral hazard in situations with asymmetric information (Boot et al., 1991; Boot and Thakor, 1994). In addition, the literature on agency costs shows that pledging collateral reduces moral hazard problems and lowers a firm's cost of debt (Smith and Warner, 1979; Stulz and Johnson, 1985). Similarly, in their theoretical model, Kjenstad et al. (2015) demonstrate that the use of collateral expands the borrowing capacity. Alphonse and al. (2004) also find evidence on the importance of collaterals to United States (US) SMEs. Ortiz-Molina and Penas (2008) suggest that maturity and collateral may be substitute mechanisms to exert control over informationally opaque and risky borrowers and that collateral pledges allow small businesses to obtain loans with longer maturity.

Debt Maturity

The second solution concerns debt maturity. Existing literature on the debt maturity choice demonstrates that short-term debt is better than long-term debt in resolving moral hazard problems (Dewatripont and Tirole, 1994; Zwiebel, 1996) and in alleviating informational asymmetries (Diamond, 1991; Flannery, 1986). Similarly, both the literature on agency costs of debt and the literature on restrictive debt covenants suggest that agency problems associated with informational asymmetry can be solved by shorter maturities (Berlin and Mester, 1992; Myers, 1977; Smith and Warner, 1979). In the same vein, Barnea et al. (1980) demonstrate that debt maturity structures and call provisions can serve as a means of resolving the agency problems associated with informational asymmetry and mitigate risk

shifting¹. They typically show that short-term debt can be used to alleviate the agency conflicts in an environment with interest rate uncertainty.

Therefore, for SMEs, which are particularly subject to those problems, BL is often short-term oriented. Indeed, Walker (1989) presents a framework to describe the unique financing requirements for the small firm with a special investigation on financing sources such as TC and bank credit, entrepreneur's own resources, informal investment, which are particularly associated with small businesses. The author argues that small businesses rarely obtain long-term debt or equity in traditional financial markets, they must rely on TC and bank credit as major sources of debt and they obtain much of their external capital from entrepreneurs' own funds and rely heavily on sources from family and relatives. In a more recent study, Ortiz-Molina and Penas (2008) investigate the determinants of the maturity of lines of credit to small businesses. Their results provide strong support for the hypothesis that shorter loan maturities serve to mitigate the problems associated with borrower risk and asymmetric information that are typical of small business lending. They show that maturity is shorter for firm owners that have poor credit histories, are older, and less experienced, and for firms that are more informationally opaque.

Debt Covenants and Renegotiations

The third solution is to use debt covenants and renegotiations. Debt covenants are agreements between a company and its creditors according to which the company should operate within certain limits. In theory, breach of a debt covenant usually allows creditors to demand immediate repayment. However, in practice, since the debtor is not usually in a position to make an immediate repayment, a breach of covenants therefore usually leads to a renegotiation of the terms of debt.

Financial theory also suggests that covenants are an efficient means to solve information problems between borrowers and their lenders, to control agency problems such as risk shifting and that the strictest covenants should be placed on risky firms and those that are harder for lenders to monitor (Berlin and Mester, 1992; Rajan and Winton, 1995; Smith and Warner, 1979). Smith and Warner (1979) suggest that control rights from covenants reduce borrower adverse selection or moral hazard to avoid conflicts between shareholders and lenders. In the same vein, Berlin and Mester (1992) show that by writing very restrictive covenants, which can be selectively renegotiated, agency problems are reduced without unduly constricting the borrower's ability to make valuable investments. They demonstrate covenants work as tripwires that enhance the flexibility and efficiency of financial contracting, since they give institutions the right to renegotiate or call loans when covenants are violated. Rajan and Winton (1995) further suggest that both covenants and collateral can be motivated as contractual devices that increase a lender's incentive to monitor because their usefulness and value to the financial intermediary depends totally on monitoring efficiency. Covenants make the loan's effective maturity, the ability to collateralize makes a loan's

¹ Jensen and Meckling (1976) first introduced the risk-shifting problem as one type of the conflicts of interest between creditors and shareholders.

effective priority, contingent on monitoring by the lender, and it is therefore optimal for the bank to monitor lenders with covenants more than those without covenants.

In a more recent study, Niskanen and Niskanen (2004) examine the use and determinants of covenants in Finnish small firms' loans. Their results show that negative covenants are more common than affirmative covenants and loans with real estate collateral are less likely to contain covenants than loans with other types of collateral. Christensen and Nikolaev (2012) examine how different types of financial covenants serve to resolve the conflicts of interest between lenders and borrowers. They show that while capital covenants control agency problems by aligning debt holder–shareholder interests, performance covenants serve as trip wires that allow for the transfer of control rights to lenders when performance deteriorates. Furthermore, performance covenants are used frequently when there is less contractility of accounting information available, especially for financially constrained firms.

On the other hand, a number of papers have analyzed models of financial contracting where renegotiation is a central element. Smith and Warner (1979) conjecture that the stringency of covenants in private placements stems from the ease of renegotiating contract terms with a small number of well-informed institutional investors. Kahn and Huberman (1989) show that renegotiation can achieve an efficient outcome while no other simple contract can when there is uncertainty and a cost to contract complexity.

Berlin and Mester (1992) provide a formal analysis of the connection between the severity of contractual covenants and the ease of renegotiation and show that the value of being able to renegotiate contractual provisions depends on the severity of agency problems. In particular, they demonstrate that firms that are poor ex ante credit risks find the option to renegotiate valuable and that as the firms' creditworthiness rises (above some critical level), the ex ante value of the option to renegotiate the covenants decreases. In addition, their model suggests that covenant restrictions become less severe as creditworthiness improves, and that the value of the option to renegotiate increases as the creditor's monitoring technology improves. Their theory suggests that poorer credit risks will depend more on BL and private placements, since these are easier to renegotiate. This is consistent with the empirical evidence showing that small businesses are more bank-dependent than large businesses (Howorth and Moro, 2012; Petersen and Rajan, 1994; Walker, 1989). On the other hand, they argue that restrictive covenants are written into debt contracts to control agency problems, but these restrictions are not costless because they restrict the borrower's flexibility to make efficient investment decisions.

Relationship Lending

Another solution is that banks and other financial institutions may establish a relationship lending with borrowers to reduce asymmetric information problem as well as its consequences. Under relationship lending, information is gathered by the lender through the provision of past loans and other services to the firm, its manager and its partners such as suppliers, customers or its employees and competitors. This information acquisition

facilitates the lender in establishing a trust relationship with the borrower and in making lending decision in terms of amount, interest rate and other credit conditions.

Empirical evidence generally suggests that banking relationships increase credit availability; reduce the cost of credit and the pledging of collateral. Petersen and Rajan (1997, 1995, 1994) show that stronger relationships are associated with lower dependence on trade debt. In the same vein, Cole (1998) finds that a potential lender is more likely to extend credit to a firm with which it has a pre-existing relationship as a source of financial services, but that the length of this relationship is unimportant. They provide empirical support for the theory that banking relationships generate valuable private information about the financial prospects of the customer and that this private information is less valuable when the firm deals with multiple sources of financial services.

Since SMEs are informationally opaque and bank-dependent, relationship lending is particularly relevant to those firms (Berger and Udell, 1995; Petersen and Rajan, 1995, 1994) and reflects attempts by banks to deal with the relatively high risks and costs of lending to small businesses. Indeed, in SME lending, banks largely rely on soft information, because the scale and scope of hard information are limited. The role of relationship lending to SMEs has been well documented in the finance literature. Petersen and Rajan (1995, 1994) argue that longer relationships reflect reduced opacity, leading to improved availability of small business finance. In another study, Berger and Udell (1995) examine the role of relationship lending in small firm finance regarding bank lines of credit. They find that longer banking relationships help reduce interest rates charged and ease collateral conditions required by banks to borrowers, supporting the hypothesis that relationship lending generates valuable information about borrower quality. Using evidence from a survey of over 6,000 firms conducted in 1992, Binks and Ennew (1996) suggest that firms expecting to grow in the future do perceive a rather tighter credit constraint but this may be offset partly or wholly by a generally better relationship with their bank. Cole et al. (2004) posit that strong bank–borrower relationships enable banks to assess the credit rating of their small business customers.

Using SME loan data from the US and Germany, Grunert and Norden (2012) analyze whether and how hard and soft information affects the borrower's bargaining power. They find that more favorable soft information including management skills and character increases borrower bargaining power, affecting the outcomes of the loan contracting process. In the same vein, Uchida et al. (2012) find empirical evidence that bank officers' activities play a significant role in relationship lending by producing soft information about SMEs and that this role is particularly important at small banks while large banks focus their resources on transactions lending. In another study, Howorth and Moro (2012) provide evidence that trustworthiness decreases the interest rate charged on bank borrowings of SMEs. Ogawa and Tanaka (2013) examine how the Japanese SMEs responded to the shocks during the Global Financial Crisis, using the unique surveys conducted by the Research Institute of the Economy, Trade and Industry in 2008 and 2009. They show that the firms rely mainly on bank–firm relationship as well as the customer–supplier relationship to overcome the

negative liquidity shocks in financial crises. The bank-dependent SMEs asked their closely-affiliated financial institutions for help, while the SMEs less dependent on financial institutions sought help primarily from their suppliers. In addition, a long customer–supplier relationship plays an important role in mitigating the supply shock.

Furthermore, as highlighted by the literature (Berger and Udell, 2002; Boot, 2000), soft information may be accumulated by banks only over time, as lending relationships become stronger. Therefore, asymmetric information may decrease with the firm's age since banks are able to collect more information from older firms. In the absence of such relationships, banks usually respond to the problems of information opacity, moral hazard and adverse selection by, e.g., charging high interest or requiring collateral or rationing credit in order to minimize exposure to the high risk. However, banks may also have difficulty extending relationship loans to opaque small firms (Berger et al., 2001). One possible reason lies in the fact that shareholders-managers in SMEs may be reluctant to provide information required by banks because the managers of those firms prefer autonomy and aim to maintain control over the company. Alternatively, firms may prefer to operate informally to benefit from tax evasion, thus they do not disclose private information to formal lenders, which consequently restricts their access to formal financing, and consequently such firms have to rely on informal sources such as TC or sources from family and relatives (Dabla-Norris and Koeda, 2008).

When other solutions such as collaterals, debt covenants and relationship lending cannot fully compensate asymmetric information, agency costs and firm risk, banks may ration credit to firms, i.e. they limit the supply of additional credit to those firms, even if the latter are willing to pay higher interest rates. Besides, complicated lending procedures, strict collateral conditions or high interest rates may induce firms to refuse the credit or prevent them from demanding a BL, which leads to the concept of self-credit rationing or discouraged borrowing. In the next two subsections, we provide theoretical foundations and empirical evidence on credit rationing and self-credit rationing that largely explain financial constraints of SMEs.

1.2.3 Credit Rationing

The current literature on credit rationing follows the lead of Jaffee and Russell (1976) and Stiglitz and Weiss (1981), modeling credit rationing as an equilibrium phenomenon driven by the asymmetry of information between borrowers and lenders.

In Jaffee and Russell (1976), the authors posit that "credit rationing occurs when lenders quote an interest rate on loans and then proceed to supply a smaller loan size than demanded by the borrowers". That is, some borrowers demand larger loans than their lenders can offer at the market interest rate. This type of credit rationing however implies that raising the interest rate is sufficient for the borrower to get financed.

Stiglitz and Weiss (1981) provide the first theoretical justification of true credit rationing in which a bank would deny credit to a potential borrower even when it has funds available for loans and the borrower is willing to pay a higher interest rate. They present a model of credit

rationing in which lenders may adjust the borrowing amounts based on the level of asymmetric information. Accordingly, they define credit rationing as situations in which either:

"(a) among loan applicants who appear to be identical some receive a loan and others do not, and the rejected applicants would not receive a loan even if they offered to pay a higher interest rate, or (b) there are identifiable groups of individuals in the population who, with a given supply of credit, are unable to obtain loans at any interest rate, even though with a larger supply of credit, they would."

Stiglitz and Weiss (1981) argue that both moral hazard and adverse selection explain why a lender would not want to raise interest rates even if the borrower were willing to pay higher rates, which results in credit rationing phenomenon. Specifically, while interest rate and collateral pledges serve as screening device to distinguish between good and bad risks, increasing the interest rate or increasing collateral requirements could cause adverse selection by attracting borrowers with risky projects, and worsen moral hazard problems by increasing the relative attractiveness of riskier projects, for which the return to the bank may be lower.

In a subsequent study, Bester (1985) theoretically suggests that no credit rationing will occur in equilibrium if banks compete by simultaneously choosing collateral requirements and the rate of interest to screen investors' riskiness. Therefore, different contracts as a self-selection mechanism can be used. In addition, their model shows that borrowers with high probability of default choose a contract with a higher interest rate and lower collateral than those with low probability of default.

Consistent with Stiglitz and Weiss (1981), Tirole (2010) defines credit rationing as follows:

"a would-be borrower is said to be rationed if he cannot obtain the loan that he wants even though he is willing to pay the interest that the lenders are asking, perhaps even a higher interest".

In a more recent study, Kjenstad et al. (2015) construct a synthesized model to study credit rationing by loan size based on agency cost argument. They show that if the agency cost is sufficiently high, the borrower is unable to obtain the loan at any interest rate and loan size is negatively correlated with agency costs. They generalize two types of credit rationing in a unified framework. In the first case, some borrowers demand larger loans than their lenders can offer at the market interest rate, which is explained in Jaffee and Russell (1976). In the second case, some borrowers may not get the loans that they need at any interest rate, i.e. they are denied by lenders as modeled in Tirole (2010). Their results suggest that, in good times of an economy, firms could be mainly experiencing the first type of credit rationing while during economic recessions with more severe agency, the second type of credit rationing is more likely to occur.

In providing finance for SMEs, bank lenders are generally assumed to have poorer information about the individual firm than the borrower. Particularly, investment projects of

small businesses are often difficult for financial institutions to evaluate and monitor and the owners may have a limited credit history and few collateralizable assets (Levenson and Willard, 2000). Consequently, SMEs are more likely to be rationed by banks that aim to avoid the problems of adverse selection and moral hazard (Stiglitz and Weiss, 1981). As noted in Valadkhani et al. (2014), rejection rates on loan application are 10-12 % for small businesses in the US, the United Kingdom (UK) and Australia, higher than for large businesses. Levenson and Willard (2000) measure credit rationing as the sum of the probability that a creditworthy firm applies for and is denied financing, and the probability that a creditworthy firm, with a project in need of finance, does not apply for credit because of expected denial. They show that credit denial is negatively correlated with firm size, suggesting that credit rationing should be less relevant for larger firms than small counterparts.

1.2.4 Self-Credit Rationing

As discussed earlier, a distinctive feature of the lending relationships, especially in small businesses finance, is that they are affected by asymmetric information and agency problems that arise from the informational opacity. In this context, in order to mitigate the complex problems associated with risk and asymmetric information, in addition to credit rationing, banks may use different contracts which act as a self-selection mechanism to distinguish good from bad borrowers by choosing collateral requirements and the interest rate to screen investors' riskiness (Bester, 1985). They may also require the borrowers to provide more information via application procedures or implement stringent screening and monitoring procedures. These solutions may lead to a firm's self-credit rationing, i.e. discouraging a firm from applying for a BL, especially to new and very small businesses which do not have valuable assets for collateral, are unable to obtain guarantors, have no relationships with banks and have no track record upon which to prove their creditworthiness (Deakins et al., 2008). Beck et al. (2005) actually show that collateral requirement, bank paperwork and bureaucracy, high interest rates, and the need to have special connections with banks all have significant constraining effects on firm growth, with effects stronger for small firms. Besides, self-credit rationing may be the direct result of a high probability being credit-rationed, which is also more likely to be the case of small businesses (Levenson and Willard, 2000).

There is a paucity of theoretical models to understand discouraged borrowing. Since discouraged borrowers do not apply to the bank for a loan, they are not included within the scope of the Stiglitz and Weiss (1981) credit rationing model. Kon and Storey (2003) provide a theory of discouraged borrowing for SMEs with a heuristic framework to understand discouraged borrowers. They define 'Discouraged Borrowers' as non-applicants caused by the bank's screening error under positive heterogeneous application costs. They suggest that the scale of discouragement is higher when application costs on BL are higher, the screening skills of the banks are weaker and the difference between interest rates charged by banks and money lenders is smaller. They further show that the number of discouraged firms increases with collateral requirements by banks and decreases with alternative sources of funding. According to their model, discouragement is shown to be at a maximum where there is some,

but not perfect, information. By the same token, when both banks and borrowers are perfectly informed, there is no borrower discouragement.

Empirical studies on the determinants of discouraged borrowing are relatively rare and focus on small businesses. These studies generally suggest that younger, smaller and riskier firms are more likely to be discouraged from demanding a BL.

Taking the concept of a discouraged borrower originally formulated by Kon and Storey (2003), Han et al. (2009) empirically examine whether discouragement is an efficient self-rationing mechanism by including both good and bad borrowers who experience discouragement. Using data from the 1998 US Survey of Small Business Finances, they indeed show that this is true. Specifically, their results indicate that riskier borrowers have higher probabilities of discouragement, which increase with longer financial relationships. They also show that discouragement is more efficient in concentrated than in competitive markets since low risk borrowers are less likely to be discouraged in the former than in the latter. However, application costs do not appear to be a key determinant of discouragement among small businesses. However, while Kon and Storey (2003) consider the discouragement of "good borrowers" as a consequence of the unobservable quality of borrowers, Han et al. (2009) view discouragement as a self-rationing mechanism in the application decision, implying that both bad and good borrowers can be discouraged. Imperfect information therefore lies at the heart of the concept of discouraged borrowers and the acquisition of reliable information from informationally opaque small business borrowers is a concern to lenders.

In another study, Chakravarty and Xiang (2013) investigate the determinants of discouraged small businesses in developing countries using a firm-level survey database compiled by the World Bank. They show that younger and smaller firms are less likely to be discouraged and that the level of competition and the relationships of the firms with banks have a significant impact on the probability of a firm in being discouraged. Specifically, firms facing greater number of competitors are more likely to be discouraged; and a greater number of financial institutions that a firm has ongoing relationships with, decreases the likelihood being discouraged. In addition, a firm is less likely to be discouraged borrower in countries with a higher rate of growth. Further analysis suggests that the drivers of borrower discouragement might work differently for firms operating in relatively developed versus underdeveloped economies.

On the other hand, discouraged firms are rarely taken into account in the literature of the effects of financing constraints on the usage of alternative financing. Casey and O'Toole (2014) provide the only study that investigates the use of alternative financing sources by bank-constrained SMEs by taking into account both credit-rationed firms and firms that self-ration due to high lending costs. They find that not only rationed firms but also self-rationed firms are more likely to rely on alternative channels including TC and informal lending.

While there is little research taking into account discouraged borrowers in the financial literature, these have been recognized as important in both theoretical and empirical work in SME literature. This is because relative to large firms, SMEs are more likely to be discouraged from applying for a BL and they are more likely to report discouragement than report rejection (Canton et al., 2013; Levenson and Willard, 2000). In Levenson and Willard (2000), bank denial rate for small businesses is 2.14% versus 4.22% for discouraged firms because of expected denial. In another study, using pre-crisis survey data from 2005 and 2006 for nearly 3,500 SMEs in the European Union, Canton et al. (2013) investigate the determinants of perceived BL accessibility, which allows identifying discouraged borrowers, at the firm level and at the country level. They report 42% of all SMEs think that obtaining BL is difficult. Their findings further show that the youngest and smallest SMEs have the worst perception of access to BL and that SMEs in countries with concentrated banking sectors and high fraction of foreign-owned banks are more positive about loan accessibility.

1.2.5 Financing Constraints of SMEs and Role of Institutions

Several studies have demonstrated that SMEs are more likely to be financially constrained than large firms due to more severe adverse selection and moral hazard problems associated with higher level of informational opaqueness (Beck et al., 2008b; Berger and Udell, 1998). This is indeed supported by Beck et al. (2005) who show that financial constraints affect the smallest firms most adversely by using a firm-level survey database covering 54 countries. Similarly, Mateut et al. (2006) suggest that a monetary tightening affects small firms more dramatically than large firms. In the same vein, using firm-level data in 48 countries worldwide, Beck et al. (2008b) find that small firms are less able to expand external financing as they become more financially constrained than large firms. Based on a study of ten Western European countries, Jõeveer (2013) also show that small firms are more financially constrained. In an earlier study, Levenson and Willard (2000) find that constrained firms are smaller, younger, and more likely to be owned by their founders than those firms that successfully applied for external finance. Berger et al. (2001) show that financial institutions may have difficulty extending relationship loans to opaque small firms.

Since SMEs are more bank-dependent and have restricted access to capital markets, a decline in BL availability is expected to have a larger effect on these firms compared to large firms. Several recent studies address the impact of financial constraints on SMEs during the Global Financial Crisis 2008-2009. For instance, using a sample of Belgian SMEs, Vermoesen et al. (2013) find that the decline in the supply of credit induced by the recent financial crisis causes a significant drop in firms' investments in 2009. This negative effect is particularly stronger for firms with a larger proportion of long-term debt that needed to be renewed in the short run and for smaller firms that are more likely to be financially constrained. Similarly, Bottazzi et al. (2014) analyze the effect of financial constraints on firm dynamics using a sample of Italian firms. They show that financial constraints weaken firm growth and increase volatility and asymmetries in growth shock distributions, leading young fast-growing firms to bypass attractive growth opportunities and further deteriorating the growth prospects of slow-growing old firms. In terms of financing cost, using monthly data (1990–

2011), Valadkhani et al. (2014) examine the dynamic asymmetric relationship between changes in the Reserve Bank of Australia's cash rate and the interest rate for small business loans. Their results suggest that the Global Financial Crisis increased the cost of borrowing for small businesses in Australia by 2.21%.

On the other hand, several related strands of literature on law, institutions, finance, and economic growth have emerged in financial economics in recent years, and have shown that access to external financing is shaped by a country's legal and financial environment (Demirgüç-Kunt and Maksimovic, 1998; La Porta et al., 1997; Rajan and Zingales, 1998). These studies generally suggest that in countries with weak legal systems, and consequently, weak financial systems and more severe market imperfections, firms obtain less external financing which constrains firms' ability to fund investment projects and results in lower growth. In other words, better legal protection and better institutions lead to better outcomes for the financial system, both at the aggregate and firm levels.

Using a sample of 49 countries, La Porta et al. (1997) produced a substantial body of empirical evidence that links the origin of a country's legal system to institutions and financial development. They show that countries with poorer investor protections, measured by both the character of legal rules and the quality of law enforcement, have smaller and narrower capital markets including both equity and debt markets. In particular, French civil law countries have both the weakest investor protections and the least developed capital markets, especially as compared to common law countries.

Using firm-level data, Demirgüç-Kunt and Maksimovic (1998) show that firms in countries with developed financial institutions and efficient legal systems obtain more external financing than firms in countries with less-developed institutions.

Based on a large sample of countries over the 1980's, Rajan and Zingales (1998) examine whether financial development facilitates economic growth. Their findings show that industries that are technologically more dependent on external finance grow disproportionately faster in economies with better developed financial systems.

In the same vein, Qian and Strahan (2007) show that in countries with strong creditor protection, loans have more concentrated ownership, longer maturities, and lower interest rates. By contrast, in countries with weak creditor protection, their findings suggest that, maturity substitutes for interest rate and controls borrower risk. These findings are consistent with the law and finance view that strong creditor rights are associated with improved loan availability as lenders are more willing to provide credit on favorable terms.

In the finance literature, the prevailing wisdom is that large firms internalize many of the capital allocation functions carried out by financial markets and financial intermediaries. On the other hand, since small firms face more obstacles in accessing external financing sources due to greater information and transaction costs, better institutions that alleviate these frictions will have an especially positive impact on small firms. That is, informational opacity is more severe for small firms than large firms, so that financial improvements that reduce the

marginal costs of acquiring information disproportionately enhance credit availability to small firms. Another possibility is that small firms rely more on intangible assets, so that financial innovations that lower the need for collateral ease credit constraints on small firms more than large ones. Therefore, the development of financial markets and institutions should disproportionately benefit small firms. Several empirical studies find this to be true.

Using a firm-level survey database covering 54 countries, Beck et al. (2005) examine how the effects of financial, legal, and corruption obstacles on firms' growth rates vary across sizes and under the impact of financial development and legal systems. Their results show that financial constraints affect the smallest firms most adversely and that the effect of financial and institutional development in easing these constraints is stronger for small firms. They also provide evidence that the corruption of bank officials constrains firm growth, particularly for small firms. In the same vein, using cross-industry, cross-country data, Beck et al. (2008a) show that financial development boosts the growth of small firms more than large firms. Specifically, their results indicate that small-firm industries grow disproportionately faster in economies with better financial systems. Similarly, Beck et al. (2008b) use a firm-level survey database covering 48 countries to investigate how financial and institutional development affects financing of large and small firms. They show that small firms benefit the most from a better protection of property rights in accessing external financing, mainly due to its effect on bank finance. In addition, small firms and firms in countries with poor institutions use less external finance, especially bank finance. In another study, Agostino et al. (2009) use sample of Italian SMEs in manufacturing sector for the period 1995-2003 to investigate the role of institutional differences at the local level as determinants of firms' capital structure. They find that higher quality of the legal system is positively correlated with a firm's better access to financial debt.

Overall, these findings point out the limits to small firms' ability to compensate for the underdevelopment of their countries' financial and legal systems, and emphasize the importance of improving the institutional environment for increasing the access of small firms to external finance.

1.3 TC and the Relationship with BL Constraints

Previous literature of TC provides many theoretical explanations for the existence and use of TC and most theories seek to explain the TC decision from the supplier's perspective. On the other hand, the relationship between BL availability and TC use appears to be of central consideration in the empirical studies on TC. In this subsection, we provide a review of TC literature with a discussion on this relationship. Subsection 1.3.1 is dedicated to providing a description of the more plausible theories of TC provision that have been proposed in the literature explaining the suppliers' motives and supporting empirical results. In subsection 1.3.2, we attempt to provide a summary of theories explaining TC use. In subsections 1.3.3 and 1.3.4, we discuss empirical evidence on the different nature, substitute or complement, of the relationship between BL constraints and firm's usage of TC. In subsection 1.3.5, we discuss empirical evidence on this relationship during financial crises.

1.3.1 TC Provision: Theories and Empirical Evidence

Most theories of TC provision fall into one of the following categories, each of which is briefly reviewed below:

- a) Capital access and redistribution view
- b) Comparative advantage in information acquisition
- c) Comparative advantage in controlling the buyer
- d) Comparative advantage in liquidation process
- e) Comparative advantage in resolving moral hazard
- f) Warranty for product quality
- g) Ensuring sales
- h) Transaction motive
- i) Price discrimination

a) Capital access and redistribution view

TC can be viewed as a marketing expense that induces buyers to increase their purchases because the time value of money effectively lowers the price. Consequently, well-established firms should offer relatively more credit due to their better access to capital, which is defined as the "redistribution view" in TC literature. This redistribution view stems from Schwartz (1974) who shows that in maximizing their own profits, firms that have relatively easy access to capital markets are motivated to extend TC to firms that have productive investment opportunities but relatively poor access to capital markets. This flow of TC helps minimize the effect of credit rationing in periods of monetary restraint. In the same vein, Jain (2001) theoretically suggests that firms with better access to credit from financial institutions offer more TC.

The "redistribution view" finds empirical evidence in several studies. Meltzer (1960) was the first to introduce TC as a channel to redistribute obtained bank credit to less creditworthy customers. Petersen and Rajan (1997) also support the "redistribution view" by suggesting that firms with better access to credit including larger and older firms offer more TC. Similar empirical findings are presented in Danielson and Scott (2004). In the same vein, Ng et al. (1999) suggest that large firms may offer more TC because they experience the advantage of scale economies in providing TC. Using a unique firm-level data to model 500 small firms located throughout the UK, Wilson and Summers (2002) found a negative link between credit rationing and the extension of TC. That is, firms with lack of access to finance decrease the amount of credit they can offer.

In an earlier study, Nadiri (1969) provides evidence that in the manufacturing sector, a firm's provision of TC decreases when the user cost of lending increases. On the other hand, a firm increases its use of TC (payables) when the cost of borrowing from alternative sources increases. Consistent with Wilner (2000), Mateut et al. (2006) find that sellers will increase the interest rate they charge their customers in the event of a monetary tightening but by less than the increase in the riskless interest rate.

The redistribution hypothesis is also supported by several studies for the financial crisis period. For instance, Love et al. (2007) argue that the decline in aggregate TC ratios is driven by the reduction in the supply of TC that follows a bank credit crunch. In agreement with Demirguc-Kunt and Maksimovic (2001), they find that the provision of TC across countries is positively correlated with the level of development of financial intermediaries. In the same vein, Love and Zaidi (2010) find that after the crisis, firms constrained in bank finance reduce credit extension to their customers in terms of quantity and length of time, due to a smaller pool of available finance. In the same vein, Garcia-Appendini and Montoriol-Garriga (2013) find that firms with high pre-crisis liquidity levels and with access to bank credit lines offer more TC to their customers. Lin and Chou (2015) show a significant decrease of the supply of TC at the peak of financial crisis. Tsuruta (2015) shows that small businesses with enhanced credit availability offer more TC to their customers.

In the same vein, using a sample of Italian SMEs, Deloof and La Rocca (2015) investigate the relation between local financial development and TC provision in an integrated financial market. Their results suggest that the provision of TC by SMEs is positively related to provincial banking development in Italy, which facilitates the redistribution of loans via TC. Their results add to earlier findings that the provision of TC is complementary to the development of financial institutions at the country level.

b) Comparative advantage in information acquisition

One common explanation for existence of TC is based on the premise that suppliers have an advantage over banks in acquisition of information about the financial health and the creditworthiness of the buyers. This may give them a cost advantage over banks in offering credit to a buyer.

Emery (1984) argues that suppliers might act as intermediaries between buyers and banks because the first possess superior information. He shows that TC lending is restricted to borrowers with whom the seller has regular contact, thus the seller can economize on lending transactions costs. He demonstrates that financial market imperfections explain not only the seller's motive for holding a liquid reserve but, the incentive to lend this reserve to customers by extending TC with an implicit interest rate greater than the market lending rate of return in order to maximize the rate of return on the liquid reserve. Similarly, Smith (1987) argues that the seller has superior information to financial institutions and uses TC terms as a screening device to sort buyers and to elicit information about buyers' creditworthiness.

In another study, Mian and Smith (1992) argue that the supplier may visit the buyer's premises more often than financial institutions would, which gives him an advantage in monitoring of the buyer's credit quality. Similarly, suppliers often offer a two-part TC, which includes a substantial discount for relatively early repayment such as a 2 percent discount for payments made within 10 days. The buyer's inability to take this discount may serve as a strong early signal of a deterioration in the buyer's creditworthiness. While financial

institutions may also collect similar information, the supplier may be able to get it faster and at lower cost because it is obtained in the normal course of business.

In the same vein, Biais and Gollier (1997) famously hypothesize that the extension of TC reveals favorable information to banks, thereby increases their willingness to lend by assuming that suppliers receive different signals than banks do about the customer's probability of default. That is, TC helps alleviate informational asymmetry between banks and firms which otherwise would induce firms to bypass good projects, hence alleviate credit rationing due to adverse selection.

In another study, Jain (2001) posits that the seller has an informational advantage over banks, which helps economize on monitoring costs when TC is used. She models the process of intermediation between banks and the borrowers and proposes that trade creditors serve as intermediaries between banks and the borrower firms. Her model suggests that when there is more than one buyer and the seller has perfect information about the buyers' revenue, the banks may find it more profitable to lend to buyers through the seller rather than directly. Accordingly, both the bank and the seller are better off under TC at the expense of buyers whereas the buyers are rationed out by the banks and thus have no choice but to turn to TC.

Mateut et al. (2006) present a model, which links TC to monetary policy activity. The authors argue that due to imperfections in the credit market, banks observe firms' returns at a cost and they charge their clients higher interest rates proportional to the amount that they lend as the sellers' information advantage over banks induce them to ameliorate credit conditions for borrowers and increase their profits. As a result, the existence of TC weakens the influence of the credit channel to some degree, although it is more expensive than BL and is typically only held for the short term.

The suppliers' advantage in information acquisition is also argued in some recent theoretical models such as Yang (2011) who investigates the impacts of TC on firms' inventory investment dynamics and analyzes whether TC is used as substitute or complement to BL based on capital market imperfections. He finds that the use of TC and bank credit can be either complements or substitutes, i.e. the role of TC varies over time according to credit market conditions. During tight monetary periods, TC and bank borrowing are substitutes, whereas periods of monetary easing appear to show the two financing types as complementary. That is, TC provision by suppliers to a firm helps reveal suppliers' private information, thus works as a good signal of the borrowing firm's financial health, which is consistent with Biais and Gollier (1997). TC is also used as an alternative source when BL are denied or are difficult to obtain, thus help ease the impact of tight money and alleviate the decline in inventory investment in conditions of tight credit markets.

Empirically, Petersen and Rajan (1997) suggest that suppliers lend to constrained firms because they have a comparative advantage in getting information about buyers. In another study, McMillan and Woodruff (1999) document the channels through which suppliers gather information about their customers' reliability. These channels include trading relationships

and business and social networks. They show that TC provision increases when the supplier has more information about the customer's creditworthiness. This is in line with Walker (1985) who shows that the suppliers' specific experience in dealing with a customer is important in TC provision decision. He also shows that taking available TC discounts is an important means of developing a good credit record.

Using survey data of 700 large firms in the US, UK and Australia, Pike et al. (2005) provide evidence that TC terms serve as a screening device to reduce informational asymmetries between buyers and sellers. Specifically, consistent with Smith (1987), they show that two-part terms act as a screening device to elicit information on buyer creditworthiness. Similar findings are presented in Ng et al. (1999). By the same token, Wilson and Summers (2002) suggest that the choice between two part and net terms is determined by product and market characteristics, with two part terms being used to protect the supplier's interest against buyer opportunism.

c) Comparative advantage in controlling the buyer

TC provision may be driven by the suppliers' comparative advantage in controlling the buyer. For instance, Cuñat (2007) provides a model in which the suppliers may be better than financial institutions in enforcement mechanism. Specifically, tailor-made products with few alternative sources generate a surplus that increases with the length of supplier-customer relationships. This surplus increases the amount of TC offered because it ties firms to particular suppliers, thereby the supplier can threaten to cut off future supplies in the event of nonpayment. This threat may be especially credible if the buyer accounts for a small portion of the supplier's sales. Suppliers may also act as liquidity providers insuring against liquidity shocks in order to maintain their customer relationships, which explains the relatively high implicit interest rates of TC. By contrast, a financial institution may have more limited powers, since the threat to withdraw future finance may have little immediate effect on the borrower's operations.

In the same paper, using a panel of UK firms, Cuñat (2007) empirically tests his theoretical model under which a stronger relationship between buyers and sellers is associated with larger TC provision and that suppliers act as liquidity providers during difficult times. They indeed find strong evidence supporting their theoretical model, specifically that suppliers do not lend much to their customers at the beginning of their commercial relationship but that more TC is offered as the relationship evolves and that firms with high growth, low levels of liquidity are more likely to use TC. Furthermore, their results show that TC is used as last resort financing, when other forms of credit have already been exhausted, and that higher levels of collateral mean a lower proportion of TC .

Similar evidence is presented in McMillan and Woodruff (1999) who find that suppliers offer more credit to a customer when the later finds it hard to locate an alternative supplier. In addition, a longer duration of trading relationship is associated with larger credit and

belonging to business networks allows a firm to receive more credit by enabling the mechanism of enforcement.

d) Comparative advantage in liquidation process

Another hypothesis about the availability of TC concerns suppliers' relative advantage in liquidating repossessed goods. Several authors have suggested that suppliers will be more likely to offer TC in circumstances where there is easier resale of the product being sold if the buyer defaults (Frank and Maksimovic, 2005; Mian and Smith, 1992). An implication of this theory is that industries that utilize undifferentiated or durable raw materials and are required to hold large amounts of raw materials inventories, i.e. small fraction of transformed goods, will be better able to obtain TC financing, since in these cases, the goods provide better collateral. Frank and Maksimovic (2005) suggest that suppliers have advantage in liquidating collateral. Financial institutions can also reclaim the firm's assets to pay off the firm's loan. However, if the supplier already has a network for selling its goods, its costs of repossessing and resale will be lower than that of an institution.

The hypothesis that TC is a means of exploiting the supplier's liquidation advantage has been tested in various empirical works. According to Mian and Smith (1992), suppliers place more value on the collateral of their customer than the bank would. In the same vein, Petersen and Rajan (1997) suggest that suppliers lend to constrained firms because they can liquidate assets more efficiently by showing that the fraction of finished goods to inventories in an industry has a large and negative effect on the credit that suppliers offer firms.

e) Comparative advantage in resolving moral hazard

Burkart and Ellingsen (2004) argue that moral hazard is the key reason for existence of TC. Specifically, starting with the conventional idea that moral hazard at the investment stage gives rise to credit rationing of poor entrepreneurs, they argue that inputs are less easily diverted than cash, which facilitates TC because illiquid assets induce firms to be less tempted to engage in activities that are undesirable from the investors' point of view. That is, the source of the suppliers' informational advantage is the input transaction itself while other lenders can only obtain this information by incurring monitoring costs. As a result, the availability of TC increases the amount that banks are willing to lend to poor firms, consistent with the Biais and Gollier (1997). In particular, their model implies that TC and BL are substitutes for entrepreneurs with intermediate level of wealth and complements for poor entrepreneurs whereas very wealthy firms do not have to rely on TC.

Following Burkart and Ellingsen (2004), Fabbri and Menichini (2010) propose a model with moral hazard to explain the existence of TC. They model the information advantage as in Burkart and Ellingsen (2004) but interact it with a liquidation advantage, which can explain why even wealthy firms could use TC. Their findings suggest that the motivations to take TC vary among industries. More specifically, the specific characteristics of the inputs purchased on credit affect firms' motive for TC demand: to exploit the liquidation advantage of the supplier or to relax financial constraints. Particularly, financially unconstrained firms (with

unused bank credit lines) take TC to exploit the supplier's liquidation advantage. They also suggest that more intensive use of tangible inputs increases TC use and that better creditor protection decreases both the use of TC and input tangibility.

In a more recent study, Huang et al. (2011) propose a new theoretical model, using a mechanism design method, which predicts the substitution between the two credits and its counter-cyclic behavior, subject to the condition of technological efficiency not less than one. Starting with the conventional idea that, on the one hand, TC is an in-kind financing, providing the advantage of controlling diversion behavior by the manufacturer (Burkart and Ellingsen, 2004), and on the other hand, the supplier has "implicit equity stake" in the manufacturer (Petersen and Rajan, 1997), they model TC as a special investment of the seller in the manufacturer. Since the bank does not have perfect information on the own type of the manufacturer, which is, by contrast, private information belonging to the manufacturer, bank lending is affected by an ex post moral hazard, due to costly state verification. The bank must therefore observe the true outcomes of the manufacturer's activities by incurring some monitoring costs. Because of this disadvantageous position, compared to the seller, they assume that the bank adjusts its benchmarking rate of return in the slow-growth phase more than the seller. Their model suggests that when the efficiency exceeds a small threshold value, which is an easy criterion to meet, substitution holds. Complementariness only exists when the efficiency is very low, and below the small threshold value, which constitutes a rare case. Their model thus presents a viable explanation of the co-existence of substitution and complementariness, but with the evidence in favor of substitution dominating.

In general, these studies posit that suppliers are often better positioned to provide credit than banks due to relative advantages in resolving moral hazard and information asymmetries. Support for this is provided by Petersen and Rajan (1997) who suggest that suppliers' implicit equity stakes in the firms help overcome associated information difficulties, enabling them to provide lending to otherwise credit-constrained firms.

f) Warranty for Product Quality

TC can further serve as a warranty for product quality. Long et al. (1993) provide a theoretical model in which the supplier willingly extends credit to allow the customer sufficient time to inspect the merchandise, which enhances marketability. Similarly, the choice of TC terms offered by the supplier can signal product quality (Emery and Nayar, 1998; Lee and Stowe, 1993). The model of Lee and Stowe (1993) explains cross-sectional variations in TC terms across firms and industries. They show that there is a separating equilibrium in which the size of the cash discount conveys information about product quality. Emery and Nayar (1998) provide a theoretical explanation for the choice of payment terms under which these terms are chosen to permit to repair defects or alternatively to signal product quality.

In an earlier study, Smith (1987) provides one theory including product quality guarantees, market power, and sunk costs to generate a model of TC terms that are uniform within

industries and differ across industries. She argues that differentiated products and services tend to have more quality variation, hence buyers need time to inspect the merchandise or ascertain the quality of services before paying to the seller. Thus, TC terms can be viewed as a contractual solution to information problems concerning product quality.

Empirical support for this model is presented in Ng et al. (1999) who document wide variation in credit terms across industries but little variation within industries. Similarly, Wilson and Summers (2002) show that net terms serve as a screening device to elicit information on product quality or supplier creditworthiness. In another study, Pike et al. (2005) find that longer credit periods are experienced where the product quality verification process is more complex, the reputation of the seller is weaker and business is seasonal.

g) Ensuring sales

In sharp conflict with studies that argue that TC is more expensive than BL (Biais and Gollier, 1997; Burkart and Ellingsen, 2004; Mateut et al., 2006; Smith, 1987), Daripa and Nilsen (2011) propose a new theory to explain the prevalence of TC at an interest rate of zero. Accordingly, in order to avoid lost sales that may be generated by a downstream firm, the upstream firm provides TC as a subsidy limited by the value of inputs. Empirically, Petersen and Rajan (1997) suggest that firms in trouble such as fast-growing firms with losses or distressed firms extend more TC to their customers in order to maintain their sales. Giannetti et al. (2011) further show that a majority of the US small firms in their sample appear to receive TC at low cost.

h) Transaction motive

Ferris (1981) derives a transactions theory of TC use from the motives of trading partners to lower the transactions costs arising from trading uncertainty. The author argues that uncertain delivery time generates a demand by firms to hold inventories of both goods and money and that TC may reduce the transaction costs of paying bills. By forewarning both trading partners of the timing of money flows, TC serves as a hedging mechanism to eliminate the need for precautionary money inventories, the associated interest, expected penalty costs and allow the more effective management of net money accumulations, thus help pool the individual risks of immediate money use. The model specifically suggests that TC is preferred when the cost is less than twice the individual cost of bank credit. However, the author does not explain why the risk pooling is not handled by financial intermediaries. Wilson and Summers (2002) provide empirical evidence that TC serves to reduce transaction costs. Particularly, they find that smaller firms that have buyers with regular transactions are better in assessing buyer risk and have lower collection costs.

i) Price discrimination

Another motive for TC provision, even if the supplier does not have a financing advantage over financial institutions, is that because TC may be used to price discriminate. Brennan et al. (1988) claim that low competition among suppliers in an input market may create

incentives to discriminate among cash and credit customers and that price discrimination policy varies depending on the degree of competition in the input market. More specifically, the study shows that, even in the presence of a perfectly competitive banking industry, it is optimal for firms with market power to engage in vendor financing if credit customers have lower reservation prices than cash customers or if adverse selection makes it infeasible to write credit contracts that separate customers according to their credit risk. In addition, TC could be used as a strategic instrument in the oligopolistic supplier market.

Petersen and Rajan (1997) offer a price discrimination theory for TC by assuming that credit terms are invariant to the credit quality of the buyer. As a result, offering TC decreases the effective price to low-quality borrowers, thus produces a gain for the seller if risky borrowers are the more price-elastic segment of the market. They find support for this theory by showing a positive and significant relationship between a firm's TC provision and its gross profit margin. Mian and Smith (1992) argue that price discrimination is possible if the seller has sufficient market power to discriminate; and more TC is extended when the return from such a policy is larger. Wilson and Summers (2002) show that two-part terms are used to manipulate credit terms for price discrimination. Pike et al. (2005) suggest that the use of 'unearned' cash discounts are used more to price discriminate and strengthen seller-buyer relations.

1.3.2 TC Use: Theories

Although most of theoretical papers explain the existence of TC from the supplier's perspective, many imply and/or involve demand-side motives, i.e. from the buyer's perspective. The finance literature has identified three major motives of TC demand: transaction motive, control protection, and credit constraints.

As above discussed, the rationale of transaction motive was first identified by Ferris (1981) who suggests that TC use is driven by the motives of both seller and buyer to lower the transactions costs arising from trading uncertainty.

Another reason for demanding TC instead of bank credit might be control protection. Wilner (2000) argue that in order to maintain an enduring product market relationship, suppliers grant more concessions to buyers in financial distress than lenders in competitive credit markets, therefore TC is commonly more costly than institutional credit. As a result, the use of TC by buyers may be driven by the motive to protect control.

Another reason for demanding TC might be credit constraints such as credit rationing. Theories of TC have suggested that TC and BL may be either substitutes or complements.

On the one hand, firms that are rationed by banks may rely on TC as a financing of last resort to fund their projects as suggested in Biais and Gollier (1997), Burkart and Ellingsen (2004), Cuñat (2007), Yang (2011), Huang et al. (2011), implying a substitution effect between two sources. In the same vein, Schwartz (1974) shows that firms with poor access to capital markets are motivated to borrow through TC from firms that have relatively easy access to

capital markets. Jain (2001) also finds the theoretical proof for the substitutability between TC and bank credit, specifically that firms use TC relatively more when credit from financial institutions is not available. Mateut et al. (2006) consider TC as an additional source of funding for firms that cannot obtain credit from banks. These studies imply that TC is an inferior financial resource for firms mostly because of its high cost compared to bank credit and that the two sources are substitutes.

Particularly, theories of TC provision that concern the suppliers' comparative advantage over banks in information acquisition, in controlling the buyer, in liquidation process and in resolving moral hazard as discussed in subsection 1.3.1 imply that TC is better than BL in mitigating informational asymmetry and moral hazard problems. Thus, these theories provide many explanations for the availability of TC to firms that are financially constrained by banks because of informational opacity and thus imply that TC may be used as a substitute for BL by those firms.

On the other hand, firms that suffer from credit rationing may increase their use of TC because they aim to transfer suppliers' private information through TC as a good signal of their financial position to banks, to motivate banks to lend (Biais and Gollier, 1997; Burkart and Ellingsen, 2004). This strand of literature highlights the informational role of TC in facilitating firm's access to bank finance, suggesting a complementary effect between the two sources.

While theories of TC provision dominate the relevant literature, studies investigating TC usage in the corporate world constitute the largest body of empirical research on TC. So far, we have discussed the reasons for the existence of TC. It is widely argued that TC stands out as the leading short-term substitute for BL, especially for working capital finance (Allen et al., 2005; Casey and O'Toole, 2014; Walker, 1989). Therefore, it is important to examine the relationship between BL availability and TC usage. Hence, we provide in the next two subsections a review of empirical studies on TC in relationship with BL.

In line with relevant theories, there is no clear-cut evidence concerning whether TC and BL are complements or substitutes. We hereafter summarize the main empirical studies on TC and the link with BL in which the central objective is to distinguish between these two effects.

1.3.3 TC Use: Empirical Evidence on the Substitution Effect between BL and TC

Many theories of TC generally suggest that the suppliers are better than banks in overcoming asymmetric information and agency problems. Hence, when a firm is financially constrained because BL are not available, it could respond by delaying some TC payments. When used in this manner, TC can be an expensive substitute for BL (Cuñat, 2007). If this is accurate, at least from the perspective of pecking order theory, firms would seek TC only when the availability of BL declines, implying that BL and TC are substitutes.

Quite a few empirical studies suggest that firms suffering from credit rationing use TC. Meltzer (1960) first emphasized the substitution hypothesis according to which firms substitute bank credit with TC during money tightening. Following this study, several studies such as Petersen and Rajan (1997), Nilsen (2002), Blasio (2005), Mateut et al. (2006) obtained similar evidence supporting this hypothesis.

Petersen and Rajan (1997, 1995, 1994) provide a rich evidence linking credit availability and TC demand, using the Board of Governors Survey of Small Business Finances (SSBF) conducted by the Federal Reserve Board.

Petersen and Rajan (1995, 1994) posit that firms take TC when cheaper sources of financing such as BL have been exhausted. In the 1994 paper, TC use is examined as an alternative (expensive) measure of credit availability by assuming that a firm rationed on credit by institutions will borrow from more expensive sources such as TC. The percentage of TC paid late and the amount of TC discounts foregone are used as proxies for TC demand. Their primary empirical results show that firms rely more on TC (delaying TC payments or taking fewer discounts) if they have shorter banking relationships (in terms of time doing business with their principal financial institution), are located in less concentrated markets (making it harder for a lender to intertemporally subsidize loan rates because of the high degree of competition), and do business with more financial institutions (increasing the free-rider disincentive from investing in private information).

Similarly, in the 1995 paper, they indicate that bank lending constraints induce firms to borrow from more expensive non-institutional sources provided that investment returns exceed the cost of funding from alternative credit providers and that a longer relationship with banks decreases the use of TC. In addition, higher competition in the banking sector is associated with higher use of TC since high competition makes it difficult for banks to internalize the benefits of assisting the firms.

The 1997 paper provides a comprehensive empirical test on the theories of TC with a focus on small firms. By modeling TC demand as a function of TC supply, the authors investigate separately the determinants of the demand and supply of TC. They find that firms use more TC when credit from financial institutions is unavailable. Particularly, they find that the strength of relationships with institutions is negatively correlated with demand for TC. Furthermore, the firm's ability to generate cash internally decreases its demand for TC and firms with larger unused lines of credit demand less TC. These findings imply that borrowing from trade creditors, at least for longer periods of time, is a more expensive form of credit. However, they do not find a significant relationship between TC demand and BL denial.

Similar findings are presented in Nilsen (2002). Using quarterly financial reports with small-large firm distinction, and Compustat database with unbalanced panel of manufacturing firms, the author uses TC to test the theory of bank lending channel. He finds that small firms that are likely to be particularly bank credit rationed and are unlikely to have alternative finance sources, increase borrowings more from their suppliers, especially during monetary

contractions. They also find that unrated large firms increase demand for TC during periods of tight money more than small firms because they have no bond rating, thus have no access to cheaper source such as commercial paper.

In the same vein, Danielson and Scott (2004) investigate the effects of BL availability on the TC and credit card demand of small firms by using a recursive, simultaneous equation system in which TC demand is a function of loan availability and loan availability is a function of banking relationship strength. Their results show that firms increase their demand for TC and credit card debt when facing credit constraints imposed by banks, which represents a pecking order of debt financing; thereby firms increase their reliance on potentially expensive sources of funds when BL is not available.

Other studies such as Blasio (2005), Mateut et al. (2006) also support the substitution hypothesis between TC and BL. Blasio (2005) examines micro data on Italian manufacturing firms' inventory behavior to test the Meltzer (1960) hypothesis according to which firms substitute bank credit with TC during money tightening. Their results show that inventory investment of Italian manufacturing firms is constrained by their availability of TC with stronger effects during monetary restrictions, and small firms and firms not paying dividends are more likely to substitute bank credit with TC during contractions.

Mateut et al. (2006) provide both theoretical and empirical research to investigate the role of TC in the transmission of monetary policy, specifically to consider the link between TC use and credit rationing. The authors conduct an empirical investigation of 16,000 UK manufacturing firms with a panel into two periods: 1990–1992 for periods of tight monetary policy, and 1993–1999 for periods of loose monetary policy. Consistent with the existing empirical evidence on a wider use of TC over periods of monetary tightening, their results predict that when monetary policy tightens, bank lending decreases relative to TC and a monetary tightening affects smaller firms more dramatically than large firms. In addition, for all firm types (small, medium, large), it is found that the ratio of TC to the sum of TC and BL increases with an increase in the base rate during periods of tight monetary policy, and it decreases with an increase in the base rate when monetary policy is loose.

The substitution hypothesis is also supported by the study of Ogawa et al. (2013) who find that SMEs with little access to bank credit depend more on large suppliers for TC by using survey data from fiscal year 2004 for a sample of 100,000 Japanese SMEs. They further find that more TC is provided by a large supplier, which is only observed for solvent customers, not for insolvent customers.

Focusing on a developing country, Huang et al. (2011) use a data set of China's listed companies covering the period 1998–2006 including both a slow-growth period and one of rapid-growth to investigate the link between TC and bank credit. Their results provide support for the substitution hypothesis suggested in their theoretical model by showing that the substitution ratio between TC and bank credit is 14.27% through the course of cycles in the fixed-effect model and 12.05% in the dynamic panel model with the lag-effect of TC. In

addition, their estimation results show that the magnitude of substitution during the slow-growth period (1998–2002) is significantly larger than during the rapid-growth period (2003–2006).

There are a few studies investigating TC use across countries to explore the relationship between the role of institutions and TC use. The most compelling evidence is that TC is used more in countries with weak legal protection and financial development, suggesting the substitution effect between TC and the development of financial intermediaries. Using a sample consisting of a panel data of 37 industries and 44 countries, Fisman and Love (2003) show that industries with higher dependence on TC financing exhibit higher rates of growth in countries with weaker financial institutions. In another study, Van Horen (2004) studies the use of TC in 42 developing countries and finds that TC is used as a competitive tool, particularly for small and young firms.

1.3.4 TC Use: Empirical Evidence on the Complementary Effect between BL and TC

As discussed earlier, some researchers posit that TC is complementary to BL. Biais and Gollier (1997) hypothesize that TC helps reveal favorable information to banks, thereby increasing their willingness to lend. In the same vein, Burkart and Ellingsen (2004) suggest a complementary effect between TC and bank credit for very poor entrepreneurs, implying the informational role of TC in facilitating access to BL by arguing that: “the only thing worse than having to increase TC borrowing is to be unable to do so”.

This signaling theory finds empirical support in a few studies.

Cook (1999) examines how credit quality is established in Russia and, further, whether credit extended by suppliers contains information that may be useful for banks' credit decisions. Collecting data from the survey of 352 small firms and 151 financial intermediaries in Russia, their results suggest that TC works as a signal since firms using TC have a higher probability of acquiring bank credit, implying that with imperfect capital markets; trade debt may diminish the adverse effect of asymmetries in information.

Similarly, by using US small businesses data, Alphonse et al. (2004) find evidence in support of the hypothesis that TC helps firms to improve their reputation. Their results show that TC can work as a signal about firm's quality and thus facilitate access to bank debt.

In another study, Gama and Mateus (2010) examine if TC is a substitute or a complement to bank credit using a data set of Portuguese and Spanish SMEs. They use the ratio of net TC to total assets and bank debt to total assets as dependent variables, in order to assess the existence of credit rationing and to analyze if the information conveyed by TC could affect the level of indebtedness of small firms, respectively. They find that the substitution and complementary hypothesis are not mutually exclusive, especially for the younger and smaller firms. In line with the theories that emphasize the informational role of TC, their empirical results confirm that TC allows the younger and smaller firms to improve their reputation

because TC reveals the private information of the supplier to banks, which in turn can update their beliefs about customer default risk and agree to increase bank credit.

Yang (2011) uses Compustat quarterly data with a focus on the manufacturing sector as this sector is most likely to use both BL and TC. The final sample includes 1025 companies and 41,815 observations for the years 1986–2006. Applying the GMM approach, their empirical results support the theoretical findings by showing that the substitute- and complementary effects are not mutually exclusive but interact simultaneously. Specifically, on the one hand, constrained firms increase their use of TC in conditions of tight monetary policy, when TC becomes a cheaper alternative to BL, to mitigate the financial stress and overcome liquidity shortages, suggesting a substitution effect. On the other hand, during looser monetary episodes, when TC is more expensive to obtain, TC helps firms alleviate information problems facilitating their access to BL, suggesting a complementary effect.

Using a sample of small US firms, Giannetti et al. (2011) also find empirical support for the informational role of TC, specifically that firms that use TC tend to borrow from a larger number of banks and firms that receive TC pay lower fees for obtaining a BL, suggesting that banks are more inclined to extend credit to these firms. Additionally, TC seems to facilitate financing by uninformed lenders and a majority of the firms appears to receive cheap TC. These findings suggest that TC and BL are complements rather than substitutes.

In a more recent study, Agostino and Trivieri (2014) also provide empirical evidence on the informational role of TC suggested by Biais and Gollier (1997) and Burkart and Ellingsen (2004). Using a sample of Italian firms, their results suggest that TC has an informational content for banks, especially at the beginning stages of bank–firm relationships, implying that TC may play a crucial role to facilitate the access to bank finance for young firms. They further suggest that banks are likely to rely on the supplier's information in their lending decisions even after several years of lending relationships.

In the same vein, Demirguc-Kunt and Maksimovic (2001) finds that in 40 countries around the world, TC use is higher relative to bank credit in countries with weak legal environments, which make bank contracts more difficult to write. However, firms in countries with more developed banking systems offer more credit to their customers and take more credit from them. These findings suggest that the provision of TC is complementary to the development of financial intermediaries, implying a complementary effect with bank credit. Deloof and La Rocca (2015) find that debt and TC tend to be complements rather than substitutes and that a better provincial financial development is associated with a greater use of TC. Using a firm-level survey database covering 48 countries, Beck et al. (2008b) find that TC does not compensate for a lower use of bank borrowings by small firms.

1.3.5 TC Use: Empirical Evidence on the Relationship between BL and TC in Times of Crisis

The 2008–2009 Global Financial Crisis is one of historic dimensions. Financial crises are characterized by a sharp contraction of bank lending as the banks become more reluctant to

lend to even the highest-quality firms. Consistent with a causal effect of a negative shock to bank credit, financing constraints become more severe for many firms, leading them to cut investments in capital and to bypass attractive investment projects (Campello et al., 2010). TC potentially serves as an important alternative source of finance to those firms because suppliers might lend more liberally than banks because of their advantage in information acquisition and enforcement mechanism, especially during downturns. Several studies attempt to investigate whether TC and bank credit are complements or substitutes during financial crises. Since TC may provide a valuable cushion for firms that are running out of bank credit, this relationship is particularly important for firms in times of crisis when access to bank finance is limited and market liquidity dries up.

There are quite a few studies suggesting that TC does little to ease financial constraints in times of crisis, especially in the case of small businesses. Love et al. (2007) examine the effect of financial crises on TC and the use of TC during financial crises by using a standard panel-data of 890 firms in six emerging economies from *Worldscope* database of the Mexican devaluation of late 1994 and the Southeast Asia currency crisis of mid-1997. Their results show that while TC terms can be extended temporarily in the short-run but cannot fully compensate for the long-term contraction in bank credit that stems from a financial crisis. Further, they find that countries that experience a sharper decline in bank credit also experience a sharper decline in TC during a crisis.

Love and Zaidi (2010) extend the earlier work of Love et al. (2007) along two dimensions. First, they study TC behavior of SMEs, which have less access to bank finance and different TC behavior than large public firms. Second, they use detailed data on TC terms - the length of payables, receivables, and early payment discounts, while Love et al. (2007) use data on the amount of credit from firms' balance sheets. Using survey data of 3160 manufacturing firms from four East Asian countries before and after the financial crisis of 1998, their results show that firms constrained on bank finance receive less TC in terms of percent of inputs bought on credit and shorter time of repayment. The results therefore do not support the hypothesis that TC can substitute for bank credit in times of the crisis, instead suggest a complementariness of bank credit and TC.

In another study, Garcia-Appendini and Montoriol-Garriga (2013) use a supplier-client matched sample to investigate the effect of the 2007–2008 financial crisis on TC provision by US-incorporated, non-financial firms. Their results show that firms with high pre-crisis liquidity levels offer more TC to their customers and subsequently experience better performance as compared with ex ante cash-poor firms. Besides, constrained firms also increase their use of TC during this period to compensate for the scarce institutional credit. However, as the crisis became more severe and demand collapsed, these ex ante liquid suppliers reduced their amount of TC offered to their clients and began to replenish their cash stocks. This finding highlights the limitations of TC to absorb shocks from financial crises, which is consistent with Love et al. (2007).

Lin and Chou (2015) use quarterly data of 1213 Chinese firms from the first quarter of 2006 to the end of 2012 to examine the relationship between TC and bank credit during the 2008-2009 Global Financial Crisis. They find that BL and TC (accounts payable and accounts receivable) are found to be negatively and positively related, respectively, indicating a substitution and complementary effect between TC and BL. Furthermore, this study shows a significant decrease of the demand and supply-side of TC at the peak of financial crisis, followed by a subsequent increase of this source of financing after the crisis events. In addition, both large and small firms provide significantly less TC (accounts receivable) and receive less TC (accounts payable) during financial crisis. After the crisis, large firms still provide significantly less TC to their customers but receive more TC from the suppliers than smaller firms.

Tsuruta (2015) uses firm-level data on 80,625 small firms and 278,611 observations from 2006 to 2009 in Japan to investigate the relationship between BL availability and TC during the Global Financial Crisis. They construct a proxy for BL availability based on the credit guarantee program for small businesses introduced in Japan after October 2008. Accordingly, BL availability is higher for firms that satisfy the requirements of the program. Their results show that small businesses increase TC (both payables and receivables) if BL availability improves. This implies that the relationship between trade payables and BL for small businesses is complementary. This is because BL availability decreases the probability of the postponement of the repayment for trade debts. Therefore, the credit guarantee program helps improve the credit quality of small businesses, thus increase the supplier's willingness to lend. Furthermore, their findings also support the argument that suppliers have an informational advantage over banks.

On the other hand, there are a few studies suggesting that TC may ease financing constraints that firms may experience in times of crisis. Coulibaly et al. (2013) use annual and quarterly data for almost 6000 publicly-traded manufacturing firms from six emerging Asian countries to examine the effect of financial frictions in general, and TC in particular, on economic activity during the 2008–2009 Global Financial Crisis. After controlling for the effect of falling demand, they find that sales declined by less for firms with better pre-crisis financial conditions. Some firms, predominantly the domestic-oriented firms, that suffer a decline in external financing availability, rely more on TC from suppliers during the crisis, which allowed them to increase sales. By contrast, export-intensive firms resort less to TC as an alternative source of finance, which contributes to their larger declines in sales.

Using firm-level data on SME access to finance across 11 euro area members, Casey and O'Toole (2014) test whether during the financial crisis period between 2009 and 2011 bank lending constrained SMEs are more likely to use or apply for alternative external finance including TC, informal lending, loans from other companies, market financing (issued debt or equity) and state grants. They run a panel probit model with random effects to control for firm heterogeneity and use cluster robust standard errors to control for potential heteroscedasticity and serial dependence across groups in the error structure. They identify credit-rationed firms and firms that self-ration due to high lending costs. Their results show

that credit-rationed firms are 9% more likely to use TC than non-constrained firms during the recent crisis, with stronger effects for both older and larger firm. Their results highlight the substitutability of TC for bank credit in case of quantity-based rationing in which firms play as liquidity providers, particularly in times of economic crisis. However, TC is not likely to substitute for bank credit in case of cost-based rationing. In addition, credit-rationed firms are also more likely to apply for TC, especially to finance working capital. This suggests that TC is the main bank credit substitute for working capital financing.

Using over 2.5 million observations for 600.000 firms in 8 euro area countries in the period 1993–2009, Ferrando and Mulier (2013) investigate whether firms use the TC channel to manage growth. They show that not just the accounts payable but also the accounts receivable matter to firms' growth. While the former help to alleviate imperfections in the financial market, the latter do so in the product market. Further, firms that are more vulnerable to financial market imperfections (i.e. young or small firms), rely more on the TC channel to manage growth. They also show that the degree of development of the financial system matters for the importance of the TC channel for growth. Focusing on country heterogeneity, they find that in those countries with larger supply of BL or debt securities, the sensitivity of firm growth to the TC channel is smaller, which is in line with the study of Fisman and Love (2003).

In another study, Ogawa and Tanaka (2013) show that the Japanese SMEs rely on customer–supplier relationships to overcome the negative liquidity shocks in financial crises. The SMEs that are less dependent on financial institutions sought help primarily from their suppliers. In addition, a long customer–supplier relationship plays an important role in mitigating the supply shock.

Overall, most of the studies discussed above show that TC cannot fully compensate for a sharp contraction in bank credit that stems from a financial crisis. Many of them also suggest a complementariness of bank credit and TC, which highlights the limitations of TC to mitigate the negative impact of supply shocks in an extreme scenario of scarce institutional credit and market illiquidity.

1.4 The Use of Other Alternative Financing Sources in Relationship with BL Constraints and the Role of Alternative Financing

Financially constrained firms may also rely on other alternative sources such as informal finance. In this section, we discuss four other credit sources that are typically associated with SMEs finance and are potential substitutes for bank debt, i.e. Leasing, Informal sources, Government grants or subsidized loans, and Market financing. In the first sub-section, we review studies on the usage of those sources by financially constrained firms. In the second sub-section, we provide a summary of papers that discuss the role of alternative financing to firm's growth and operation.

1.4.1 The Use of Other Alternative Financing Sources in Relationship with BL Constraints

Leasing

Another financing form that can be a substitute for bank credit involves leasing arrangements. In early studies, asset leasing has been considered a method of transferring unusable tax shields from lessees to tax paying lessors. Therefore, firms with low marginal tax rates are expected to lease more (Lewellen et al., 1976; Miller and Upton, 1976; Myers et al., 1976). Lewis and Schallheim (1992) suggest that leases and debt are complements, and frame the lease choice within the optimal capital structure choice. They show that leasing can actually increase a firm's debt capacity by selling excess non-debt tax shields. In the same vein, Ang and Peterson (1984) and Finucane (1988) find leasing to be positively related to the firm's debt ratio.

Though advantages encourage firms to use leasing, the firm can however limit its use and prefer BL because a leasing operation involved firm for an irrevocable period, implying a potential operational mobility loss for the firm. For instance, the firm cannot stop the leasing contract if the activity is no longer profitable. In an empirical paper, Lease et al. (1990), show that, only 46.6% operations come to an end, 31.4% of contracts are stopped before the end and in 19% of cases, the operation led to the firm's bankruptcy. Adedeji and Stapleton (1996) also indicate that leasing finance may be more expensive than debt because lessors tend to pass on costs of asset ownership to lessees in the form of higher charges. Thus, a constraint in bank credit supply can lead the firm to increase its use of leasing, which can be considered, like TC, as the last financing resort (Krishnan and Moyer, 1994). These arguments support the literature on the substitution effect between leasing and bank finance, which appears to be more prevalent compared to complementary effect.

Marston and Harris (1988) find empirical evidence of substitutability between leases and debt by focusing on changes in lease ratios rather than on levels. In another study, Erickson and Trevino (1994) was the first to frame the lease choice within the financial pecking order and show that for firms with similar profitability and growth, leases and debt are indeed substitutes. In a more recent study, Severin and Filareto-Deghaye (2007) find a strong and significant relationship between credit rationing and the use of leasing that appears to be a last resort financing for constrained firms. In the same vein, Cosci et al. (2015), using an Italian firms, suggest that more financially constrained firms use more lease than less constrained firms and the use of leasing actually eases credit constraints. However, they do not find a significant substitutability between debt and leasing for small firms. In the same vein, Beck et al. (2008b) find that leasing does not compensate for a low use of bank debt of small firms.

While empirical studies on the determinants of leasing provide mixed evidence (Ang and Peterson, 1984; Eisfeldt and Rampini, 2009; Lasfer and Levis, 1998; Sharpe and Nguyen, 1995), it overall indicates that leasing is used more by less profitable small firms and

constrained firms on bank debt. A common explanation for leasing availability to constrained firms is that the use of leasing may reduce agency costs of the separation between ownership and control. Lessors therefore have a monitoring advantage because they have first claim over the asset (Lasfer and Levis, 1998). As a result, leasing is likely to be advantageous for financially distressed, debt-constrained firms.

Informal sources

In addition to TC and leasing, there are other additional forms of alternative finance for bank credit including informal lending and sources from family and friends. Their usage and availability play an important role for firm growth and performance, especially in the context of developing countries (Allen et al., 2012a, 2012b, 2005; Yiu et al., 2013). In addition, these informal sources are particularly prevalent among small businesses that are often financially constrained by banks and are less likely to be offered other sources such as TC (Petersen and Rajan, 1997).

Unlike TC and leasing, the literature on the relationship between informal sources is not well developed, primarily focusing on developing economies (Bell, 1990; Ghosh et al., 2000). Using data from India, Bell (1990) shows that the interest rates are set higher in informal credit markets, which is explained by higher risk levels of borrowers, higher cost of entry for new informal creditors and hence lower competition in the supply side. In line with Bell (1990), Ghosh et al. (2000) suggest that informal credit is also seen as an alternative financing way for the credit rationed borrowers. In a more recent study, Beck et al. (2008b) show that small firms rely more on informal sources from money lenders as compared to large firms. On the other hand, the difference between sources from family and friends and other financing forms is that those sources are not an expensive source because the family members and friends of the business owner are often willing to lend at a low rate, even a negative rate. Yet many borrowers tap family and friends only as a last resort because this financing discourages risk taking (Lee and Persson, 2013).

Government grants or subsidized loans

Bank-constrained firms may rely more on government grants or subsidized loans. There is a strand of international literature on the functioning of policy measures for SME credit such as credit guarantee schemes and the subsequent usage of this financing form (Beck et al., 2010; Oh et al., 2009). However, the role of this special financing form in alleviating SMEs' credit constraints appears to be limited as shown by Beck et al. (2008b) and Casey and O'Toole (2014) who find that development finance including government grants does not compensate for restricted access to bank finance of small businesses.

Market financing

Turning to market-oriented financing, such as equity, and debt issuance, much of the research has focused on large firms and less so on SMEs. Kashyap et al. (1993) test the relationship between monetary policy and credit conditions and find that tighter monetary policy leads to

shifts in firms' mix of external finance whereby commercial paper usage increases when bank lending availability deteriorates. Leary (2009) examines the effect on firms' financial structures of two changes in bank funding constraints: the 1961 emergence of the market for certificates of deposit, and the 1966 Credit Crunch. The author finds that bank-dependent firms shift towards equity when bank debt is scarce. This finding highlights the fact that supply frictions in credit markets are important determinants of corporate capital structures, particularly for more bank-dependent firms. This is consistent with the pecking order theory formulated by Myers and Majluf (1984). Accordingly, adverse selection in the market for external finance makes it efficient for the firm to access equity last after all other sources of external finance including internal financing and debt are exhausted.

1.4.2 The Role of Alternative Financing

A number of studies linking bank credit constraints to firm's use of alternative financing suggest that the alternative sources are often more expensive than BL in terms of cost but are better than BL in resolving frictions related to asymmetric information and agency problems that are typical of SMEs. This is because the alternative sources generally operate outside formal institutions, thus those sources are backed by alternative mechanisms such as reputation, relationships and trust (Allen et al., 2012a, 2005). Therefore, they are usually used as a financing of last resort - imperfect substitutes for bank borrowings.

Several recent studies investigate the role of alternative financing sources in accelerating firm growth and performance as a complement to the formal channels, especially in developing countries where financial development and legal protection are relatively weak (Allen et al., 2012, 2005; Ayyagari et al., 2010; Yiu et al., 2013). Taken together, studies on the role of alternative finance are inconclusive. While some suggest that alternative sources play an active role in enhancing the growth of small businesses (Allen et al., 2012a, 2012b, 2005), others show that this role is limited (Ayyagari et al., 2010).

Allen et al. (2012a, 2012b, 2005) show that non-state, non-listed firms in China and India rely more on alternative financing channels such as TC and funds from family and friends in order to finance activity. Overall, their results show that alternative finance, backed by non-legal mechanisms and particularly important for SMEs, has filled the gap between the vast and fast-growing economy and the underdeveloped banks and markets along with inefficient legal institutions and weak financial development.

Allen et al. (2005) examine whether the law-finance-growth nexus works for three sectors of the Chinese economy: State Sector, Listed Sector and Private Sector. They find that legal protection of minority and outside investors is positively correlated with the development of external financing markets and positively correlated with the growth of firms in State Sector and Listed Sector. However, in spite of relatively poorer applicable legal protection and standard financing channels, the Private Sector has been growing much faster than the others and has been contributing to most of the economy's growth. These findings suggest that alternative financing channels and governance mechanisms, such as those based on reputation

and relationships, are valuable to the growth of this sector. Specifically, they show that the two most important financing channels for the Private Sector during the start-up and subsequent periods are financial intermediaries, including state-owned banks and private credit agencies, and founders' friends and families. On the other hand, TC is an important form of financing for firms during their growth period. They also show that alternative channels of financing that include all forms of internal finance, capital raised from family and friends of the founders and managers, and funds raised in the form of private equity and loans, are the most important sources of financing, accounting for close to 60% of total funds raised by private firms. Additionally, alternative channels of financing are important even for the State and Listed Sectors.

In the same vein, using cross-country datasets and India firm samples and their own surveys of SMEs, Allen et al. (2012a) examine the legal and business environments, financing channels, and growth patterns of different types of firms in India. They consider the entire corporate financing system in India including both large listed firms and small and unlisted firms. They show that alternative finance, defined as non-internal financing from all nonbank, nonmarket sources, and generally backed by non-legal mechanisms, constitutes the most important source of external finance. While BL serves as the second most important external financing source, financial markets play a limited role in financing the growth of Indian firms. Specifically, they show that formal credit including bank and market finance is not associated with higher growth rates for firms, implying that alternative finance may have advantages compared to formal channels. Their results therefore indicate that bank and market finance is not superior to alternative finance in fast-growing economies such as India. Additionally, they report that while 85% of the respondent firms consider friends and family finance extremely important in the start-up phase and 86% in the growth phase, the corresponding numbers are 15% and 17% for bank finance. They also show that larger firms seek less alternative finance, supporting the hypothesis that the reliance on alternative finance is the result of limited access to institutional finance.

In another study, Allen et al. (2012b) provide a comprehensive review of firms' financing channels (internal and external, domestic and international) around the world, with the focus on alternative finance, i.e. financing from all the nonmarket, non-bank external sources. They argue that while traditional financing channels, including financial markets and banks, provide significant sources of funds for firms in developed countries, alternative financing channels play an important role in both developed and developing countries. Additionally, in fast-growing emerging economies, alternative finance is often the dominant source of funds for firms.

Similarly, Chavis et al. (2011) show that younger firms typically rely more on other financing alternatives than on bank finance for both short-term (working capital) and long-term (new investment) financing.

In the same vein, using a sample of 284 private firms in 19 cities in China, Yiu et al. (2013) analyze the importance of informal financing in facilitating the growth of private firms in

China. They argue that informal financing, in the form of underground financing and TC, substitutes formal financing in providing financial assistance and capital to private firms in China. They further posit that the effects of two kinds of informal financing vary across provinces with different levels of institutional development, and complement each other by supporting firms in different industries. Their results generally support the positive effects of alternative financing and its coexistence with formal financing.

Similarly, Casey and O'Toole (2014) provide evidence that bank-constrained firms increase their use and demand of alternative sources during the financial crisis. Specifically, their findings suggest that credit-rationed firms are 9% more likely to use TC than non-constrained firms, 4.5% more likely to use informal lending, other company or shareholder loans. Self-rationed firms because of high cost are nearly 8% more likely to use the latter. However, they find no evidence that credit-rationed SMEs use market finance. On the other hand, both credit-rationed and self-rationed firms are likely to decrease grant usage. On the demand for alternative financing by bank-constrained firms, their results suggest that bank credit constrained firms have a higher demand for alternative financing types. Specifically, they find that credit-rationed firms are 9% more likely to apply for all non-bank financing alternatives, while self-rationing firms are nearly 18% more likely to apply for non-bank financing. In particular, credit-rationed firms are 7.5% more likely to apply for TC. Their findings reveal that credit-rationed firms tend to apply for TC whereas self-rationed firms apply for other forms of alternative financing. Additionally, they find that firms denied credit for working capital tend to turn to TC, while informal and intercompany lending tends to act as a substitute for bank investment loans. This suggests that TC is the main bank credit substitute for working capital financing. They also find that smaller, self-rationing borrowers are more likely to apply for grant finance.

In conflict with the above-mentioned studies that highlight the important role of alternative sources to firm growth and performance, by examining firm financing patterns and growth with a database of 2,400 Chinese firms, Ayyagari et al. (2010) show that firms with bank financing grow faster than those financed from alternative channels. This finding holds when using a sample of just private sector firm. They also show that bank financing is more prevalent with larger firms. Unlike Allen et al. (2005), these findings suggest that the role of reputation and relationship-based informal financing and governance mechanisms in supporting the growth of private sector firms is likely to be limited and unlikely to substitute for formal mechanisms.

In the same vein, Saeed (2009) investigates the impact of financial sources on firm growth in Brazil and finds that shifting from informal to formal bank finance is associated with improved economic growth outcomes. Firms with access to formal credit channels experience a higher growth than those with informal channels, supporting the view that developed financial system facilitates firms' growth in less developed countries.

In another study, Beck et al. (2008b) investigate the determinants of the use of external financing sources of large and small firms and show that small firms finance a lower

proportion of their investment externally, in particular because they make use of bank finance to a lesser extent. They show that leasing, TC, development finance and equity do not compensate for lower access to bank financing of small firms. By contrast, they find that small firms use significantly more informal finance than large firms do. However, since financing from such sources is limited, the use of informal financing does little to relax financial constraints faced by small firms in developing economies. They also find that larger firms more easily expand external financing when they are constrained than small firms. Their findings therefore point out the limits of alternative sources to compensate for restricted access to bank finance of SMEs, and emphasize the role of institutional development for facilitating the access of small firms to external finance.

1.5 Conclusion

In this chapter, we have examined the literature linking BL constraints to firm's usage of TC and other alternative financing sources. We can see that studies investigating the link between BL constraints and TC usage represent a considerable body in the financial literature, and provide mixed results. Particularly, the question of whether BL and TC are substitutable or complementary financing sources has received more attention in recent studies but remains open. We suggest that further investigation to explore the nature of this relationship provides a promising avenue of research to improve our understanding of the impact of financing constraints on firm's behavior in using TC as well as the role of TC in easing financing constraints.

Besides, a number of studies highlight the complementary effect between BL and TC for small businesses (Burkart and Ellingsen, 2004) and a higher use of TC by large firms than small firms (Casey and O'Toole, 2014; Nilsen, 2002). Hence, one can expect that size has an impact on the relationship between the two sources. However, to our knowledge, there is little research taking into account this potential impact. We argue that an analysis in this aspect is critical to contribute to the literature on the nexus BL-TC. In the second chapter, we attempt to fill the gap by examining the effects of BL constraints on TC use of Vietnamese firms with a comparison between SMEs and large firms. Moreover, since most of empirical studies on the link between BL availability and TC usage focus on developed countries, we believe that our study on Vietnam, a transition economy, adds additional insights to the relevant literature.

In spite of the considerable research on the role of financial development and legal protection in facilitating firms' access to external financing sources, especially bank finance (Beck et al., 2008b), we find no study considering the effects of these country-specific characteristics on the relationship between BL and TC. Besides, several studies show that the development of financial intermediaries have an influence on TC use by firms (Burkart and Ellingsen, 2004; Demirgüç-Kunt and Maksimovic, 2001; Fisman and Love, 2003). Thus, one can expect that the institutional development of a country affects the link between bank credit availability and TC use. We suggest that the question of whether institutional development affects the nature of the relationship, substitute or complement, between BL and TC provides a valuable

research problematic. To address this question, in the third chapter, we investigate the effects of BL constraints on TC usage for an international sample and explore whether these effects differ by firm size, firm age and level of institutional development.

Apart from TC, other alternative sources are often associated with small businesses such as informal sources or sources from family and relatives. Several studies show that SMEs rely most heavily on those sources (Beck et al., 2008b). However, there is little research investigating directly the effects of BL constraints on the use of these sources. This has inspired our research in the fourth chapter that investigates the effects of BL constraints on the use of six alternative financing sources by SMEs, i.e. TC, leasing, credit cards, informal finance, sources from family and friends and equity by using an international data set. In addition, the distinction between working capital and new investments financing has never been investigated in the literature on the use of alternative sources. We also provide an attempt to fill this gap in the third chapter.

By reviewing the literature on BL constraints, we can see that discouraged firms represent a substantial part of all constrained SMEs but those firms have rarely been taken into account in studies related to financing constraints. We argue that exploring TC usage by these firms will provide a more comprehensive study on the effects of BL constraints and add new insights to the literature on the relationship between two sources. Therefore, we take into account discouraged firms as a type of bank-constrained firms in the second, third and fourth chapters.

Finally, in the last chapter, we attempt to explore the interplay between the use of commercial paper, bank credit lines and TC by nonfinancial S&P 500 firms with a focus on the effect of the recent financial crisis (2008-2009). This study allows us to contribute to the scarce literature on the link between commercial paper and TC. Since both credit sources have short-term maturity, one would expect that they are substitutable financing sources from the firm's perspective. Nilsen (2002) note that large firms tend to prefer commercial paper to TC since the former is cheaper than the latter. Hence, while previous studies show that small firms may use TC to compensate for a low use of BL, one would expect that larger firms might increase TC borrowings to compensate for a restricted access to commercial paper market as well as a reduction in bank lending in time of crisis. We also explore how informational asymmetry and agency costs affect the use of those sources while previous studies suggest that short-term debt is better than long-term debt in resolving such market frictions (Dewatripont and Tirole, 1994; Zwiebel, 1996).

1.6 References of Chapter 1

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1.7 Figures and Tables of Chapter 1

Figure 1.1: Theories of BL Constraints

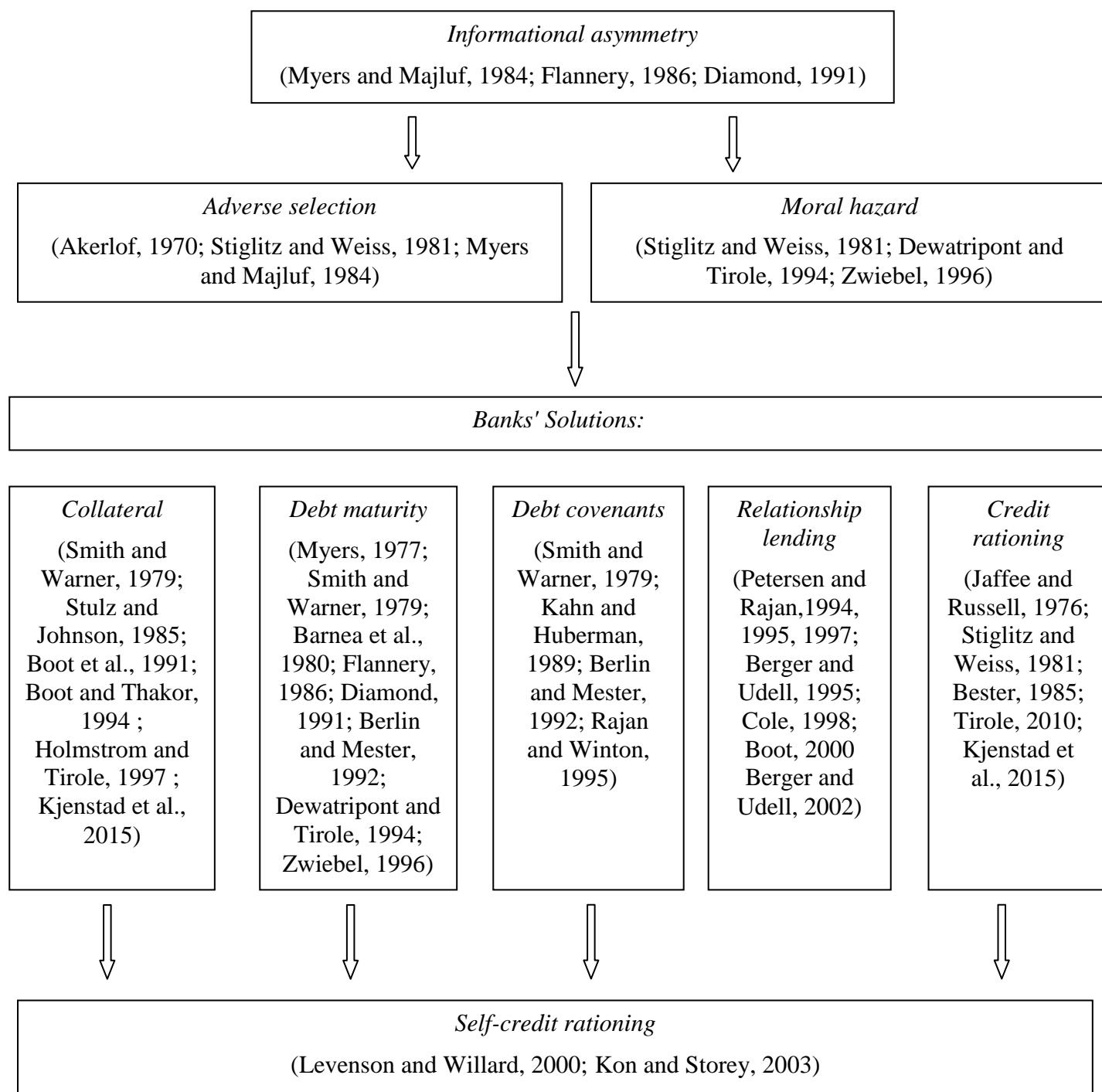


Figure 1.2: Theories of TC

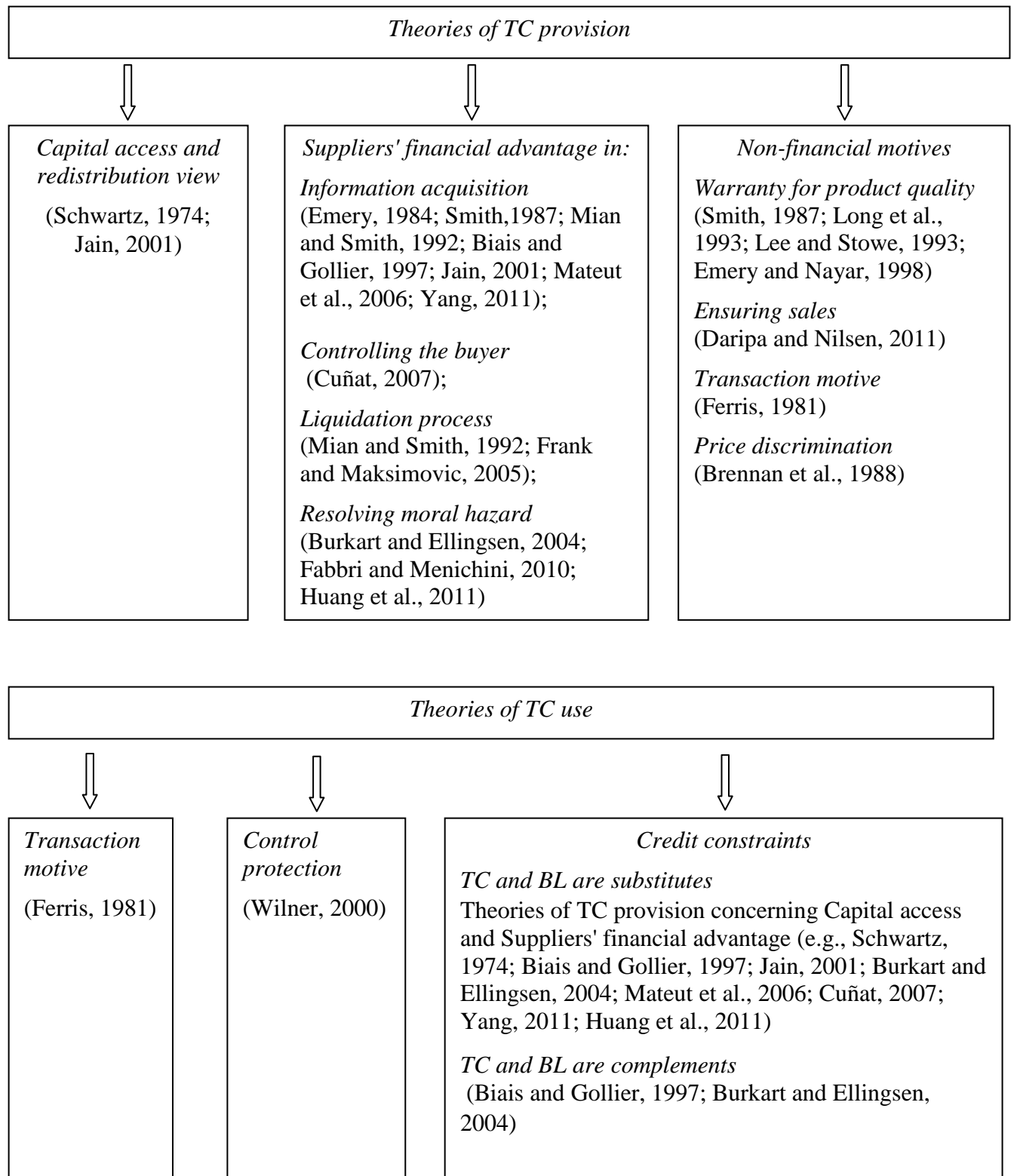


Table 1.1: Literature on BL Constraints

Panel A. Theoretical Studies on BL Constraints

Author(s)	Theory	Methodology	Main propositions/findings
Akerlof (1970)	Adverse selection	Equilibrium model	-Information problem can either cause an entire market to collapse or contract it into an adverse selection of low-quality products
Jensen and Meckling (1976)	Agency costs	Equilibrium model	-Debt involves agency costs that arise because of the conflict of interest between shareholders and bondholders.
Jaffee and Russell (1976)	Credit rationing	Equilibrium model	-Credit rationing is the result of asymmetry of information between borrowers and lenders -Credit rationing occurs when lenders supply a smaller loan size than demanded by the borrowers at a quoted interest rate
Myers (1977)	Agency costs	Equilibrium model	-Agency problems can be solved by shorter maturities
Smith and Warner (1979)	Agency costs	Optimization model	-Agency problems can be solved by pledging collateral, shorter maturities and control rights from covenants
Barnea et al. (1980)	Agency costs	Equilibrium model	-Short-term debt and call provisions can be used as a means of resolving the agency problems and mitigate risk shifting
Stiglitz and Weiss (1981)	Credit rationing	Equilibrium model	-Adverse selection and moral hazard cause credit rationing
Myers and Majluf (1984)	Informational asymmetry	Equilibrium model	-Firms choose financing sources following a pecking order under which internal financing is first preferred, then debt, equity is issued as a “last resort”
Stulz and Johnson (1985)	Agency costs	Optimization model	-Pledging collateral reduces moral hazard problems and lowers a firm’s cost of debt and secured debt can be used to increase the value of the firm
Bester (1985)	Credit rationing	Equilibrium model	-No credit rationing occurs in equilibrium if banks compete by choosing collateral requirements and the rate of interest to screen investors' riskiness
Flannery (1986)	Informational asymmetry	Equilibrium model	-Short-term debt is better than long-term debt in alleviating informational asymmetries
Kahn and Huberman (1989)	Informational asymmetry	Optimization model	-Renegotiation can achieve an efficient outcome while no other simple contract can
Ang (1991)	General analysis		-Small business are subject to higher informational asymmetry and more severe hazard problems

Table 1.1 (continued): Literature on BL Constraints

Panel A (continued). Theoretical Studies on BL Constraints

Author(s)	Theory	Methodology	Main propositions/findings
Boot and al. (1991)	Moral hazard	Equilibrium model	-Pledging collateral reduces moral hazard problems
Diamond (1991)	Informational asymmetry	Equilibrium model	-Short-term debt is better than long-term debt in alleviating informational asymmetries
Berlin and Mester (1992)	Agency costs	Equilibrium model	-Agency problems can be solved by shorter maturities and by writing restrictive covenants, which can be selectively renegotiated -Poorer credit risks will depend more on BL and private placements, since these are easier to renegotiate
Boot and Thakor (1994)	Moral hazard	Equilibrium model	-Pledging collateral reduces moral hazard problems
Dewatripont and Tirole (1994)	Moral hazard	Optimization model	-Short-term debt is better than long-term debt in resolving moral hazard problems
Rajan and Winton (1995)	Agency costs	Equilibrium model	-Both covenants and collateral increase a lender's incentive to monitor
Zwiebel (1996)	Moral hazard	Equilibrium model	-Short-term debt is better than long-term debt in resolving moral hazard problems
Holmstrom and Tirole (1997)	Agency costs	Equilibrium model	-Pledging collateral reduces moral hazard problems and lowers a firm's cost of debt
Boot (2000)	Review of literature on relationship banking		-Relationship banking can be a value-enhancing intermediation activity and soft information may be accumulated by banks only over time,
Kon and Storey (2003)	Discouraged borrowing	Equilibrium model	-Discouragement is shown to be at a maximum where there is some, but not perfect, information
Tirole (2010)	Credit rationing	Equilibrium model	-Credit rationing occurs when a borrower cannot obtain the loan that he wants even though he is willing to pay the interest
Kjenstad et al. (2015)	Credit rationing	Equilibrium model	-There are two types of credit rationing due to various ex-post agency issues: In the absence of agency costs, the borrower always demands a larger loan than what the lender can offer; and when the agency cost is sufficiently high, the borrower is unable to obtain the loan she needs at any interest rate.

Table 1.1 (continued): Literature on BL Constraints

Panel B. Empirical Studies on BL Constraints

Author(s)	Country focus	Firm/industry characteristics	Methodology	Main findings
Walker (1989)	US	Small firms	Statistics analysis	-BL and TC are two main sources of small businesses
Petersen and Rajan (1994)	US	Small firms	Survey; OLS; Tobit	-Banking relationships increase credit availability
Petersen and Rajan (1995)	US	Small firms	Survey; Tobit	-Banking relationships increase credit availability
Berger and Udell (1995)	US	Small firms	Survey; OLS; Logit	-Relationship lending generates valuable information about borrower quality
Binks and Ennew (1996)	UK	Private firms	Survey; Ordered probit	-Better relationship with banks enhance firm's growth and ease credit constraints
Petersen and Rajan (1997)	US	Small firms	Survey; OLS; two-step estimation	-Banking relationships increase credit availability
La Porta et al (1997)	49 countries	Aggregate data	OLS	-Countries with poorer investor protections have smaller and narrower capital markets
Demirgüç-Kunt and Maksimovic (1998)	30 countries	Largest publicly traded firms	OLS	-Better institutional development facilitates firm's access to external financing
Rajan and Zingales (1998)	41 countries	Manufacturing firms	OLS	-Better institutional development facilitates firm's access to external financing and thus enhances firm's growth
Cole (1998)	US	Small firms	Survey; Logit	-Banking relationships generate valuable private information about the financial prospects of the customer
Ortiz-Molina and Penas (2008)	US	Small firms	Survey; OLS	-Maturity and collateral are substitute mechanisms to exert control over opaque and risky borrowers
Dabla-Norris and Koeda (2008)	26 transition economies	Firms with external financing	Survey; Probit	-Informality is associated with lower access to and use of bank credit
Beck et al. (2008a)	44 countries	Industries in manufacturing sector	Survey; OLS	-Financial development exerts a disproportionately positive effect on small firms

Table 1.1 (continued): Literature on BL Constraints

Panel B (continued). Empirical Studies on BL Constraints

Author(s)	Country focus	Firm/industry characteristics	Methodology	Main findings
Beck et al. (2008b)	48 countries	80% are SMEs	Survey; Tobit	-Small firms are more financially constrained than large firms and benefit the most from a better protection of property rights in accessing external financing
Han et al. (2009)	US	Small firms	Survey; Logit	-Riskier borrowers have higher probabilities of discouragement
Agostino et al. (2009)	Italy	SMEs	Survey; Panel data; GMM	-Higher quality of the legal system is positively correlated with a firm's better access to financial debt
Howorth and Moro (2012)	Italy	SMEs	Survey; OLS	-Trustworthiness decreases the interest rate charged on bank borrowings of SMEs
Grunert and Norden (2012)	US and Germany	SMEs	Probit; Ordered probit	-More favorable soft information including management skills and character increases borrower bargaining power
Uchida et al. (2012)	Japan	SMEs	Survey; Probit, Ordered Logit	-Bank officers play a significant role in relationship lending by producing soft information about SMEs
Christensen and Nikolaev (2012)	US	Firms with covenant contracts	Ordered logit	-Financial covenants (capital and performance covenants) control the conflicts of interest between lenders and borrowers via different mechanisms
Chakravarty and Xiang (2013)	10 developing countries	93% are from SMEs	Survey; Logit	-Younger and smaller firms are less likely to be discouraged -A greater number of financial institutions decreases the likelihood being discouraged
Canton et al. (2013)	15 EU members	SMEs	Survey; Hierarchical Binomial Logit	-Youngest and smallest SMEs have the worst perception of access to BL
Vermoesen et al. (2013)	Belgium	SMEs	Panel data; Firm fixed effects model	-The decline in the supply of credit induced by the recent financial crisis reduces firms' investments in 2009

Table 1.1 (continued): Literature on BL Constraints

Panel B (continued). Empirical Studies on BL Constraints

Author(s)	Country focus	Firm/industry characteristics	Methodology	Main findings
Jõeveer (2013)	10 Western European countries	Excluding micro-enterprises	Panel data; ANOVA analysis; OLS	-Small firms are more financially constrained
Ogawa and Tanaka (2013)	Japan	SMEs	Survey; Probit	-Firms rely mainly on bank–firm relationship and the customer–supplier relationship to overcome the negative liquidity shocks in financial crises.
Casey and O’Toole (2014)	11 euro area members	SMEs	Survey; Probit	-Both rationed firms and self-rationed firms are more likely to rely on alternative channels
Bottazzi et al. (2014)	Italy	Limited Liability registered firms	Panel data; Asymmetric exponential power (AEP)	-Financial constraints weaken firm growth and increase volatility and asymmetries in growth shock distributions
Valadkhani et al. (2014)	Australia	Small firms	Generalized least square (GLS)	-The Global Financial Crisis increased the cost of borrowing for small businesses

Table 1.2: Literature on TC

Panel A. Theoretical Studies on TC Motives

Author(s)	Motive	Methodology	Main propositions/findings
Schwart (1974)	Capital access	Equilibrium model	-Firms with easier access to capital markets extend TC to buyers to induce them to increase their purchases
Ferris (1981)	Transaction motive	Optimization model	-TC reduces transactions costs arising from trading uncertainty
Emery (1984)	Informational advantage	Equilibrium model	-Suppliers have superior information
Smith (1987)	Informational advantage	Equilibrium model	-TC terms work as a screening device that helps suppliers protect non-salvageable investments
Brennan et al. (1988)	Price discrimination	Equilibrium model	-Suppliers use TC to price discriminate
Long et al. (1993)	Warranty for Product Quality	Equilibrium model	-TC serves as a guarantee for product quality
Biais and Gollier (1997)	Informational advantage	Equilibrium model	-TC reveals suppliers' private information to banks, thus increases their willingness to lend
Emery and Nayar (1998)	Warranty for Product Quality	Equilibrium model	-Payment terms are chosen to permit to repair defects and to signal product quality
Wilner (2000)	Control protection	Equilibrium model	-Managers demand TC in anticipation of larger concessions in case of financial distress
Jain (2001)	Informational advantage	Optimization model	-Banks and suppliers profit from TC lending at the expense of buyers
Burkart and Ellingsen (2004)	Moral Hazard	Equilibrium model	-TC and BL are substitutes for entrepreneurs with intermediate level of wealth and complements for poor entrepreneurs -Better creditor protection decreases the use of TC
Frank and Maksimovic (2005)	Advantage in liquidation	Equilibrium model	-Suppliers have advantage in liquidating collateral
Mateut et al. (2006)	Informational advantage	Equilibrium model	-Suppliers' information advantage over banks induce them to ameliorate credit conditions for borrowers
Cuñat (2007)	Controlling advantage	Equilibrium model	-Suppliers can threaten to cut off future supplies in the event of nonpayment, thus can lend more liberally

Table 1.2 (continued): Literature on TC

Panel A (continued). Theoretical Studies on TC Motives

Author(s)	Motive	Methodology	Main propositions/findings
Fabbri and Menichini (2010)	Moral Hazard and Advantage in liquidation	Equilibrium model	-Financially unconstrained firms (with unused bank credit lines) take TC to exploit the supplier's liquidation advantage. -Greater reliance on TC is associated with more intensive use of tangible inputs. -Better creditor protection decreases both the use of TC and input tangibility
Yang (2011)	Informational advantage	Equilibrium model	-TC and bank borrowing are substitutes during tight monetary periods and complements during looser monetary episodes
Huang et al. (2011)	Informational advantage	Equilibrium model	-TC and BL can be substitutes or complements, but with the evidence in favor of substitution dominating
Daripa and Nilsen (2011)	Ensuring sales	Optimization model	The upstream firm provides TC at an interest rate of zero to avoid lost sales
Seifert et al. (2013)	Review of TC literature		- TC literature is divided into four areas of inquiry: TC motives, order quantity decisions, credit term decisions, and settlement period decisions.

Table 1.2 (continued): Literature on TC

Panel B. Empirical Studies on TC and the Relationship with BL

Author(s)	Country focus	Firm/industry characteristics	Methodology	Main findings
Meltzer (1960)	US	Manufacturing firms	OLS	-TC is a substitute for bank credit -Firms redistribute funds through TC
Walker (1985)	US	Small firms	Survey	-Taking available TC discounts is a good credit record
Mian and Smith (1992)	US	Manufacturing firms	OLS; Logit	-Suppliers have an advantage in monitoring of the buyer's credit quality and place more value on the collateral than the bank would
Petersen and Rajan (1994)	US	Small firms	Survey; OLS; Tobit	-TC is a substitute for bank credit
Petersen and Rajan (1995)	US	Small firms	Survey; Tobit	-TC is a substitute for bank credit
Petersen and Rajan (1997)	US	Small firms	Survey; OLS; two-step estimation	-TC is a substitute for bank credit -Suppliers have advantage in information acquisition and in liquidation -Suppliers use TC to price discriminate -Firms with better access to credit offer more TC
Cook (1999)	Russia	Small firms	Survey; Probit	-TC and bank credit are complements
McMillan and Woodruff (1999)	Vietnam	Non-state firms	Survey; Tobit	-The more information about customers, suppliers obtains, the more TC they offer
Ng et al. (1999)	US	Firms with one product line	Survey; Logit	-TC terms serve as contractual solutions to information problems concerning product quality and buyer creditworthiness
Demirgüç-Kunt and Maksimovic (2001)	40 countries	Manufacturing firms	OLS	-The provision of TC is complementary to the development of financial intermediaries
Nilsen (2002)	US	Small-large firm distinction	Panel-data; VAR; OLS; SUR	-Both unrated large firms and small firms increase demand for TC during periods of tight money
Wilson and Summers (2002)	UK	Small firms with one product line	Survey; Tobit; Ordered Probit; Logit; OLS	-TC terms are used to price discrimination; and information problems -TC serves to reduce transaction costs -The extension of TC is negatively associated with credit rationing
Fisman and Love (2003)	43 countries	37 industries	Panel-data; OLS	-Industries with higher dependence on TC financing exhibit higher rates of growth in countries with weaker financial institutions

Table 1.2 (continued): Literature on TC

Panel B (continued). Empirical Studies on TC and the Relationship with BL

Author(s)	Country focus	Firm/industry characteristics	Methodology	Main findings
Van Horen (2004)	42 developing countries	The majority are SMEs	Survey; Tobit	-TC is used as a competitive tool, particularly for small and young firms
Danielson and Scott (2004)	US	Small firms	Survey; Bivariate probit	-TC is a substitute for bank credit
Alphonse and al. (2004)	US	Small firms	Survey; 2SLS	-TC and bank credit are complements
Blasio (2005)	Italy	Manufacturing firms	Panel-data; OLS	-Small firms and firms not paying dividends are more likely to substitute bank credit with TC during contractions.
Pike et al. (2005)	US, UK and Australia	Large companies	Survey	-TC terms serve as contractual solutions to reduce information asymmetries and discriminatory pricing
Mateut et al. (2006)	UK	Manufacturing firms	Panel-data; Fixed effects model	-Bank lending decreases relative to TC -A monetary tightening affects smaller firms more than large firms
Cuñat (2007)	UK	Manufacturing firms	Panel-data; GMM	-TC provision is positively associated with the strength of supplier-customer relationship
Love et al. (2007)	6 emerging economies	Publicly traded firms	Panel-data; Firm fixed effects	-TC cannot fully compensate for the contraction in bank credit -Bank credit crunch reduces the supply of TC (Redistribution view)
Beck et al.(2008b)	48 countries	80% are SMEs	Survey; Tobit	-TC does not compensate for a lower use of bank debt of small firms
Gama and Mateus (2010)	Portugal and Spain	SMEs	Panel-data; GMM	-TC and bank credit may be either substitutes or complements, esp. for younger and smaller firms
Love and Zaidi (2010)	4 East Asian countries	Manufacturing SMEs	Survey; OLS	-TC and bank credit are complements during the financial crisis of 1998
Giannetti et al. (2011)	US	Small firms	Survey; OLS; Probit	-TC and bank credit are complements rather than substitutes.
Yang (2011)	US	Manufacturing firms	Panel-data; GMM	-TC and bank credit are substitutes during tight monetary period, and complements during loose monetary episodes

Table 1.2 (continued): Literature on TC

Panel B (continued). Empirical Studies on TC and the Relationship with BL

Author(s)	Country focus	Firm/industry characteristics	Methodology	Main findings
Huang et al. (2011)	China	Listed companies	Panel-data; 2SLS; GMM	-TC is a substitute for bank credit, esp. during the slow-growth period
Ogawa and Tanaka (2013)	Japan	SMEs	Survey; Tobit	-TC is a substitute for bank credit. -More TC is provided by a large supplier to solvent customers
Garcia-Appendini and Montoriol-Garriga (2013)	US	Incorporated, non-financial firms	Panel data; Firm fixed effects model	-TC and bank credit are substitutes during the financial crisis -Decline in access to lines of credit decreases TC provision
Coulibaly et al. (2013)	6 emerging Asian countries	Publicly-traded manufacturing firms	OLS; Logit	-TC and bank credit are substitutes for domestic-oriented firms during the financial crisis
Ferrando and Mulier (2013)	8 euro area countries	Nonfinancial companies	Panel data; GMM	-Firms use both accounts payable and receivable to manage growth during the financial crisis
Ogawa and Tanaka (2013)	Japan	SMEs	Survey; Probit	-A long customer–supplier relationship plays an important role in mitigating the supply shock
Casey and O’Toole (2014)	11 euro area members	SMEs	Survey; Probit	-TC and bank credit are substitutes during the financial crisis
Agostino and Trivieri (2014)	Italy	Manufacturing SMEs	Panel-data; GMM	-TC has an information content for banks, especially at the beginning stages of bank–firm relationships
Lin and Chou (2015)	China	Listed firms	Panel data; Firm fixed effects model	-Both demand and supply-side of TC decrease at the peak of financial crisis
Tsuruta (2015)	Japan	Small firms	Panel data; Firm fixed effects model; OLS	-TC and bank credit are complements during the financial crisis -Enhanced credit availability increases TC provision
Deloof and La Rocca (2015)	Italy	SMEs	OLS; Fixed effects model; 2SLS	-The provision of TC is complementary to the development of financial institutions at the local level.

Table 1.3: Studies on Other Alternative Financing Sources

Author(s)	Country focus	Firm/industry characteristics	Methodology	Main findings
Lewellen et al. (1976)			Equilibrium model	-Leasing is a method of transferring unusable tax shields from lessees to tax paying lessors
Miller and Upton (1976)			Equilibrium model	-Leasing is a method of transferring unusable tax shields from lessees to tax paying lessors
Myers et al. (1976)			Optimization model	-Leasing is a method of transferring unusable tax shields from lessees to tax paying lessors
Ang and Peterson (1984)	US	Non-financial firms	Tobit	-Leases and debt are complements
Finucane (1988)	US	Non-financial firms	Tobit	-Leases and debt are complements
Marston and Harris (1988)	US	Firms with rental commitments	OLS	-Leases and bank loan are substitutes
Lease et al. (1990)	US	363 financial leasing contracts	Statistics analysis	-Few lease contracts are paid out strictly according to the contractual specifications
Bell (1990)	India	Rural Households	Survey	-Informal credit is an alternative financing for the credit rationed borrowers
Lewis and Schallheim (1992)			Optimization model	-Leases and debt are complements
Kashyap et al. (1993)	US	Aggregate data	OLS	-Commercial paper usage increases when bank lending availability declines
Krishnan and Moyer (1994)	US	Non-financial firms	Logit; OLS	-Leases and bank loan are substitutes
Erickson and Trevino (1994)	US	Airline industry	OLS	-Leases and bank loan are substitutes
Sharpe and Nguyen (1995)	US	Non-financial and - utilities firms	Panel data; Tobit	-Leases and bank loan are substitutes
Adedeji and Stapleton (1996)	UK	Non-financial firms	Tobit	-Leases and bank loan are substitutes

Table 1.3 (continued): Studies on Other Alternative Financing Sources

Author(s)	Country focus	Firm/industry characteristics	Methodology	Main findings
Lasfer and Levis (1998)	UK	Quoted and unquoted firms	Logit	-Small firms with high Tobin's q and those that are less profitable are more likely to use leasing
Ghosh et al. (2000)			Equilibrium model	-Informal credit is an alternative financing for the credit- rationed borrowers
Allen et al. (2005)	China	State, Listed and Private Sectors	Aggregate data; Panel data; Survey	-The usage of alternative financing enhance firm growth and performance of the Private sector and compensate for a low use of formal financing
Severin and Filareto-Deghaye (2007)	France	SMEs	KACM method	-Leases and bank loan are substitutes
Beck et al. (2008b)	48 countries	80% are SMEs	Survey; Tobit	-Leasing, TC, development finance and equity do not compensate for lower access to bank financing of small firms -Small firms rely more on informal sources from money lenders as compared to large firms
Eisfeldt and Rampini (2009)	US	Manufacturing firms	OLS; Tobit	-Leases and bank loan are substitutes
Oh et al. (2009)	Korea	Manufacturing firms	Panel data; Probit	-Credit guarantees influence significantly firms' ability to maintain their size, and increase their survival rate
Leary (2009)	US	Manufacturing sector	Probit; Multinomial logit	-Bank-dependent firms shift towards equity when bank debt is scarce
Saeed (2009)	Brazil	SMEs	OLS; 2SLS estimates	-Shifting from informal to formal bank finance is associated with improved economic growth outcomes
Ayyagari et al. (2010)	China	Private firms	Survey; OLS; Selection model	-Firms with bank financing grow faster than those financed from alternative channels
Beck et al. (2010)	46 countries	76 partial credit guarantee schemes	OLS	-Government has an important role to play in funding and management, but less so in risk assessment and recovery

Table 1.3 (continued): Studies on Other Alternative Financing Sources

Author(s)	Country focus	Firm/industry characteristics	Methodology	Main findings
Chavis et al. (2011)	Over 100 countries	New and young firms	Survey; Probit	-Younger firms rely more on other financing alternatives than on bank finance for both short-term (working capital) and long-term (new investment) financing
Allen et al. (2012a)	India	Non-financial firms	Panel data; Survey; OLS; Ordered probit	-The usage of alternative financing enhance firm growth and performance and compensate for a low use of formal financing
Allen et al. (2012b)	40 countries	Non-financial firms	Survey	-Alternative financing channels play an important role in both developed and developing countries
Yiu et al. (2013)	China	Private firms	OLS; Selection model	-The usage of alternative financing (underground financing and TC) enhance firm growth and performance and compensate for a low use of formal financing
Lee and Persson (2013)			Optimization model	-Sources from family and friends are used as a last resort because this financing discourages risk taking
Casey and O'Toole (2014)	11 euro area members	SMEs	Survey; Probit	-Bank-constrained firms increase their use and demand of alternative sources during the financial crisis including TC, informal lending, other company or shareholder loans -Development finance including government grants does not compensate for restricted access to bank finance of small businesses
Cosci et al. (2015)	Italy	Firms reporting total value of leases outstanding	OLS; Probit	-Leases and BL are substitutes

Chapter 2: The Effects of Bank Loan Constraints on Trade Credit Use across Size: Evidence from Micro data of Vietnamese Firms

Abstract

This chapter examines the effects of bank loan (BL) constraints on the use of trade credit (TC) by Vietnamese firms across size with a comparison between large firms and Small and Medium-sized Enterprises (SMEs). We distinguish three types of bank-constrained firms, i.e. credit denied firms, discouraged firms and those with pending applications; and four types of discouraged firms, i.e. those that did not apply for a BL because of burdensome procedures for loans, strict collateral requirements, high interest rates and expected denial. Using a sample of 1000 Vietnamese firms from the World Bank Enterprise Survey in 2005, we find support for our main hypothesis that bank-constrained large firms rely on TC to a greater extent relative to bank-constrained SMEs. However, this effect differs across bank constraint types. More specifically, we find that denied large firms use more TC by 5.2% whereas denied SMEs use less of it by 6.7%, implying a substitution and complementary effect respectively. Furthermore, our results suggest that discouraged large firms because of burdensome procedures for BL and strict collateral requirements also use more TC. Our results, on the other hand, imply that TC may be cheaper than BL for SMEs, which induces them to prefer TC when they have been discouraged from applying for a BL because of high interest rates. In addition, SMEs with pending applications also use more TC while discouraged firms because of expected denial use less of it.

Résumé

Ce chapitre examine les effets des contraintes sur les prêts bancaires (BL) sur l'utilisation du crédit commercial (TC) par les entreprises vietnamiennes. L'étude fait une comparaison des réactions des grandes et des petites et moyennes entreprises (PME) face au rationnement du crédit bancaire. Nous distinguons trois types de contraintes sur BL: les entreprises dont la demande de crédit a été refusée par la banque, les entreprises qui n'ont pas fait de demande car elles sont découragées et celles dont la demande est en instance. Nous distinguons quatre raisons de découragement, à savoir : la lourdeur des procédures de demande de BL, les exigences de garanties jugées trop strictes, des taux d'intérêt jugés trop élevés et l'anticipation d'un refus. L'étude empirique est fondée sur un échantillon de 1000 entreprises vietnamiennes ayant répondues à l'Enquête sur l'Entreprise de la Banque Mondiale en 2005. Les résultats de notre étude empirique étayaient notre hypothèse principale selon laquelle les grandes entreprises subissant le rationnement bancaire font plus appel au TC que les PME dans la même situation. Plus précisément, nous constatons que les grandes entreprises dont la demande de BL a été refusée utilisent plus de TC tandis que les PME dans le même cas l'utilisent moins. Ce résultat implique un effet de substitution pour les grandes entreprises et une complémentarité entre les deux types de financement pour les PME. En outre, nos résultats suggèrent que les grandes entreprises découragées en raison de la lourdeur des procédures pour obtenir un BL ou parce que les exigences de garantie sont jugées trop strictes utilisent également plus de TC. Nos résultats impliquent également que le TC peut être moins cher que BL pour les PME, ce qui les incite à préférer le TC quand elles sont découragées de demander un BL en raison de taux d'intérêts bancaires jugés élevés. En outre, les PME dont les demandes de BL sont en attente utilisent plus de TC. Finalement, les entreprises découragées en raison de refus anticipé font moins appel au TC.

Chapter 2: The Effects of Bank Loan Constraints on Trade Credit Use across Size: Evidence from Micro data of Vietnamese Firms

2.1 Introduction

It is well known that external financing is a critical resource for firms in transition economies (Coulibaly et al., 2013; Le et al., 2006; Young et al., 2008). Nevertheless, in those countries with weak legal and financial systems, firms obtain less external financing, which results in lower growth (Beck et al., 2005; Delcours, 2007; Demirgüç-Kunt and Maksimovic, 1998; La Porta et al., 1998, 1997; Rajan and Zingales, 1995). Besides, because of greater barriers to financing in developing countries, trade credit (TC) has been considered as one of the primary funding sources, especially for Small and Medium-sized Enterprises (SMEs) (Demirgüç-Kunt and Maksimovic, 2001; Lin and Chou, 2015; Van Horen, 2004) and shown to be valuable for the firm growth and performance (Fisman and Love, 2003; Yang, 2011; Yiu et al., 2013). In this study, we address the question of whether or not financially constrained firms use more TC and how this effect differs by constraint type and firm size with a comparison between SMEs and large firms in Vietnam, an emerging economy.

Researchers have raised the question of why several firms rely on their suppliers to obtain financing, rather than on specialized financial intermediaries such as banks. As TC is often seen as an expensive substitute (Cook, 1999; Ng et al., 1999; Petersen and Rajan, 1997, 1995, 1994; Wilson and Summers, 2002), based on the explicit cost alone, companies should therefore prefer bank loans (BL). A prevalent explanation is that companies have no other choice of financing because they are rationed on credit by financial institutions (Danielson and Scott, 2004; Lin and Chou, 2015; Nilsen, 2002; Petersen and Rajan, 1997; Yiu et al., 2013). In effect, many enterprises report insufficient access to bank credit as one of the most important constraints to operation and growth of their business (Beck et al., 2005). In transition economies, bank lending is the main channel of funding for firms, especially for private small firms, they however face severe constraints in accessing loans (Allen et al., 2005; Beck et al., 2008; Le et al., 2006; Lin and Chou, 2015; Yiu et al., 2013). Taken together with the absence of capital markets, this explains why TC appears to be more prevalent in transition countries where the legal protection and financial development are weak (Burkart and Ellingsen, 2004; Fisman and Love, 2003). In contrast, another strand of literature posits that TC may not be more expensive, even cheaper than BL (Daripa and Nilsen, 2011; Emery, 1984). Besides, TC may offer advantages over banks in reducing transaction costs (Ferris, 1981) or in facilitating banks' lending decision by serving as a good signal (Biais and Gollier, 1997).

Four observations motivate this study. First, there is a debate in the literature on the nature of the link between BL and TC. On the one hand, the substitution hypothesis posits that

constrained firms on BL use more TC as an alternative financing to offset the decline in bank lending. This argument finds empirical evidence in several studies such as Meltzer (1960), Petersen and Rajan (1997, 1995, 1994) and finds support in some recent theoretical models (Huang et al., 2011; Mateut et al., 2006). On the other hand, the complementary hypothesis postulates that TC allows firms to access BL thanks to the supplier's private information (Biais and Gollier, 1997) especially for low-wealth firms (Burkart and Ellingsen, 2004). This argument also finds empirical support in some studies such as Cook (1999) and Agostino and Trivieri (2014).

Second, previous studies are inconclusive on the effects of firm size on the link between BL and TC. Several studies have shown that size is a significant determinant of TC utilization (Beck et al., 2008; Lin and Chou, 2015; Nilsen, 2002; Petersen and Rajan, 1997). Overall, these authors suggest that larger firms have higher level of TC use, mainly because they have better credit quality and thus receive more TC than smaller firms. In contrast, the literature has demonstrated that TC is more likely to be used when companies are small, young and opaque firms (Ogawa et al., 2013; Wilner, 2000). Taken together, one would expect that on the one hand, smaller firms are more likely to be financially constrained by banks, thus may attempt to borrow more from the suppliers; larger firms, on the other hand, are more likely to be offered TC, thus they are able to increase TC to compensate the reduction in bank financing. Furthermore, since SMEs form a substantial part of all enterprises in most countries and largely contribute to economic growth and employment creation, this sector has received more and more attention in the research literature and has become a valuable research area. Besides, a substantial body of literature has consistently shown that small business is specific and their financing patterns are significantly different from large firms (Beck et al., 2008, 2005; Canton et al., 2013; Psillaki and Daskalakis, 2009; Vermoesen et al., 2013). Therefore, a focus on the TC utilization by financially constrained SMEs indeed merits attention.

Third, there is little research investigating directly the usage of TC by bank-constrained firms other than those that were denied credit (Danielson and Scott, 2004; Petersen and Rajan, 1997). In the literature linking financing constraints to TC use, Casey and O'Toole (2014) is one of the rare studies that distinguishes two types of constrained firms: denied firms and self-rationed borrowers that refuse to take the credit offered because of high bank rates. In this study, we distinguish three main types of constrained firms: denied firms, i.e. those that were turned down on their loan application; firms with pending application, i.e. those whose loan application is still pending, and discouraged firms, i.e. those that need a BL but did not apply for it. Distinguishing between denied firms and discouraged firms is necessary to explore the potential differences in their behavior regarding TC use. Likewise, there would be differences in TC use across types of discouraged firms. We therefore distinguish four types of discouraged firms: those because of burdensome procedures for BL, high interest rates, strict collateral requirements and expected denial. We believe that ignoring discouraged firms and those with pending application underestimate the firm's difficulties in accessing BL. There are quite a few of studies that shows the importance to study discouraged borrowing, especially for SMEs, since discouraged firms form a substantial part of constrained SMEs

(Canton et al., 2013; Chakravarty and Xiang, 2013; Han et al., 2009; Levenson and Willard, 2000). Levenson and Willard (2000) report that while 2.14% of U.S small businesses in their sample were rejected on bank credit, 4.22% of their firms were discouraged from applying for a BL because they thought their application would not be approved, i.e. expected denial. In another study, by investigating the determinants of perceived credit constraint among SMEs in EU countries, Canton et al. (2013) report 42 % of all SMEs think that obtaining BL is difficult. Hence, BL constraints are more widespread as previously believed.

Four, there is little research considering the effects of financing constraints on using TC by firms in developing countries since most of the previous studies focus on developed countries (Casey and O'Toole, 2014; Nilsen, 2002; Petersen and Rajan, 1997, 1995, 1994). Furthermore, Vietnam represents an ideal setting for testing the link bank finance-TC. Studies related to TC use by Vietnamese firms are relatively rare. McMillan and Woodruff (1999) provide the only study that considers the link between the inter-firm relationships and the provision of TC by Vietnamese firms. They find that firms lend to their constrained buyers and that a longer duration of trading relationship is associated with larger credit provision.

Besides, apart from bank and TC, alternative sources of external finance are mostly unavailable, particularly for SMEs, because the access to the financial markets in Vietnam (e.g., stock, bond, commercial paper) is very limited. In effect, in our sample, TC is the third most important external financing used by Vietnamese firms to finance working capital after bank borrowings and equity. On the other hand, accessing BL remains the challenging task for Vietnamese firms, especially for SMEs (Le et al., 2006; Nguyen et al., 2006; Tenev et al., 2003). According to Vietnam Institute of Manpower, Banking & Finance, only 30% of SMEs have access to bank finance, the remaining 70% of SMEs have to rely on internal financing or alternative financing sources that are often very costly with interest rates between 15-18%.

Additionally, investigating the use of TC by discouraged firms is particularly interesting in the context of Vietnam since complicated administrative procedures, strict collateral requirements and the high cost of state BL are very specific characteristics in such a developing country (Le et al., 2006; Yiu et al., 2013). The banking system in Vietnam is dominated by state-owned banks that are reluctant to lend to small firms due to high informational asymmetry, weaknesses in legal systems and in banks' skills of assessing and managing credit risk. Often times, to compensate for the asymmetric information between lender and borrower, banks require collateral assets of high value to mitigate counterparty risk. BL to small firms are therefore very collateral dependent and many small firms cannot obtain a BL due to lacking pledgeable assets or choose not to apply for a BL. Besides, the literature suggests that lower protection of property rights, that is indeed the case of Vietnam, a former collectivist country decreases external financing of small firms significantly more than it does for large firms, particularly due to the differential impact it has on bank finance (Beck et al., 2008).

To the best of our knowledge, this is the first study that examines the relationship between bank credit constraints and Vietnamese firms' use of TC and the first to take into account not

only denied firms, but also discouraged firms and those with pending applications. We also explore whether BL and TC are substitutes or complements across firm size by directly looking at the reaction of financially constrained firms with a focus on SMEs. SMEs, which form the majority of private firms, are an important engine of growth for the Vietnamese economy. According to Vietnam Association SMEs, they account for 97,5% of the number of enterprises in Vietnam, employ in total 51% of the workers in the economy, and contribute approximately 40% of Gross Domestic Product (GDP). Yet, as above-discussed, they face severe difficulties in accessing external finance, especially bank finance. We therefore examine whether TC is valuable for these firms when they are financially constrained by financial institutions in comparison with large enterprises.

To address our research question, we use data from the Enterprise Survey of Productivity and the Investment Climate, conducted by World Bank in 2005 (WBES). Our sample consists of 1000 Vietnamese firms in the manufacturing sector of which 49.1% of our observations are from SMEs and another 50.9% are from large firms. Importantly for our analyses, the WBES data allow constructing direct measures of TC usage and BL constraints based on a firm's level of TC use to finance the assets side of working capital and the history of its interactions with banks. All data refer to the year 2004 when the financial systems are under normal conditions.

The chapter is structured as follows. In the next section, we provide a review of the relevant literature on the relationship between BL constraints and TC use, and develop our hypotheses. The following sections present our research methodology and discuss key findings. The chapter concludes with discussions of managerial implications and suggestions for future research.

2.2 Theoretical Framework and Hypotheses

2.2.1 The Complementary and Substitution Effect between BL and TC

Existing research in corporate financial management has demonstrated that TC and bank finance may be either substitutes or complements. On the one hand, the substitution effect between BL and TC implies a negative correlation between BL availability and TC usage. The complementary effect, on the other hand, implies a positive correlation between the usage of the two.

The substitution effect finds the first empirical evidence in Meltzer (1960) who shows that in times of monetary contraction, firms with ample cash balances extend TC to firms that suffer from the negative impact in bank lending. Most subsequent studies support the substitution hypothesis between the two sources. Petersen and Rajan (1997, 1995, 1994) provide a rich evidence based on the link between bank credit availability and TC for U.S firms. Accordingly, they suggest that financially constrained firms use TC as "financing of last resort". They frame BL and TC into a pecking order of financing to test the substitution hypothesis for which they indeed find empirical evidence. In all three papers, they show that firms rely more on TC if they have shorter banking relationships. However, surprisingly, in

the 1997 paper, they do not find a significant effect of bank denial on TC demand. In the same vein, Nilsen (2002) find that small and unrated large firms without a bond rating in the United States increase their use of TC during monetary contractions. To control for the potential collinearity between banking relationship strength and loan application outcomes, Danielson and Scott (2004) carried out a research using a recursive simultaneous equation system in which TC demand is a function of loan availability and loan availability is a function of banking relationship strength. Their results indicate a positive and significant relationship between bank denial and TC demand. Other studies carried out in developed countries such as Blasio (2005), Mateut et al. (2006) also support a negative correlation between the usage of TC and BL.

The substitution hypothesis raises a question as to why TC is available when BL is not. A common explanation is that suppliers have *a monitoring advantage over banks*, e.g., advantage in collateral value (Mian and Smith, 1992), in liquidation process (Frank and Maksimovic, 2005), in resolving moral hazard problems (Burkart and Ellingsen, 2004), in enforcing repayment (Cuñat, 2007) and in granting more concessions in renegotiation arising from buyer-seller relationship (Wilner, 2000). Alternatively, sellers may have *superior information* about firms than banks, thus be better institutions in evaluating and controlling the credit risk of their buyers as analyzed by Emery (1984), Smith (1987), Mian and Smith (1992), Freixas (1993), Biais and Gollier (1997), Jain (2001). This explanation is particularly true when the customers are small, young and opaque firms (Berger and Udell, 1995; Wilner, 2000) or operate in countries with poorly developed financial institutions. Indeed, even though weak creditor protection and imperfect information will affect both financial intermediaries and TC providers, trade creditors may mitigate these problems better than formal lenders for several reasons such as better information acquisition, the renegotiation/liquidation process, and enforcement (Burkart and Ellingsen, 2004; Demirgüç-Kunt and Maksimovic, 2001; Fisman and Love, 2003).

On the other hand, the complementary effect between BL and TC also finds theoretical foundations and empirical support. In their model, Biais and Gollier (1997) suggest that TC helps transfer private information about the borrower from the supplier to the bank, thus alleviate credit rationing problem by improving the borrower's reputation, implying the informational role of TC. In another study, Burkart and Ellingsen (2004) investigate the situations in which substitution and complementariness take place. Their theoretical model is based on the idea that inputs are less easily diverted than cash thanks to input illiquidity, what facilitates TC provision. They suggest a substitution effect for entrepreneurs with intermediate level of wealth and a complementary effect for the poorest entrepreneurs because the availability of TC increases bank credit offered to these firms. Overall, these studies suggest a positive relationship between BL availability and TC use, particularly for small businesses that are more likely to be credit-rationed by banks.

The complementary hypothesis finds empirical support in Cook (1999) who shows that Russian small firms using TC have a higher probability of acquiring bank credit. In the same vein, using a data set of Portuguese and Spanish SMEs, Gama and Mateus (2010) suggest

that the substitution and complementary hypothesis are not mutually exclusive, especially for the younger and smaller firms. Using TC use as dependent variable, they show that the ratio of bank debt to total assets is negatively correlated with the ratio of the difference between trade receivables and trade payables to total assets, implying a substitution effect between bank debt and TC. In another analysis, using bank credit as dependent variable, they find a positive correlation between the two ratios for Portuguese SMEs, most likely because these firms are smaller and younger than Spanish counterparts, implying a complementary effect. In a more recent study, using a sample of Italian firms, Agostino and Trivieri (2014) show that TC has an informational content for banks, especially at the beginning stages of bank–firm relationships, implying that TC may play a crucial role to facilitate the access to bank finance for young firms.

2.2.2 Size and the Relationship between BL and TC

There are many reasons to believe that the relationship between BL constraints and TC use can be different for large and SMEs. The central argument lies with the fact that larger firms receive more credit from their suppliers because they are more creditworthy than smaller counterparts. This is essentially because the latter are characterized by a high level of informational asymmetry (Beck et al., 2005, 2008; Berger and Udell, 1998; Berger et al., 2001; Canton et al., 2013; Vermoesen et al., 2013). Consequently, problems of adverse selection and moral hazard are more pronounced for SMEs than for large firms, what causes the restricted access not only to formal financing channels but also to informal credit sources such as TC.

Petersen and Rajan (1997) show that firms of higher credit quality including large and profitable firms receive significantly more credit from their suppliers. In another study, Nilsen (2002) found that large firms without a bond rating increase their use of TC during monetary contractions more than unrated small firms do. This finding has been considered puzzling because large firms are less likely to be financially constrained and hence should be less likely to rely on TC than small firms. However, Burkart and Ellingsen (2004) provide an explanation for this finding by demonstrating that entrepreneurs with intermediate level of wealth such as unrated large firms are able to increase TC utilization when they are credit-rationed whereas bank credit and TC limits are both binding for low-wealth entrepreneurs such as unrated small firms. Lin and Chou (2015) show that both large and small firms provide significantly less TC (accounts receivable) and receive less TC (accounts payable) during financial crisis. However, after the crisis, large firms still provide significantly less TC to their customers but receive more TC from the suppliers than smaller firms.

In the same vein, Wilson and Summers (2002) demonstrate that firm size has a direct impact on credit policy choices. They show that larger customers are more likely to have the bargaining power to demand credit terms, are more likely to be offered two part terms with longer discount periods and lower effective interest rates. In contrast, smaller and younger firms have often a weak bargaining position, thus tend to accept the supply terms of larger buyers in order to establish their position in the market. Similar findings are presented in

Giannetti et al. (2011) who find that large firms and especially firms with many suppliers also receive more TC for longer periods, suggesting buyer market power affects the availability of TC.

Using a firm-level survey database covering 48 countries, Beck et al. (2008) investigate the use of external financing sources across different sizes of firms over a broad range of external sources. However, they find that TC does not compensate for lower access to bank financing of small firms worldwide. Further, they show that large firms have an easier access than small firms to external financing when they are financially constrained.

On the other hand, several studies show that younger, smaller firms have a higher demand for TC. Van Horen (2004) finds that TC is used as a competitive tool in developing countries, particularly for small and young firms. Blasio (2005) find that small firms and firms not paying dividends are more likely to substitute bank credit with TC during contractions. Mateut et al. (2006) suggest that when monetary policy tightens, bank lending decreases relative to TC and a monetary tightening affects smaller firms more dramatically than large firms. Ogawa et al. (2013) suggest that for young and small firms with little access to BL, TC is an important funding source.

Overall, previous research suggests that small firms often play the role of TC demanders. However, large firms can receive larger amounts of TC from suppliers since they are more creditworthy and have a stronger bargaining power relative to small firms, which may induce large firms to rely more on TC when they are financially constrained by banks.

2.2.3 Hypotheses

Drawing on the literature linking financing constraints and firm's TC usage as well as the evidence on the effect of firm size on this relationship, we test the following central hypothesis:

Main hypothesis: Bank-constrained large firms increase TC use to a greater extent relative to bank-constrained SMEs.

By distinguishing SMEs from large firms, we attempt to explore the different nature, substitute or complement, of the relationship between BL and TC. On the one hand, one would expect a substitution effect between these two sources in Vietnam, since in such a developing country, firms are more likely to be bank-constrained, thus consequently rely on TC as a financing of last resort. On the other hand, the complementary effect may take places since in Vietnam banks' skills in collecting information and evaluating the borrowers' credit quality are limited while informational asymmetry is a major obstacle in lending process, especially for SMEs and private firms. Often times, banks rely on trust to lend to private firms (Nguyen et al., 2006). Hence, TC is expected to play a signalling role to banks, i.e. the supplier's private information may be particularly valuable for banks in the lending decision to SMEs due to their financial opacity. Drawing on the literature of the complementary and

substitution effect between BL and TC in the case of credit rationing (Biais and Gollier, 1997; Burkart and Ellingsen, 2004), we hypothesize:

Hypothesis 1: While denied large firms increase their use of TC, denied SMEs decrease their use of TC.

Inconclusive results of previous empirical studies could be due to noisy proxy of the credit constraint of firms (Danielson and Scott, 2004; Petersen and Rajan, 1997, 1995, 1994). The measure may be biased because of credit-constrained firms that do not expect to receive a loan may choose not to apply at all (Levenson and Willard, 2000; Petersen and Rajan, 1997). Besides, the relationship between BL and TC could depend on the type of the credit constraint, i.e. denied firms, discouraged firms and those with pending applications. One would expect that firms whose loan application is still pending may increase TC for a short-term financing while they are waiting for bank decision. We argue that compared to denied firms, those with pending applications face less severe financing constraints, since they are not totally denied credit and may obtain the financing later. We therefore do not expect a complementary effect for SMEs facing this constraint. Hence, taking into account the potential effect of firm size, we hypothesize:

Hypothesis 2: Large firms with pending applications increase TC use to a greater extent relative to SMEs with pending applications.

Another type of bank-constrained firms we investigate in this study concerns discouraged firms, i.e. firms choose not to apply for a BL because of a constraint such as burdensome loan procedures, strict collateral requirements, high interest rates, or expected denial. All these constraints are particularly prevalent for SMEs, and very common in a transition economy such as Vietnam (Le et al., 2006; Nguyen and Bryant, 2004; Tenev et al., 2003). For instance, Le et al. (2006) suggest that in the absence of effective market institutions and business data, banks in Vietnam face considerable uncertainties in lending to private businesses, a substantial part of all SMEs. Besides, Chakravarty and Xiang (2013) and Canton et al. (2013) show that small and young firms are more likely to be discouraged from requesting a BL. Levenson and Willard (2000) argue that since the loan amount requested by SMEs is often smaller than large firms, the fixed costs of granting and servicing loans lower the profit margins of financial institutions. Thus, even if their creditworthiness is not worse than for large firms, banks should be less willing to lend to SMEs.

Discouraged borrowing may be due to burdensome procedures for BL, what is aggravated by the heavy bureaucracy in Vietnam, since burdensomeness in such procedures increases the effective cost of BL and prevent firms from obtaining loans in time. This is more likely to be the case for SMEs because the amount of loan requested by these firms are often smaller than large firms, thus they are less willing to follow costly heavy application procedures, especially knowing that their application is less likely to be approved (Levenson and Willard, 2000). Discouraged firms because of this constraint may borrow more from their suppliers who usually do not require a complicated process, implying a substitution effect. This

substitution effect is expected to be stronger for large firms since they are usually offered more TC as discussed earlier.

On the other hand, many firms, especially SMEs, cannot afford a BL because of strict collateral requirements, a consequence of informational asymmetry between lenders and borrowers and the skills of evaluating credit risk by banks in Vietnam. Previous studies have consistently shown that SMEs are more likely to be constrained on bank credit due to lacking valuable assets to provide as collateral (Beck et al., 2005, 2008; Berger et al., 2001; Canton et al., 2013; Vermoesen et al., 2013). Therefore, strict collateral conditions required by banks not only increase the probability being rejected on the firms' loan application but also may discourage them from demanding a BL. Those discouraged firms may turn to TC use thanks to the supplier's monitoring advantage over banks in collateral value and liquidation process (Burkart and Ellingsen, 2004; Frank and Maksimovic, 2005; Mian and Smith, 1992) or informational advantage over banks (Jain, 2001; Smith, 1987) or better enforcement by threatening to stop the supply of goods (Cuñat, 2007). This substitution effect is again expected to be stronger for large firms.

Besides, firms may be discouraged from requesting a BL because of high interest rates on BL. This constraint is also likely to be more prevalent for SMEs, since they often pay higher interest rates than large businesses because of the high operational costs associated with making loans to them and their weak negotiating positions (Dietrich, 2012). While several studies suggest that TC is an expensive substitute for BL (Cuñat, 2007; Mateut et al., 2006; Wilner, 2000), a number of theoretical studies posit that TC may be cheaper for specific classes of firms. For instance, Schwartz (1974) argue that some firms have easier and cheaper access to capital markets than do their customers, thus they utilize their borrowing capacity to pass credit on to their customers. As a result, firms that cannot pay the interest rate required by banks may benefit from TC offered by their suppliers at a lower rate. Emery (1984) argue that suppliers might act as intermediaries between buyers and banks because the first possess superior information, thereby they extend TC with an implicit interest rate lower than the market borrowing rate at which buyers would pay otherwise. In another study, Smith (1987) posits that the seller, in order to protect non-salvageable investments in buyers, is willing to provide credit to a specific risk class of buyers (at risk level above a threshold) at rates lower than financial institutions would offer. Besides, Burkart and Ellingsen (2004) demonstrate that there is a small equilibrium differential between the bank interest rate and the TC interest rate, what could explain the widespread use of net terms. In a more recent paper, Daripa and Nilsen (2011) theoretically suggest that TC is provided as a subsidy by the upstream firm to downstream firm to limit lost sales, what explains the prevalence of TC at an interest rate of zero. Taken together, one would expect that discouraged firms because of high interest rates may also rely more on TC. This appears particularly prevalent in Vietnam because the banking system has not been fully liberalized yet and remains dominated by State-Owned banks, thus the low competitiveness may cause high and unfair rates on loans. Indeed, Qian and Strahan (2007) suggest that in countries with strong creditor protection, loans have lower interest rates. Besides, large firms may borrow from their suppliers at a lower cost than smaller counterparts because they have the bargaining power (Giannetti et al., 2011; Wilson

and Summers, 2002). Thus, one would expect that as compared to SMEs, large firms would rely more on TC when they suffer from a discouraged borrowing because of high interest rates.

Another reason that prevents firms from demanding a BL is that they did not think their application would be approved, mostly because they did not possess any valuable assets to be pledged for BL or they could not prove the profitability of their project. Levenson and Willard (2000) argue that smaller firms facing high expected denial rates choose not to apply at all because of the cost incurred by the loan applications. Discouraged firms of this type may also turn to TC. Similarly, we expect that this potential substitution effect would be stronger for large firms.

Taken together, one would expect that discouraged firms may increase their use of TC to compensate for BL. Similarly to the case of those with pending applications, we argue that compared to denied firms, discouraged firms face less severe financing constraints, since they appear to have more financing choices. We therefore do not expect a complementary effect for discouraged SMEs. Hence, taking into the fact that the suppliers may be more willing to lend to discouraged large customers, we generally hypothesize:

Hypothesis 3: Discouraged large firms increase TC use to a greater extent relative to discouraged SMEs.

2.3 Data and Methodological Approach

2.3.1 Data and Measuring Financial Variables

We use Vietnamese firm-level data collected from Enterprise Survey of Productivity and the Investment Climate led by World Bank in 2005 (WBES)². The general purpose of the survey is to understand the investment climate in Vietnam and how it affects business performance, with the objective of helping improve it. The original sample consists of 1150 manufacturing firms. This sector is interesting to be examined because TC is more expressive in manufacturing industries compared to other industries (Blasio, 2005; Marotta, 2005).

This survey provides a comprehensive data set for our analytical use. One of the virtues of the WBES data is that it contains details that are not normally available in more commonly used datasets of financial statements. Besides, WBES provides not only information from the firm's financial statements, but it is also a rich source of information on the firm's level of TC use (percentage of the assets side of working capital financed by TC) as well as the history of its interactions with financial institutions (e.g., whether the firm applied and obtained a loan from a financial institution, and the main reason why it did not apply for a loan). The survey also provides information on the general characteristics of the firm such as firm age, firm's activity sector and legal status.

² Enterprise Surveys (<http://www.enterprisesurveys.org>), The World Bank.

a) Measuring the dependent variable

Importantly for our research, the survey data contain information on firm's level of TC usage. In the survey, enterprise managers were asked the fraction of the assets side of working capital, i.e. inventories, accounts receivable and cash, financed by using TC in 2004. As argued by Petersen and Rajan (1997), it is unlikely that a firm will finance long-term projects with TC. Indeed, our data show a very low use of TC to finance new investments with a mean value of 0.9% approximately versus 7.2% for working capital. Hence, we focus on the use of TC for working capital financing.

b) Measuring variables of interest

Another advantage of the WBES data is that it provides detailed information on loan applications and denials, which allows us to construct direct measures of BL constraints. Firms are asked if they have a BL; and if not whether a) they were rejected on the last loan application, b) their loan application is still pending or c) they did not apply for a BL. We refer to firms (bank constraint type) defined in a) as denied firms (actual denial), those in b) as firms with pending applications (pending request). In the third case, firms were asked the reason why they did not apply, whether a) they do not need a loan, b) application procedures for loans are too burdensome, c) it is necessary to have contacts or give informal payments to get the loans³, d) collateral requirements for BL are too strict, e) interest rates are too high or f) they did not think that it would be approved. We define all firms that need a BL but did not apply for it, i.e. except those that do not need a loan, as discouraged firms; and refer to this type of constraint as discouraged borrowing.

In the first analysis, we construct a binary variable that captures the aggregate effect of bank constraints, BLCONS, taking a value of 1 if a firm's last application on BL was denied, or its loan application is still pending, or it was discouraged from applying for a BL because of a constraint, and zero otherwise. To control for firms having no demand for loan, we include NONEED, a binary variable that equals 1 if the firm did not apply for a BL because it does not need a loan, and zero otherwise.

In the second analysis, we construct three binary variables DENY, PENDING and DISC to proxy for three types of bank-constrained firms: denied firms, firms with pending applications and discouraged firms, respectively.

In the final analysis, to distinguish four types of discouraged firms, we create four binary variables: BDS, COLLA, IR, EXPDENY that take the value of 1 if the firm did not apply for a BL because of the following reasons respectively: burdensome procedures, strict collateral requirements, high interest rates, and expected denial; and zero otherwise. The omitted type is from firms having a BL.

³ Since there are only three observations of firms that report being discouraged from demanding a bank loan because of informal payment or necessary contact with banks, we exclude these observations from our sample.

The next step is to distinguish SMEs from large firms. In this study, we use a criterion of size defined in Vietnamese law documents. According to Circular 16/2013/TT-BTC issued the 8th February 2013, SMEs are defined as those with fewer than 200 permanent employees and the annual revenues not exceeding VND 20 billions. Hence, large firms are those that employ at least 200 permanent employees or have the annual revenues exceeding VND 20 billions. Based on this criterion, 49.1% of our observations are from SMEs and another 50.9% are from large firms. On average, the firms in our sample have total sales of VND 72,388.43 million and 370 permanent workers. We create as proxies for firm size two binary variables, *SME* and *LARGE*, that equal 1 if the firm is a SME and large-sized, and zero otherwise, respectively. The group of large firms is used as the reference category in the analysis.

2.3.2 Empirical Model and Identification Strategy

In general, we model the effects of BL constraints on the usage of TC across size for firm i as:

$$TCUSE_i = \beta_0 + \beta_1 (BLC/LARGE)_i + \beta_2 (BLC/SME)_i + \beta_3 SME_i + \mu X_i + \varepsilon_i$$

where *TCUSE* is the dependent variable measured by the fraction of the assets side of working capital financed by using TC; *BLC* indicates measures of BL constraints, *BLC/LARGE* and *BLC/SME* are the interaction terms between BL constraints and firm size; and X_i is a vector of firm-level controls. Our main hypothesis concerns the coefficient β_1 and β_2 on the interaction terms. Our a priori expectations would suggest a positive and stronger effect ($\beta_1 > \beta_2$) for large firms.

The selection of the firm-level controls in X_i draws on existing research that identifies the determinants of firm's use of TC (Beck et al., 2008; Danielson and Scott, 2004; Petersen and Rajan, 1997, 1995, 1994) and the specific characteristics of Vietnam. We include several variables to control for a firm's demand for capital, its creditworthiness and transparency, and its relationship with suppliers that may influence the usage of TC.

Since younger firms may rely more on TC, to capture this effect, we include firm age measured by the natural logarithm of age plus one where age is the number of years since the founding year of the firm as of 2004 (*Age*) and the square of this value to control for non-linearity in the relationship (*Age squared*). To control for the availability of internal financing, we include the ratio Net profits to Total sales to proxy for the internal cash flow generation (*NP/TS*). It is expected that the greater ability of financing may decrease a firm's reliance on TC. We also include the sales growth ratio 2003-2004 to control for the firm's growth because firms with higher growth could have higher demand for TC (*Sales growth*).

Besides, one would expect that the more experience the manager has, the more credit he can get from their trade partners. To capture this effect, we include the natural logarithm of the experience years plus one of the firm's manager (*Experience*). Export firms may be better credit risks, thus may receive more credit from their suppliers. Therefore, we include *Export*, a binary variable that equals 1 if the firm exports, and zero otherwise. To capture the potential

effect of legal status, we include a binary variable, *SOE* that equals 1 if the firm is a State-Owned Enterprise, and zero otherwise. A State-Owned Enterprise (SOE) can be either wholly or partially owned by the government and is expected to receive more TC.

In addition, hiding profits or sales from tax authorities increases information asymmetries in the borrower-lending relationship, thus reducing incentives for banks to lend. As a result, informal firms may increase alternative financing sources such as TC. Alternatively, firms in transition economies may prefer informal financing including TC that may enable tax evasion (Dabla-Norris and Koeda, 2008). To capture these effects, we include a binary indicator for firms that hide a fraction of revenues from tax collectors (*Informality*). By contrast, a firm having financial statements audited is often more transparent, thus may be offered more TC. To control for this effect, we include a binary indicator for firms that have their financial statements certified by an external auditor (*Audit*).

On the other hand, a firm that has a strong relationship with the suppliers is expected to receive more TC. To proxy for this relationship, we construct a binary variable, *Relationship*, that equals 1 if at least one of the two most important ways the firm acquired a new technology in the last two years was based on equipment or machinery provided by the supplier, and zero otherwise. To capture industry effects, we introduce binary indicators for seven industry groups (Wood products is the omitted category). Deletion of missing values for all the variables yields a sample of 1000 firms. The detailed definitions of all variables are presented in Appendix 2.1.

We observed that in 72.7 percent of the cases, no portion of the assets side of working capital is financed using TC; in 0.4 percent the entire assets side of working capital is financed using TC and in another 26.9 percent the fraction of the assets side of working capital financed by using TC is between 0 and 100 percent. The level of credit is therefore treated as a censored variable, with the level of credit observed only when it falls between 0 and 100 (percent). Hence, we use a standard tobit model with two-sided censoring.

Since the coefficients in the Tobit regressions are the marginal effects of the underlying unobserved variables, not the observed dependent variables, McDonald and Moffit (1980) suggested a method to calculate the marginal effect of the independent variables in those regressions. According to their method, a tobit coefficient can be decomposed into two parts: the marginal effect of the independent variable in the uncensored range plus the change in the probability of being censored. The first part of this decomposition is calculated by multiplying the tobit coefficient by the percentage of the sample that is uncensored, reported at the bottom of each table.

2.3.3 Descriptive Statistics

Table 2.1 summarizes the BL status across size including the number of firms and proportion in the sample.

[Insert Table 2.1 here]

In Panel A, we find that firms constrained on BL represent 19.5% of our observations of which 12% are from discouraged firms, another 1.7% are from those with pending applications, and the remaining 5.8% are from denied firms. We observe that the proportion of discouraged firms is twice larger than denial rate. Across size, z-test suggests SMEs are significantly more financially constrained by banks than large firms (12.2% versus 7.3%), mainly because the former are more likely to be discouraged from applying for a BL (8.6% versus 3.4%), which may explain for the insignificant difference in the proportion of denial rate between two groups. As detailed in Panel B, burdensome procedures are the most important reason for which firms did not request a BL with 5.7% of our observations, and remain the main constraint for both SMEs and large firms. The second and third most important reasons are strict collateral requirements with 3.5% and expected denial with 1.8%. Another 1% of our observations reported high interest rates as their reason. Across size, z-test suggests that SMEs are more likely to be discouraged because of burdensome applications and strict collateral requirements at 1% significance level and because of expected denial at 5%. By contrast, we do not observe a significant difference across size for discouraged firms because of interest rates.

Table 2.2 presents descriptive statistics for all the variables used in our regression analysis. All data refer to the year 2004. On average, 7.2 percent of the assets side of working capital is financed by using TC. As expected, the use of TC is significantly higher for large firms (9.1%) relative to SMEs (5.2%).

[Insert Table 2.2 here]

The correlations among the variables are presented in Table 2.3. To save space, we do not report the correlation coefficients for the types of bank constraints in detail and industry indicators.

[Insert Table 2.3 here]

2.4 Results and Discussion

2.4.1 Overall Effects

The regression results are reported in Table 2.4. Models 1-3 present the results on the link between BL constraints and the use of TC by all firms in our sample. In Model 1, we include firm size and industry indicators. In Model 2, we control for firm characteristics. In Model 3, we include all control variables. The results in three models consistently show that firms that are financially constrained on BL use significantly more TC to finance working capital ($p=0.051$, $p<0.05$ and $p<0.05$ respectively). The marginal effects from Model 3 suggest that a constrained firm increases their use of TC by 2.4%⁴, i.e. 33.4% of the mean (7.2%). By contrast, we do not find any significant coefficient on the variable NONEED, suggesting that

⁴ The marginal effects are calculated by multiplying the tobit coefficient by the percentage of the sample that is uncensored reported in parentheses at the bottom of the table (McDonald and Moffitt, 1980).

firms that do not need for a loan are not likely to use more TC, supporting the argument that TC ranks below BL in the management choice of financing sources.

[Insert Table 2.4 here]

Looking at the effect of firm size, Models 1-3 show that size is positively and significantly related to the use of TC by Vietnamese firms ($p < 0.01$). The marginal effects from Model 3 indicate that SMEs use less TC by 3.03% compared to large firms.

Focusing on the controls for firm characteristics, Model 2 and Model 3 show that TC use first decreases with firm age at 5% and eventually rises later at 10%. Internal financing availability, sales growth and export indicator are negatively related to TC use but the coefficients are not statistically significant. By contrast, the manager's experience in years affects positively TC use in both models at 5% and 10% respectively. Besides, SOEs and informal firms use significantly more TC at 5%. Firms that have acquired new technology with equipment or machinery provided by the supplier also increase their use of TC ($p < 0.05$) whilst the coefficient on Audit is positive but weakly significant.

Considering the effect of size on the relationship between BL constraints and TC usage, we report in Model 4 the results of the interaction terms between size and BLCONS. We find that large firms use significantly more TC when they are financially constrained by banks ($p < 0.05$), implying a substitution effect between BL and TC. On the other hand, bank-constrained SMEs also tend to rely more on TC but the coefficient is not statistically significant. The marginal effects suggest a stronger substitution effect for constrained large firms with an increase by 3.66% (versus 1.26% for SMEs). This finding provides support for Main Hypothesis predicting that when a firm is constrained on BL, large firms increase TC use to a greater extent relative to SMEs.

2.4.2 The Effects of Actual Denial, Pending Request and Discouraged Borrowing on TC Use across Size

Considering the effects of BL constraints on using TC across three types of constrained firms, i.e. denied firms, discouraged firms and those with pending applications, Model 1 in Table 2.5 shows that the coefficient on DENY is not statistically significant for the whole sample although the sign is positive. On the other hand, we find that firms with pending applications use more TC by 5.55%. ($p < 0.1$), suggesting a substitution effect between the two credit sources. The results also reveal a significant substitution effect for discouraged firms ($p < 0.1$) with an increase in using TC by 2.4%.

[Insert Table 2.5 here]

Model 2 explores the effects of actual denial, pending request and discouraged borrowing on using TC across size by including the interaction terms between size and measures of BL constraints. In line with our a priori expectations, the results show that denied large firms increase significantly TC utilization ($p < 0.05$), implying a substitution effect between BL and

TC. By contrast, the results suggest a negative link between actual denial and the use of TC by SMEs ($p < 0.1$), implying a complementary effect between the two credit sources. The marginal effects suggest that while denied large firms increase their use of TC by 5.2 percent, denied SMEs decrease their use of TC by 6.7 percent compared to the mean of 7.2 percent with a standard deviation of 15.4 percent. Hence, these findings provide evidence in support of Hypothesis 1.

Besides, these findings provide empirical support for the pecking order for large firms, since we find that large firms tend to rely on TC as a financing of last resort when their BL application was turned down. On the contrary, when SMEs were denied credit, they use less TC. One possible explanation is that only large firms are able to react by borrowing more from their suppliers in the case of actual denial thanks to their larger TC limits whereas bank and TC limits move in the same direction for poorer firms (Burkart and Ellingsen, 2004). These findings are also in line with Biais and Gollier (1997) who theoretically suggest that TC plays a signalling role to facilitate firm's access to BL by revealing suppliers' positive information about the firm to banks, this information in turn increases banks' willingness to lend. These findings are further consistent with Cook (1999), Gama and Mateus (2010) and Agostino and Trivieri (2014) who empirically suggest that TC is a complement to BL for small and young firms. Besides, our empirical results provide a possible explanation for the curious finding by Petersen and Rajan (1997) that credit-denied small firms do not increase TC. Thus, TC is somehow a weak substitute for bank credit.

On the other hand, we find that SMEs with pending applications rely more on TC by 7.88% ($p < 0.1$), implying a substitution effect between the two sources. That is, as TC is less available to small firms, they are likely to use TC as a substitute for bank credit during a short time while waiting for the bank's approval - the constraint appears to be less severe than an actual denial. By contrast, large firms also tend to rely more on TC when their loan application is pending but the effect is not statistically significant, most likely because they have more financing choices than smaller counterparts. Another reason may be that loan amounts requested by large firms are often larger than requested by SMEs, therefore are not easily compensated by using TC under which the amount is limited by the value of goods. This does not support Hypothesis 2 that predicts a stronger substitution effect for large firms with pending applications.

The coefficients for discouraged large firms and SMEs are also positive but weak (p -value = 0.318 and 0.237 respectively) with a marginal effect of 2.31% for large firms compared to 2.07% for SMEs. This weak significance may reflect the differences in firm's reaction regarding TC use across types of discouraged borrowing. To explore such potential differences, we investigate in the following analysis the effects of BL constraints on firm's TC usage across size and four types of discouraged firms, i.e. those because of burdensome procedures, strict collateral requirements, high interest rates and expected denial.

2.4.3 The Effects of Discouraged Borrowing on TC Use across Size

As shown in subsection 2.3.3 (Descriptive Statistics), SMEs are significantly more likely to be discouraged than large firms from demanding a BL. In our sample, the majority of discouraged firms (71.66%) are from SMEs with 86 out of 120 cases, versus only 34 discouraged firms (28.33%) are from large counterparts. Our dataset therefore does not allow running the regressions separately for each firm-size group, neither looking at interaction terms between large-size indicator and some types of discouraged borrowing; hence we first run a regression for the whole sample and then run a regression with the possible interaction terms, and finally we run a separate regression for SMEs. The results are reported in Models 3-6 in Table 2.5.

The results in Model 3 indicate that discouraged borrowing due to burdensome procedures induce Vietnamese firms to increase significantly their reliance on TC by 4.08 percent ($p < 0.05$). Besides, we find a negative coefficient at 10% on EXPDENY, suggesting that firms that predicted the bank's reject on their loan application and thus chose not to apply use less TC. The marginal effect is relatively large. On average, these discouraged firms use 9.02 percent less of TC. This finding implies a complementary effect between BL and TC and thus is not in line with Hypothesis 3. Intuitively, firms that evaluate themselves as borrowers with low creditworthiness could not be good from the point of view of either the bank or the supplier. Therefore, they are not able to increase TC that is also not available to them. Since these discouraged firms usually consist mainly of SMEs (13 SMEs versus 5 large firms in our sample) and firms without any valuable assets to provide collateral or without ability to prove the profitability of their project, a possible explanation comes from Burkart and Ellingsen (2004) that suggests that for the poorest entrepreneurs, the bank and TC limits always move in the same direction, i.e. a complementary effect. Furthermore, compared to other types of discouraged firms, expected denial could be seen as the closest constraint to actual denial. As mentioned in Petersen and Rajan (1997) and measured in Levenson and Willard (2000), expected denial should be taken into account together with actual denial to get an accurate measure of the true level of credit denial. Therefore, in line with Hypothesis 1, this finding suggests that the complementary effect between BL and TC arises for discouraged firms because of expected denial. By contrast, discouraged firms because of high interest rates and strict collateral requirements are likely to increase their use of TC but the coefficients are not statistically significant.

Moving to Model 4 in Table 2.5, in our attempt to explore the use of TC by discouraged firms across size, we include the interaction terms between size and all types of constrained and discouraged firms except those because of high interest rates and expected denial. This is because the fraction of the assets side of working capital financed using TC (for non-missing observations) by large firms facing these constraints is always zero, thus the data do not allow to obtain properly the coefficients for large firms in these cases. This may imply that large firms do not tend to use more TC when they are discouraged from applying for a BL because of high interest rates and expected denial. We provide further evidence on these arguments by looking at the reaction of discouraged firms across size in Models 4-6.

The results in Model 4 suggest that large firms increase their use of TC when they are discouraged from demanding a BL because of burdensome procedures or strict collateral requirements by 5.7% and 7.4% respectively ($p < 0.1$), implying a substitution effect. The coefficient on BDS for SMEs firms is also positive but not statistically significant (p -value = 0.208). By contrast, the coefficient on COLLA for SMEs is negative but not statistically significant. Hence, while our descriptive statistics show that SMEs are significantly more likely than large firms to be discouraged from applying for a BL because of burdensome procedures and strict collateral requirements, we do not find any significant evidence on the use of TC by discouraged SMEs facing these constraints. On the other hand, we find a significant substitution effect between BL and TC for large firms facing the same types of discouraged borrowing. One possible explanation is that while the monitoring advantage of the supplier in collateral value or in liquidation process (Burkart and Ellingsen, 2004; Frank and Maksimovic, 2005; Mian and Smith, 1992) may allow firms that do not possess valuable assets for collateral to access TC, it is likely that the suppliers only lend to firms with better creditworthiness such as large firms. Likewise, this supply effect may provide an explanation for the weak evidence on the substitution effect by discouraged SMEs because of burdensome application procedures. Overall, these findings provide some support for Hypothesis 3 that predicts that when a firm is discouraged from applying for a BL, large firms increase TC use to a greater extent relative to SMEs.

Looking at the use of TC by bank-constrained SMEs more specifically, Model 5 considers only the sub-sample of SMEs. We find that the coefficient on IR becomes significant at 1%; and DENY consistently is negative and significant at 10%. The marginal effects suggest that discouraged SMEs because of high interest rates increase their use of TC by 13.22 percent, nearly twice larger than the mean. However, the coefficients on BDS and EXPDENY are weakly significant. Our results suggest that while TC is not likely to be available to denied SMEs, it appears to be available for some types of discouraged SMEs including those because of high interest rate, implying that TC is not always more expensive than BL, especially for a specific class of risky firms (Daripa and Nilsen, 2011; Smith, 1987). This is not likely the case for large firms because they often have a cheaper access to formal credit and even when bank rates are too high for them, they normally have more financing options at lower cost than TC (Nilsen, 2002). This provides further support for the pecking order of financing choices by large firms thereby TC ranks below bank finance. Our study is in line with Beck et al. (2008) to the extent that TC does little to relax bank credit constraints for small businesses. However, by investigating directly the effects of bank constraints on the use of TC, our results suggest that TC may be available to a specific class of constrained SMEs. On the other hand, it is likely that TC is not available to firms that are discouraged from applying a BL because of expected denial even when those firms are large-sized.

Given the effects of DENY and EXPDENY, Model 6 in Table 2.5 combines these two variables into one variable, DENYBROAD, to look at the aggregate effect of "true" credit denial. As expected, the coefficient on DENYBROAD is negative and significant at 5% with a marginal effect of 5.07 percent. Hence, our results generally support the complementary

effect between BL and TC for SMEs in the case of credit rationing including actual credit denial and discouraged borrowing because of expected denial.

2.5 Conclusion

Using survey data from a sample of Vietnamese businesses collected by World Bank in 2005, in this chapter, we have investigated the question of whether BL constraints affect TC use by firms with a focus on SMEs in comparison with large firms. More specifically, our central hypothesis is to test whether when a firm is constrained on BL, large firms increase TC use to a greater extent relative to SMEs. The data used in this study are unique because they provide us with the level of TC used by firms and the detailed information on the BL applications, which allows constructing direct measures of TC usage and BL constraints.

In line with previous studies (Casey and O'Toole, 2014; Danielson and Scott, 2004; Nilsen, 2002; Petersen and Rajan, 1997), we find that firms constrained on BL significantly increase their use of TC. Our results also show that TC is used by a broad range of constrained firms because not only denied firms but also discouraged firms and those with pending applications tend to rely more on TC. Overall, our results suggest that bank-constrained large firms increase their use of TC to a greater extent relative to bank-constrained SMEs, supporting our central hypothesis. However, the link between BL and TC varies across types of bank constraints.

Specifically, we provide support for Petersen and Rajan's (1995, 1994) pecking order of debt financing but only for large firms. That is, when bank credit is not available, large firms increase their reliance on potentially expensive sources of funds including TC. This is most likely because only large firms, that are often associated with high creditworthiness, are able to increase TC usage in the case of bank denial. On the other hand, our data show that compared to large firms, SMEs are more financially constrained by banks and more frequently discouraged from applying for a BL. Nevertheless, it is likely that SMEs cannot borrow from their suppliers when they are denied credit or discouraged from applying for a BL because of expected denial, their use of TC therefore decreases in these situations. Consistent with Burkart and Ellingsen (2004), these findings imply a substitution effect between BL and TC for large firms and a complementary effect between the two sources for SMEs. These findings also imply that TC works as a signalling mechanism to facilitate the access to BL of SMEs, which is in line with Biais and Gollier (1997), and Burkart and Ellingsen (2004). In contrast, we find that SMEs use more TC when they are discouraged from applying for a BL because of high interest rates and when their loan application is still pending. On the other hand, large firms use more TC when they are discouraged from applying for a BL because of burdensome application procedures and strict collateral requirements, what may be also explained by the higher credit quality and stronger bargaining power of large firms as compared to SMEs.

Our study makes two main contributions to the management literature. First, we take a first step to investigate the link between financing constraints and the use of TC by Vietnamese

firms. While bank credit constraints have been considered as a major issue in transition economies (Beck et al., 2008), we show that these constraints are indeed widespread in Vietnam and TC is a (weak and imperfect) substitute of BL (Meltzer, 1960). Second, we add some additional insights on the link between bank finance and TC. More specifically, our results demonstrate that while the two sources tend to be substitutes for large firms, they appear to be complements for SMEs. However, the link between the two sources also depends on bank constraint type, since we find that SMEs with pending applications and discouraged SMEs because of high interest rates use more TC. While in Beck et al. (2008), they find that TC does not compensate for a lower use of BL of small firms; our results suggest that TC does compensate at a certain level for BL for a specific class of small firms. Hence, our study not only enriches the knowledge on the use of TC and the link with bank finance, but also extends the existing literature on the effects of financing constraints on TC usage by investigating a broad range of bank constraint types and considering the effect of size, what previous studies did not take into account (Beck et al., 2008; Danielson and Scott, 2004; Lin and Chou, 2015; Mateut et al., 2006; Petersen and Rajan, 1997).

Our results suggest that like BL, TC appears to be more available for large firms, especially in the case of credit rationing. Besides, SMEs can borrow from their suppliers only when their loan application is pending or they are discouraged from demanding a BL because of high rates. Since TC is valuable for firm's performance, especially when formal financing is not accessible or too costly (Allen et al., 2012; Yang, 2011; Yiu et al., 2013), our managerial implications are that SMEs in transition economies in general, in Vietnam in particular, should build the relationships with their suppliers to obtain more financing through TC channel. Furthermore, consistent with Biais and Gollier (1997) and Burkart and Ellingsen (2004), our findings provide evidence on the signalling hypothesis whereby TC helps improve SME's creditworthiness by transferring suppliers' private information to banks, thus enhances BL availability. Hence, firms should use TC as a positive signal to induce banks to lend.

On the other hand, the policy implication is that since SMEs play an important role in the growth of the economy, the Vietnamese government should continue in its effort to ease firms' financing constraints for SMEs by promoting financial institutions and financial markets, developing other financing channels. Besides, capital markets are underdeveloped whereas other alternative financing sources such as informal credit or sources from family and friends are often expensive and limited. Hence, it would be beneficial to facilitate other financing forms such as special development financing provided by the government for the sake of SMEs. In addition, in order to alleviate discouraged borrowing, it would be necessary to apply a separate lending process with affordable and suitable requirements for SMEs. Troublesome procedures for BL are also one of the major concerns for Vietnamese firms' access to bank finance including both large firms and SMEs, thus they end up borrowing from an alternative source less desired. Hence, policymakers should play an active role in improving loan application procedures and the quality of banking services in order to facilitate firms' access to bank credit.

A limitation of this study is that the data set does not allow us to distinguish firms that have a BL but still need borrow more from those that have obtained all the financing needed, i.e. firms that have obtained a BL may still financially constrained and thus react by borrowing more from their suppliers. In addition, future research should include an alternative measure of firm's credit quality other than size such as a measure of firm risk to check the robustness of the results. We also expect that in a future work, we will be able to examine the link between BL and TC across different levels of firm's relationships with their suppliers.

Appendix 2.1: Variable Definitions

This appendix provides the detailed definitions of all the variables used in our analyses. Data have been collected from World Bank Enterprise Survey (WBES) in 2005.

Variable name	Definition
<i>Dependent variable</i>	
TCUSE	The fraction of the assets side of working capital financed by using TC
<i>Variables of interest</i>	
BLCONS (0,1)	A binary variable that equals 1 if a firm's last application on BL was denied, or is still pending, or a firm was discouraged from applying for a BL, and zero otherwise
DENY (0,1)	A binary variable that equals 1 if a firm's last application on BL was denied, and zero otherwise.
PENDING (0,1)	A binary variable that equals 1 if a firm's loan application is still pending, and zero otherwise
DISC (0,1)	A binary variable that equals 1 if a firm needs loans but did not apply for a BL, and zero otherwise
BDS (0,1)	A binary variable that equals 1 if a firm did not apply for a BL because of burdensome loan procedures, and zero otherwise
COLLA (0,1)	A binary variable that equals 1 if a firm did not apply for a BL because of strict collateral requirements, and zero otherwise
IR (0,1)	A binary variable that equals 1 if a firm did not apply for a BL because of high interest rates, and zero otherwise
EXPDENY (0,1)	A binary variable that equals 1 if a firm did not apply for a BL because of expected denial, and zero otherwise
NONEED (0,1)	A binary variable that equals 1 if a firm did not apply for a BL because it does not need loans, and zero otherwise
SME (0,1)	A binary variable that equals 1 if a firm has fewer than 200 permanent employees and the annual revenues not exceeding VND 20 billions, and zero otherwise
LARGE (0,1)	A binary variable that equals 1 if a firm has at least 200 permanent employees or the annual revenues exceeding VND 20 billions, and zero otherwise
<i>Control variables</i>	
Age	The natural logarithm of age plus one where age is the number of years since the founding year of the firm
Age squared	The square of Age
NP/TS	The ratio of net profits to total sales
Sales growth	The annual sales growth ratio
Experience	The natural logarithm of the experience years plus one of the firm's manager
Export (0,1)	A binary variable that equals 1 if the firm exports, and zero otherwise
SOE (0,1)	A binary variable that equals 1 if the firm is a State-Owned Enterprise, and zero otherwise

Appendix 2.1 (continued): Variable Definitions

Variable name	Definition
<i>Control variables (continued)</i>	
Informality (0,1)	A binary variable that equals 1 if a firm hides a fraction of revenues from tax collectors, and zero otherwise
Audit (0,1)	A binary variable that equals 1 if a firm has its financial statements certified by an external auditor, and zero otherwise
Relationship (0,1)	A binary variable that equals 1 if at least one of the two most important ways the firm acquired a new technology in the last two years was based on equipment or machinery provided by the supplier, and zero otherwise
Industry (0,1)	A vector of binary variables, <i>Clothing and garments</i> , <i>Construction materials</i> , <i>Electrical machinery</i> , <i>Food & Beverage</i> , <i>Metal parts and products</i> , <i>Paper products and Miscellaneous</i> , that equal 1 if a firm belongs to Clothing and garments, Construction materials, Electrical machinery, Food & Beverage, Metal parts and products, Paper products and Miscellaneous industry group, respectively, and zero otherwise

2.6 References of Chapter 2

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2.7 Tables of Chapter 2

Table 2.1: Number of Firms and Proportions across BL Status and Size

This table provides the number of firms and proportions in the sample across BL status and size. Data have been collected from World Bank Enterprise Survey (WBES) in 2005. *SMEs* are defined as those with fewer than 200 permanent employees and the annual revenues not exceeding VND 20 billions. *Large firms* are those that employ at least 200 permanent employees or have the annual revenues exceeding VND 20 billions. *BL constrained* refers to the firms that were denied on their last loan application, those with pending application, and those that were discouraged from applying for a BL. *Discouraged* refers to the firms that did not apply for a BL because of burdensome loan procedures, strict collateral requirements, high interest rates or expected denial. *Pending* refers to the firms whose loan application is pending. *Denied* refers to the firms whose last loan application was turned down. *No need for BL* refers to the firms that did not apply for a BL because they do not need loans. *Having a BL* refers to the firms that have a BL. Statistics are calculated on estimation sample so as to provide context for results with 1000 firms. The proportions in the sample are presented in parentheses. Panel A presents the number of firms and proportions across BL status with the discouraged firms grouped. Panel B provides the number of firms and proportions for each type of discouraged borrowing. Statistics from a z-test for the significance of the difference in the proportions between SMEs and large firms are presented at the bottom of each panel.

Panel A. Number of firms and proportions across BL status

	BL constrained	Types of BL constraints			No need for BL	Having a BL
		Discouraged	Pending	Denied		
All firms (100%)	195 (19.50%)	120 (12%)	17 (1.7%)	58 (5.8%)	198 (19.80%)	607 (60.7%)
SMEs	122 (12.2%)	86 (8.6%)	9 (0.9%)	27 (2.7%)	104 (10.4%)	265 (26.5%)
Large firms	73 (7.3%)	34 (3.4%)	8 (0.8%)	31 (3.1%)	94 (9.4%)	342 (34.2%)
<i>SMEs-Large firms</i>						
Difference	.049	.052	.001	-.004	.01	-.077
Std. Err.	.013	.010	.004	.007	.013	.02
z-test	3.69	4.89	0.24	-0.53	0.74	-3.74
Prob.	0.000	0.000	0.40	0.29	0.22	0.000

Panel B. Number of firms and proportions across types of discouraged borrowing

	Discouraged firms	Loan procedures	Strict collateral	High interest rate	Expected denial
All firms	120 (12%)	57 (5.7%)	35 (3.5%)	10 (1%)	18 (1.8%)
SMEs	86 (8.6%)	42 (4.2%)	27 (2.7%)	4 (0.4%)	13 (1.3%)
Large firms	34 (3.4%)	15 (1.5%)	8 (0.8%)	6 (0.6%)	5 (0.5%)
<i>SMEs-Large firms</i>					
Difference	.052	.027	.019	-.002	.008
Std. Err.	.010	.007	.005	.003	.004
z-test	4.89	3.62	3.24	-0.63	1.89
Prob.	0.000	0.000	0.000	0.26	0.02

Table 2.2: Descriptive Statistics

This table provides the descriptive statistics for our sample. Data have been collected from World Bank Enterprise Survey (WBES) in 2005. The dependent variable is *TCUSE*, which is the fraction of the assets side of working capital financed by using TC. Detailed variable definitions are presented in Appendix 2.1. *NP/TS* and *Sales growth* are winsorized at the 2.5% and 97.5% level. Statistics from a *t-test* for the significance of the difference in the *TCUSE* mean between SMEs and large firms are presented at the bottom of the table. Statistics are calculated on estimation sample so as to provide context for results with 1000 firms. All data refer to the year 2004.

Variables	Obs	Mean	SD	Minimum	Maximum
TCUSE	1000	7.185	15.358	0	100
BLCONS (0,1)	1000	.195	.396	0	1
DENY (0,1)	1000	.058	.233	0	1
PENDING (0,1)	1000	.017	.129	0	1
DISC (0,1)	1000	.12	.325	0	1
BDS (0,1)	1000	.057	.231	0	1
COLLA (0,1)	1000	.035	.183	0	1
IR (0,1)	1000	.01	.099	0	1
EXPDENY (0,1)	1000	.018	.133	0	1
NONEED (0,1)	1000	.198	.398	0	1
SME (0,1)	1000	.491	.500	0	1
Age	1000	2.237	.831	.693	4.753
Age squared	1000	5.697	4.086	.480	22.596
NP/TS	1000	.028	.064	-.219	.191
Sales growth	1000	.353	.774	-.448	3.877
Experience	1000	2.165	.942	0	3.931
Export (0,1)	1000	.489	.500	0	1
SOE (0,1)	1000	.358	.479	0	1
Informality (0,1)	1000	.265	.441	0	1
Audit (0,1)	1000	.319	.466	0	1
Relationship (0,1)	1000	.124	.329	0	1
Clothing and garments (0,1)	1000	.162	.368	0	1
Construction materials (0,1)	1000	.114	.317	0	1
Electrical machinery (0,1)	1000	.031	.173	0	1
Food & Beverage (0,1)	1000	.17	.375	0	1
Metal parts and products (0,1)	1000	.186	.389	0	1
Paper products (0,1)	1000	.056	.230	0	1
Miscellaneous (0,1)	1000	.156	.363	0	1
<i>TCUSE</i>					
SMEs	491	5.203	12.452	0	90
Large firms	509	9.097	17.516	0	100
<i>TCUSE</i>	<i>Difference</i>	<i>Std. Err.</i>	<i>t-test</i>	<i>Prob.</i>	
SMEs - Large firms	-3.893	.964	-4.038	0.0000	

Table 2.3: Correlation Table

This table shows Pearson correlation coefficients. The dependent variable is *TCUSE*, which is the fraction of the assets side of working capital financed by using TC. Detailed variable definitions are presented in Appendix 2.1. *NP/TS* and *Sales growth* are winsorized at the 2.5% and 97.5% level. Statistics are calculated on estimation sample so as to provide contest for results with 1000 firms. All data refer to the year 2004. * Statistical significance at the 5% level.

Variables	1	2	3	4	5	6	7
1 TCUSE	1						
2 BLCONS	0.0606	1					
3 NONEED	0.0192	-0.2445*	1				
4 SME	-0.1268*	0.1326*	0.0340	1			
5 Age	0.0510	-0.0946*	-0.0490	-0.3250*	1		
6 Age squared	0.0573	-0.0928*	-0.0507	-0.3138*	0.9855*	1	
7 NP/TS	-0.0315	-0.0418	0.0739*	-0.0093	-0.0233	-0.0227	1
8 Sales growth	-0.0278	0.0220	-0.0273	0.0211	-0.1576*	-0.1316*	0.0557
9 Experience	0.0954*	-0.0567	0.0110	-0.2229*	0.2180*	0.2256*	0.0136
10 Export	0.0115	-0.0725*	0.0360	-0.3365*	0.1015*	0.0860*	-0.0171
11 SOE	0.1188*	-0.0885*	-0.0884*	-0.4163*	0.5117*	0.5264*	-0.0770*
12 Informality	0.0371	0.0362	-0.0595	0.1264*	-0.1627*	-0.1678*	0.0713*
13 Audit	0.0915*	-0.0607	0.0799*	-0.3503*	0.0858*	0.0854*	0.0667*
14 Relationship	0.0614	-0.0473	-0.0651*	-0.1146*	0.1351*	0.1420*	-0.0340

Variables	8	9	10	11	12	13	14
8 Sales growth	1						
9 Experience	-0.0716*	1					
10 Export	0.0768*	0.0824*	1				
11 SOE	-0.1414*	0.2470*	0.0915*	1			
12 Informality	0.0525	-0.1120*	-0.0163	-0.1601*	1		
13 Audit	0.0009	0.1645*	0.2318*	0.2318*	-0.0707*	1	
14 Relationship	0.0013	0.1093*	0.0265	0.0861*	-0.0403	0.0419	1

Table 2.4: Effects of BL Constraints on TC Use across Size - Overall Effects

The dependent variable is *TCUSE*, which is the fraction of the assets side of working capital financed by using TC. Detailed variable definitions are presented in Appendix 2.1. *NP/TS* and *Sales growth* are winsorized at the 2.5% and 97.5% level. All data refer to the year 2004. All regressions are tobit regressions. *t*-statistics are reported in parentheses. *** Statistical significance at the 1% level, ** Statistical significance at the 5% level, * Statistical significance at the 10% level.

Variables	Model 1	Model 2	Model 3	Model 4
BLCONS	7.926** (1.96)	10.188** (2.41)	8.937** (2.11)	
NONEED	-1.863 (-0.45)	5.378 (1.25)	4.112 (0.96)	
BLCONS LARGE				13.622** (2.24)
BLCONS SME				4.682 (0.80)
NONEED LARGE				4.454 (0.78)
NONEED SME				3.370 (0.53)
SME	-14.273***(-4.34)	-12.006*** (-2.99)	-11.280*** (-2.82)	-9.062* (-1.84)
Firm characteristic Controls	No	Yes	Yes	Yes
Age		-22.866** (-1.98)	-23.145** (-2.01)	-23.611** (-2.05)
Age squared		4.254* (1.81)	4.294* (1.83)	4.383* (1.87)
NP/TS		-27.441 (-1.08)	-27.342 (-1.07)	-27.904 (-1.09)
Sales growth		-1.840 (-0.80)	-2.297 (-1.00)	-2.246 (-0.98)
Experience		4.182** (2.20)	3.675* (1.95)	3.655* (1.94)
Export		-3.460 (-0.99)	-3.387 (-0.89)	-3.280 (-0.86)
SOE		9.090** (2.15)	8.864** (2.11)	9.131** (2.17)
Informality		7.686** (2.04)	7.601** (2.02)	7.300* (1.94)
Audit		5.788 (1.56)	5.106 (1.38)	4.979 (1.35)
Relationship		9.716** (2.06)	9.312** (1.99)	9.316** (1.99)
Industry controls	Yes	No	Yes	Yes
Intercept	-26.591*** (-4.98)	-9.535 (-0.65)	-9.461 (-0.62)	-9.964 (-0.65)
Number of obs.	1124	1000	1000	1000
Uncensored obs. (%)	302 (26.87%)	269 (26.9%)	269 (26.9%)	269 (26.9%)
<i>p</i> -value	0.0000	0.0000	0.0000	0.0000

Table 2.5: Effects of BL Constraints on TC Use across Size and Constraint Types

The dependent variable is *TCUSE*, which is the fraction of the assets side of working capital financed by using TC. Detailed variable definitions are presented in Appendix 2.1. *NP/TS* and *Sales growth* are winsorized at the 2.5% and 97.5% level. All data refer to the year 2004. All regressions are tobit regressions. *t*-statistics are reported in parentheses. *** Statistical significance at the 1% level, ** Statistical significance at the 5% level, * Statistical significance at the 10% level.

Variables	Model 1	Model 2	Model 3	Model 4	Model 5 SMEs	Model 6 SMEs
DENY	5.349 (0.77)		5.431 (0.79)		-23.971* (-1.76)	
DENYBROAD						-24.437** (-2.15)
PENDING	20.617* (1.83)		20.628* (1.84)		28.127* (1.89)	28.110* (1.89)
DISC	8.660* (1.66)					
BDS			15.184** (2.21)		11.106 (1.37)	11.099 (1.37)
COLLA			8.095 (0.90)		-1.924 (-0.18)	-1.922 (-0.18)
IR			17.660 (1.18)	17.288 (1.17)	63.653*** (3.16)	63.684*** (3.16)
EXPDENY			-33.531* (-1.79)	-34.859* (-1.88)	-25.384 (-1.33)	
NONEED	4.054 (0.95)		4.042 (0.95)		2.102 (0.35)	2.100 (0.35)
<i>Interaction terms</i>						
DENY LARGE		19.333** (2.29)		20.237** (2.42)		
DENY SME		-24.895* (-1.76)		-26.094* (-1.86)		
PENDING LARGE		9.885 (0.60)		10.802 (0.67)		
PENDING SME		29.303* (1.91)		27.901* (1.84)		
DISC LARGE		8.582 (1.00)				
DISC SME		7.698 (1.18)				
BDS LARGE				21.129* (1.81)		

Table 2.5 (continued): Effects of BL Constraints on TC Use across Size and Constraint Types

Variables	Model 1	Model 2	Model 3	Model 4	Model 5 SMEs	Model 6 SMEs
BDS SME				10.456 (1.26)		
COLLA LARGE				27.632* (1.78)		
COLLA SME				-2.601 (-0.23)		
NONEED LARGE		4.415 (0.78)		5.220 (0.93)		
NONEED SME		3.344 (0.53)		1.873 (0.30)		
SME	-11.365*** (-2.83)	-8.838* (-1.80)	-10.908*** (-2.73)	-5.951 (-1.24)		
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	-9.783 (-0.64)	-10.975 (-0.72)	-9.560 (-0.63)	-11.714 (-0.77)	-23.304 (-1.12)	-23.351 (-1.12)
Number of obs.	1000	1000	1000	1000	491	491
Uncensored obs. (%)	269 (26.9%)	269 (26.9%)	269 (26.9%)	269 (26.9%)	102 (20.77%)	102 (20.77%)
p-value	0.0000	0.0000	0.0000	0.0000	0.0020	0.0013

Chapter 3: The Effects of Bank Loan Constraints on Trade Credit Use across Size, Age and Institutional Development: Evidence from International Data

Abstract

In this chapter, we investigate the effects of bank loan (BL) constraints on firm's trade credit (TC) use across size, age and country-level institutional development. Using an international dataset of 36 developed and developing countries compiled from two enterprise surveys led by World Bank in 2005, we consider a broad range of bank constraint categories including actual denial, pending applications and discouraged borrowing. The latter refers to firms that choose not to apply for a BL because of burdensome procedures for BL, corruption in the banking system, high interest rates, strict collateral requirements or expected denial. Our results suggest that TC and BL tend to be substitutes for large firms and complements for small firms. We further find that the substitution effect dominates in developed countries with higher institutional development and the complementary effect dominates in developing countries with weaker institutional development. Our results highlight these effects particularly when BL constraints relate to actual credit denial. By contrast, these effects are not found for discouraged firms because of burdensome procedures for BL, since they tend to rely more on TC use even when they are smaller firms or operate in countries with weaker institutional development. In general, our results indicate that bank credit constraints are more widespread than previously believed. However, TC cannot fully compensate the low use of bank finance of small businesses, especially in the context of developing countries; hence, the development of institutions should be central consideration in the policymaking process.

Résumé

Dans ce chapitre, nous étudions les effets des contraintes sur les prêts bancaires (BL) sur l'utilisation du crédit commercial (TC) en fonction de la taille et de l'âge des entreprises et du développement institutionnel des différents pays. Notre base de données internationale comprend des entreprises de 36 pays développés et en développement. Elle a été constituée par la compilation de deux enquêtes auprès des entreprises menées par la Banque mondiale en 2005. L'originalité de notre recherche provient du fait que nous considérons un large éventail de catégories de contraintes bancaires, y compris refus de la demande de crédit, les demandes en instance et les entreprises qui ne font pas de demande car elles sont découragées. Ces dernières sont les entreprises qui choisissent de ne pas faire de demande de BL en raison de la lourdeur des procédures lourdes de demande de BL, de la corruption dans le système bancaire, de taux d'intérêt élevés, d'exigences trop strictes en matière de garantie ou de l'anticipation d'un refus. Nos résultats suggèrent que les TC et les BL ont tendance à être des substituts pour les grandes entreprises et sont complémentaires pour les petites entreprises. Nous constatons en outre que l'effet de substitution domine dans les pays développés (développement institutionnel plus élevé) tandis que l'effet complémentaire domine dans les pays en développement (développement institutionnel faible). Ces effets sont particulièrement nets lorsque la contrainte consiste dans le refus de la demande de BL. En revanche, l'effet de complémentarité disparaît pour les entreprises découragées en raison de la lourdeur des procédures, car ces entreprises ont tendance à compter davantage sur le TC, même quand elles sont petites ou opèrent dans un environnement institutionnel peu favorable. En général, nos résultats indiquent que le rationnement du crédit bancaire est plus répandu qu'on ne le croyait auparavant. Toutefois, le TC ne peut pas compenser entièrement le faible accès au financement bancaire des petites entreprises, en particulier dans le contexte des pays en développement. Dans ces derniers, le développement d'institutions favorisant le financement bancaire doit être un élément central dans le processus de développement.

Chapter 3: The Effects of Bank Loan Constraints on Trade Credit Use across Size, Age and Institutional Development: Evidence from International Data

3.1 Introduction

A substantial body of literature has demonstrated that the availability of external financing sources is one of the key drivers of the firm's growth (Beck et al. 2005; Bottazzi et al. 2014; Demirgüç-Kunt and Maksimovic 1998; Fisman and Love 2003; Vermoesen et al. 2013). However, market imperfections such as informational asymmetry, adverse selection, moral hazard may restrict access to those sources, especially for small businesses (Beck et al., 2008, 2005; Berger et al., 2001; Canton et al., 2013; Jøeveer, 2013; Myers and Majluf, 1984; Petersen and Rajan, 1997; Stiglitz and Weiss, 1981). According to the 2004 World Development Report (IBRD, World Bank, 2004), small firms are 50 percent more likely than large firms to report difficulty in finance access and finance cost as a major or severe constraint.

When the access to formal financing channels such as bank credit is restricted, a firm may react by borrowing more from their suppliers under the form of trade credit (TC) (Cook, 1999; Danielson and Scott, 2004; Mateut et al., 2006; Meltzer, 1960; Nilsen, 2002; Petersen and Rajan, 1997, 1995, 1994). Indeed, TC stands out as the leading substitute for bank loan (BL) (Allen et al., 2005; Casey and O'Toole, 2014; Walker, 1989). It is particularly important for small and young firms that have limited access to capital markets including bond and commercial paper markets (Blasio, 2005; Van Horen, 2004), and in less developed countries with weaker financial development and legal protection (Burkart and Ellingsen, 2004; Fisman and Love, 2003). Besides, TC is often seen as an expensive substitute for BL in terms of cost (Cuñat, 2007) but is better than BL in resolving the consequences of market imperfections due to, for instance, the supplier's advantage in information acquisition (Emery, 1984; Jain, 2001; Mian and Smith, 1992; Smith, 1987).

Four observations motivate this study. First, previous studies provide inconclusive evidence on the link between BL and TC. As above-mentioned, several empirical studies show that TC is a substitute for bank credit. This substitution hypothesis finds support in some recent theoretical models (Huang et al., 2011; Mateut et al., 2006). On the other hand, another strand of relevant theories suggest that TC is complementary to bank credit. The complementary hypothesis argue that TC improve a firm's reputation by transferring the supplier's private information to banks that in turn will become more willing to offer credit (Biais and Gollier, 1997), especially for the poorest firms (Burkart and Ellingsen, 2004).

Second, previous studies provide puzzling findings on the effects of firm size on the link between BL and TC. A number of studies highlight the impact of firm size on firms' usage of

TC (Beck et al., 2008; Nilsen, 2002; Petersen and Rajan, 1997). Overall, these authors find that large firms have higher level of TC use, mainly because they have better credit quality and thus receive more TC than small firms. Particularly, Burkart and Ellingsen (2004) theoretically suggest that the TC and bank credit limits are both binding for the poorest firms whereas TC may compensate for insufficient BL availability of firms with intermediate level of wealth. Therefore, one can expect that there are some differences between bank-constrained large firms and bank-constrained small firms in using TC.

Third, there is little research investigating the use of TC by discouraged firms, i.e. those that need a loan but do not apply for a BL because of a constraint. Yet, there are quite a few papers that show the importance to take into account these firms in studies of BL accessibility because they form a substantial part of all constrained Small and Medium-sized Enterprises (SMEs) (Canton et al., 2013; Chakravarty and Xiang, 2013; Han et al., 2009; Levenson and Willard, 2000). To the best of our knowledge, in the literature on the link between credit constraints and alternative financing, Casey and O'Toole (2014) is the only study that distinguishes two types of constrained firms: denied firms and self-rationed borrowers because of high bank rates. In this study, we examine not only TC use by firms that are actually denied on BL, but also firms with pending applications and discouraged firms. Distinguishing between denied firms and discouraged firms is necessary to test the effects of bank constraints on the use of TC because there are potential differences in the behavior of rationed firms and self-rationed firms as shown in Casey and O'Toole (2014). Likewise, there would be differences in TC use across categories of discouraged firms, i.e. those did not apply for a loan because of burdensome applications of BL, corruption in banking systems, strict collateral requirements, high interest rates, and expected denial.

Four, there is little research investigating directly the effects of bank credit availability on a firm's use of TC across countries and how these effects differ by country level of institutional development. While previous studies commonly focus on one single country, Casey and O'Toole (2014) is one of the rare papers using a multi-countries sample. Moreover, the relationship between BL and TC may reflect the heterogeneity in the development of financial intermediaries and the efficiency of legal systems. However, despite the considerable evidence on the effects of institutional development on external financing sources in general (Beck et al., 2008, 2005; Rajan and Zingales, 1998) and TC use in particular (Demirgüç-Kunt and Maksimovic, 2001; Fisman and Love, 2003), there is no study shedding light on its effects on the relationship between BL and TC.

In this study, we construct direct measures of BL constraints by using firm-level data from enterprise surveys led by World Bank in 2005 (World Bank Enterprise Surveys-WBES), i.e. BEEPS (Business Environment and Enterprise Performance Survey) and ICS (Productivity and the Investment Climate Private Enterprise Survey). Our sample consists of 36 developed and developing countries. We further investigate how the nexus BL-TC varies across different country levels of income, financial development and legal protection. The studied year, 2004, is before the Global Financial Crisis, firms therefore face normal conditions of financial system at this time.

Controlling for firm's characteristics and country-specific variables, our findings reveal that the substitution and complementary hypothesis are not mutually exclusive. While TC and BL appear to be substitutes for large firms, they tend to be complements for small firms. Likewise, we find that the substitution effect dominates in countries with higher income level and higher institutional development and the complementary effect dominates in countries with lower income level and weaker institutional development. In addition, discouraged firms because of burdensome loan procedures are more likely to increase TC use compared to other discouragement categories.

The chapter is structured as follows. In the second section, we provide a review of the relevant literature on BL constraints and the link with TC use, and develop our hypotheses. Data and methodological approach are presented in the third section. In the fourth section, we report and discuss empirical results. We conclude this chapter with discussion of managerial and policy implications in the last section.

3.2 Theoretical Framework and Hypotheses

3.2.1 Informational Asymmetry and BL Constraints

Existing literature has argued that lending decisions are driven by informational asymmetry (Diamond, 1991; Flannery, 1986; Myers and Majluf, 1984), especially in the case of small businesses that are often characterized by financial opaqueness (Beck et al., 2008, 2005; Berger et al., 2001; Canton et al., 2013; Vermoesen et al., 2013). Informational asymmetry generates two well-known problems, namely adverse selection (Myers and Majluf, 1984; Stiglitz and Weiss, 1981) and moral hazard (Dewatripont and Tirole, 1994; Zwiebel, 1996). Often times, those problems reduce the bank's willingness to lend to small businesses, thus cause higher denial rate for those firms, i.e. credit rationing. On the other hand, in order to cope with those problems, banks may require borrowers to provide more information via application procedures or implement screening and monitoring procedures or require borrowers to pledge collateral. All these solutions may generate constraints for firms, which are potential sources of their discouragement, i.e. self-credit rationing.

Some studies have demonstrated that smaller and younger firms are more likely to be discouraged than larger and older firms from applying for a BL and that small businesses tend to report discouraged borrowing rather than actual credit denial (Canton et al., 2013; Chakravarty and Xiang, 2013; Levenson and Willard, 2000). That is, not only credit rationing but also self-credit rationing generates typical financing constraints faced by those firms.

As explained by Levenson and Willard (2000), on the one hand, the smaller amounts of loan requested by small firms reduce profit margins of banks, thus decrease their willingness to lend to those firms; on the other hand, those firms are reluctant to pay the costs of loan application knowing that their application is less likely to be approved. Furthermore, complicated lending procedures, or even corruption in banking system or necessary contacts with banks are particularly relevant constraints to small firms' access to bank finance. This is because often times, they are not willing or not able to pay costly lending procedures or

informal payments to banks. In addition, since they are often younger than large firms, they are less likely to have relationships with financial institutions. On the other hand, complex procedurals usually prevent firms from obtaining loans in time, thus may discourage them from applying for a bank credit and thus induce them to turn to alternative financing channels (Yiu et al., 2013).

Besides, BL granted to small young firms are often collateral dependent because of high level of informational asymmetry between lender and borrower. However, often times, small businesses lack tangible assets to provide as collateral, thus they are more likely to be constrained on bank credit (Beck et al., 2008, 2005; Berger et al., 2001; Canton et al., 2013; Vermoesen et al., 2013). This is because strict collateral conditions required by banks not only increase the probability being rejected on firms' loan application but also may discourage them from demanding a BL.

Kon and Storey (2003) provide an important theory of discouraged borrowers for small businesses. They show that imperfect information lies at the root of discouragement phenomenon. Their model suggests that the scale of discouragement is higher when application costs on BL are higher, the screening skills of the banks are weaker and the difference between interest rates charged by banks and money lenders is smaller. They further show that the number of discouraged firms increases with collateral requirements by banks and decreases with alternative sources of funding.

In addition, small businesses often pay higher interest than large businesses because of the high operational costs associated with making loans to them and their weak negotiating positions (Dietrich, 2012). This is because the majority of these costs are mainly fixed. Banks therefore pass these costs on to the borrowers in the form of higher interest costs to small businesses above those for large businesses that usually require larger loans. Small businesses are also in a weak position to negotiate lower interest because of their poor credit ratings.

Another type of bank constraint concerns pending applications, which prevent firms from obtaining loans in time to finance their operations. There are several reasons that may explain a firm's pending applications such as incomplete application because of required collateral, the firm's informational opaqueness that makes it difficult for banks to decide and costs time to collect necessary information. As in the case of actual denial, small businesses are more likely to have pending applications due to higher level of asymmetric information, weaker ability to provide collateral or to prove the profitability of their investment project.

3.2.2 BL Constraints and TC Use

In the existing literature, there is no clear-cut evidence concerning whether TC and BL are complements or substitutes. Theories of TC generally suggest that the suppliers are better than banks in overcoming asymmetric information (Biais and Gollier, 1997; Mateut et al., 2006; Smith, 1987) and agency problems (Burkart and Ellingsen, 2004). Hence, when a firm is financially constrained because BL are not available, the firm could respond by borrowing more from their suppliers. When used in this manner, TC can be an expensive substitute for

BL (Cuñat, 2007; Mateut et al., 2006; Ng et al., 1999; Wilson and Summers, 2002)⁵. Moreover, lending procedures for TC are less costly than BL mainly because TC is relationship-based lending (McMillan and Woodruff, 1999; Wilner, 2000).

Quite a few empirical studies suggest that firms suffering from bank credit constraints increase TC utilization. Meltzer (1960) first provided evidence on the substitution hypothesis according to which firms substitute bank credit with TC during money tightening. Several subsequent studies such as Petersen and Rajan (1997, 1995, 1994), Nilsen (2002), Danielson and Scott (2004), Blasio (2005), Mateut et al. (2006) obtained similar evidence supporting this hypothesis. These authors generally show that TC is used as a source of financing of last resort by very constrained firms, consistent with the pecking order theory that stems from Myers and Majluf (1984).

Another strand of literature highlights the informational role of TC in facilitating firm's access to bank finance, suggesting a complementary effect between the two sources. Biais and Gollier (1997) argue that TC allows to reveal suppliers' favorable information about borrowers to banks, thus increase banks' willingness to lend. That is, TC helps alleviate informational asymmetry between banks and firms which otherwise would induce firms to bypass good projects, hence alleviate credit rationing due to adverse selection. Similarly, Burkart and Ellingsen (2004) suggest a complementary effect between TC and bank credit for very poor entrepreneurs, implying the informational role of TC in facilitating access to BL. This signaling theory finds empirical support in Cook (1999), Gama and Mateus (2010) and Agostino and Trivieri (2014).

In another study, Nilsen (2002) found that large U.S. firms without a bond rating increase their use of TC during monetary contractions to a greater extent than unrated small firms. This puzzling finding is theoretically supported by Burkart and Ellingsen (2004) who suggest that after exhausting their bank credit limits, more creditworthy firms are able to borrow more from their suppliers, whereas for poor firms, TC and bank credit limits move in the same direction.

Besides, several studies show that larger firms receive more credit from their suppliers because they have better credit quality (Beck et al., 2008; Garcia- Appendini and Montoriol-Garriga, 2013; Giannetti et al., 2011; Petersen and Rajan, 1997; Wilson and Summers, 2002). Particularly, using firm-level data on SME access to finance across 11 euro area members, Casey and O'Toole (2014) find that older and larger bank constrained firms are more likely to use TC.

By distinguishing small firms from medium and large firms and distinguishing actually denied firms, discouraged firms and those with pending application, we expect to explore some evidence on the different nature of the relationship, substitute or complement, between BL and TC.

⁵ Trade credit may not be more expensive than bank loan for a specific class of firms as suggested in a number of studies (Daripa and Nilsen 2011; Schwartz 1974; Smith 1987).

Drawing on the literature discussing the relationship between BL and TC and taking into account the potential effect of firm size, we hypothesize:

Hypothesis 1: Larger bank-constrained firms increase TC use to a greater extent relative to smaller bank-constrained firms.

Like small firms, young firms are also expected to have restricted access to both bank finance and TC. Fisman and Love (2003) show that startup firms, which are less creditworthy, may have more difficulty in benefiting from TC financing than it is for mature firms. We therefore hypothesize:

Hypothesis 2: Older bank-constrained firms increase TC use to a greater extent relative to younger bank-constrained firms.

3.2.3 The Effects of Institutional Development

In recent years, several studies have shown that a country's legal and financial environment have an influence on firms' access to external financing (Beck et al., 2008, 2005; Demirgüç-Kunt and Maksimovic, 1998; La Porta et al., 1997; Rajan and Zingales, 1998). These studies generally suggest that in countries with weaker legal systems and underdeveloped financial systems, firms obtain less external financing, which consequently constrains their growth and results in lower performance.

Besides, there are a few studies investigating the effects of institutional development on TC use. Some studies provide evidence that TC is used more in countries with weak legal protection and financial development, suggesting the substitution effect between TC and the institutional development. For instance, Fisman and Love (2003) find that TC disproportionately boosts the growth of industries in countries with weaker financial institutions. In the same vein, Van Horen (2004) finds that TC is used as a competitive tool, particularly for small and young firms in developing countries. Demirguc-Kunt and Maksimovic (2001) finds that in 40 countries around the world, TC use is more prevalent in countries with weak legal environments, which is line with the theoretical suggestion of Burkart and Ellingsen (2004). However, they show that firms in countries with more developed banking systems offer more credit to their customers, and take more credit from them, suggesting that TC is complementary to the development of financial intermediaries. In the same vein, Deloof and La Rocca (2015) find that debt and TC tend to be complements rather than substitutes and that a better provincial financial development is associated with a greater use of TC.

Moreover, a considerable body of TC literature supports the "redistribution view" according to which TC serves as a mechanism to redistribute funds from firms with easier access to formal channels to those with restricted access to formal channels (Meltzer, 1960; Ng et al., 1999; Petersen and Rajan, 1997; Schwartz, 1974). As a result, one can expect that a better development of financial intermediaries should strengthen the redistribution process, which results in more credit provided by suppliers.

Drawing on these findings, one can expect that in countries with more efficient legal systems and better financial development, not only the access to BL but also the access to TC are easier for firms. Hence, in those countries, when a firm is financially constrained by banks, it can borrow more from their suppliers to compensate for the reduction in bank credit, implying a substitution effect.

On the other hand, in countries with weaker institutional development, firms tend to rely more on informal sources including TC because of the underdevelopment of capital markets and financial intermediaries. However, in those countries, not only firms are more likely to be constrained on BL but they also tend to have difficulty in obtaining TC. As a result, it is possible that bank-constrained firms are not able to increase borrowings from their suppliers. Moreover, in developing countries, banks' skills in evaluating the borrowers' credit quality are usually limited, whereas informational asymmetry between lenders and borrowers are more severe as compared to developed countries (Cook, 1999). Hence, banks may rely on information from informal channels such as the private information of suppliers about the firm, which may be revealed through TC (Biais and Gollier, 1997). That is, in countries with weaker institutional development, TC may work as a good signal to banks about a firm's credit quality and thus facilitate access to bank finance, implying a complementary effect. Therefore, we hypothesize:

Hypothesis 3: Bank-constrained firms in countries with better institutional development increase TC use to a greater extent relative to bank-constrained firms in countries with worse institutional development.

3.3 Data and Methodological Approach

3.3.1 Data and Measuring Financial Variables

To test our main hypotheses, we use the WBES data collected by World Bank from the two cross-sectional firm surveys (BEEPS and ICS) in 36 developed and developing countries in 2005. The purpose of these surveys is to better understand conditions for doing business in the investment climate at the country level, how they compare to other countries and how they affect firm-level productivity. The ultimate goal is to provide input into government's policy decision making on ways to support firm's productivity growth. The survey contains information on the general characteristics of the firm, on the retained earnings, on the use of BL and TC.

One of the important strengths of the survey is its wide coverage of SMEs that represent approximately 90% of the observations. The survey covers three groups of firms. Small firms are defined as those having less than 50 permanent employees, medium firms are those that employ 50–249 permanent employees, and large firms are those that employ at least 250 permanent employees. Small firms dominate the sample with 69.03 percent of our observations, another 19.97 % are from medium firms, and the remaining 10.99% are from large firms. The sample is size-stratified for each country and an effort is made to focus on SMEs.

Importantly for our research, the WBES data contain information on the use of TC to finance the assets side of working capital. In the surveys, enterprise managers were asked the fraction of working capital, i.e. inventories, accounts receivable and cash, financed by using TC in 2004. TC is typically used to finance working capital (Casey and O'Toole, 2014; Petersen and Rajan, 1997). Our data actually show a very low use of TC to finance new investments with a mean value of 2.4% approximately versus 6.4% for working capital. Hence, we focus on the use of TC by firms for working capital financing.

The next step is to identify whether or not firms face binding financing constraints. While a number of methodologies to identify constrained firms have been suggested in financial management literature, many papers use survey data to construct a direct measure of credit constraints (Canton et al. 2013; Casey and O'Toole 2014; Danielson and Scott 2004; Levenson and Willard 2000; Petersen and Rajan 1997). Bank denial has been often considered as the most important proxy for bank credit constraint but it may not be a comprehensive measure because discouraged firms, which did not apply for a BL because of, e.g., expected denial (Levenson and Willard 2000) form a substantial part of all constrained firms, especially in the case of small businesses.

Furthermore, pending applications can also be seen as a category of BL constraint. While we do not find any study in the literature of credit constraints taking into account this category, we think that it might be necessary to investigate the use of TC by firms with pending applications because they are also expected to rely on alternative financing when they are not able to obtain loans in time.

Ignoring discouraged firms and those with pending application underestimate the firm's difficulties in accessing BL. Using samples of American small firms, Danielson and Scott (2004) and Petersen and Rajan (1997) report 16% and 4% of the firms were rejected on their last loan application, respectively whilst in Levenson and Willard (2000), this proportion is 2.14% versus 4.22% of discouraged firms because of expected denial. Besides, in reality, financial constraints appear to be much more severe for small businesses. In our international sample compiled from WBES, 63.58% of SMEs report finance access as an obstacle to their growth and operations. By investigating the determinants of the perception of loan accessibility among SMEs in EU countries, Canton et al. (2013) report 42 % of all SMEs think that obtaining BL is difficult. Hence, bank constraints are more widespread as previously believed.

A critical advantage of the WBES survey is that it provides detailed information on loan applications and denials, which allows us to construct direct measures of BL constraints. Firms are asked if they have a BL; and if not whether a) they were rejected on the last loan application, b) their loan application is still pending or c) they did not apply for a BL. We refer to bank constraint in a) as actual denial or credit rationing. In the third case, firms were asked the reason why they did not apply, whether a) they do not need loans, b) application procedures for BL are too burdensome, c) it is necessary to make informal payments to get BL or there is corruption in the banking system, d) collateral requirements for BL are too

strict, e) interest rates are too high or f) they did not think it would be approved. We refer to this group of firms except those that do not need a loan as discouraged firms.

We create a series of binary variables to represent seven categories of BL constraints. *DENY* equals one if the firm's last application on BL was denied; *PENDING* equals one if the firm's loan application is still pending, and zero otherwise. To represent five categories of discouraged firms, we create five binary variables taking the value of one if the firm did not apply for a BL because of the following reasons respectively: application procedures for BL are too burdensome (*BDS*), it is necessary to make informal payments to get BL or there is corruption in the banking system (*COR*), collateral requirements for BL are too strict (*COLLA*), interest rates are too high (*IR*) or they did not think it would be approved (*EXPDENY*); and zero otherwise.

3.3.2 Empirical Model and Identification Strategy

In general, we model the effects of BL constraints on the usage of TC for firm i , in country j as:

$$TCUSE_{ij} = \beta_0 + \theta (BLC/Variable\ of\ interest)_{ij} + \mu X_{ij} + \lambda Z_j + \kappa_j + \varepsilon_i$$

where *TCUSE* is the dependent variable measured by the fraction of the assets side of working capital financed by using TC; *BLC* indicates measures of BL constraints, *BLC/Variable of interest* are the interaction terms between BL constraints and indicators for firm size, age or institutional development; X_{ij} is a vector of firm-level controls; and Z_j is a vector of country controls. We also include country fixed effects κ_j in the error term.

Existing research on the determinants of TC usage (Beck et al., 2008; Casey and O'Toole, 2014; Danielson and Scott, 2004; Petersen and Rajan, 1997, 1995, 1994) suggests that firm size and age can explain much of the between-firm variation in TC usage. We therefore include these two indicators as variables of interest in explaining the effects of BL constraints on firm's use of TC.

Our first variable of interest concerns firm size. Based on the criterion used in WBES, we create three binary variables for size, *Large*, *Medium* and *Small* that equal one if the firm is large-sized (≥ 250 employees), medium-sized (50–249 employees), and small-sized (< 50 employees), respectively, and zero otherwise.

The second variable of interest concerns firm age. We define three age groups: *Young* (0-5 years), *Mid-age* (6-15 years) and *Old* (> 15 years) and create binary indicators for the age groups to be included in the interaction terms. We also include *Age*, which is measured by the logarithm of firm age plus one.

The third variable of interest concerns the level of institutional development. Following previous studies (Beck et al., 2008; Booth et al., 2001; Demirgüç-Kunt and Maksimovic, 1998; Fisman and Love, 2003; Psillaki and Daskalakis, 2009; Rajan and Zingales, 1995), we measure the financial development, *Private Credit* as the percentage of domestic credit to

private sector to Gross Domestic Product (GDP). To measure the efficiency of legal systems, earlier studies often use property rights index (Ayyagari et al., 2008; Beck et al., 2008, 2003). In this study, we use a general indicator of legal protection, *Rule of Law*, an indicator calculated by World Bank. These two indicators are from World Development Indicators (WDI) and computed as 2000-2004 averages. For the interaction terms with BL constraints, we create four dummy variables for each indicator using the 25th, 50th, 75th percentiles, i.e. *Low* ($\leq 25^{\text{th}}$ percentile), *Lower-middle* (25th-50th percentile), *Upper-middle* (50th-75th percentile), *High* ($> 75^{\text{th}}$ percentile). Another measure for institutional development used in our study comes from WBES, which is the country's income level. We construct a series of binary variables to reflect four levels of the country's income classified in WBES: *High*, *Upper-middle*, *Lower-middle* and *Low*.

Our hypotheses concern the coefficient θ on the interaction terms. Our a priori expectations would suggest a positive and stronger effect ($\theta > 0$) for larger, older firms and those in countries with better institutional development. We distinguish and investigate separately two groups of bank-constrained firms: those that applied for a BL, i.e. actually denied firms and those with pending applications, and those that did not apply for a BL, i.e. discouraged firms. We run two models for each group. In the first model, we run a regression using all our observations, then in the second model for robustness test, we run a regression using a sub-sample of firms that applied for a BL (applying firms), and another sub-sample of firms that did not apply for a BL (non-applying firms), respectively.

The selection of the firm-level controls in X_{ij} also draws on existing research that identifies the determinants of firm's use of TC. The ability to generate internal funds is also expected to affect the use of the external financing sources (Petersen and Rajan, 1997), we therefore include the share of net profits that were re-invested, *Internal funds*, to control for internal financing availability.

Lacking data, we do not have indicators such as firms' market-to-book ratio of equity to proxy for firms' growth opportunities (Rajan and Zingales, 1995) or firms' sales growth rate over the last 3 years (Beck et al., 2008). We define technology investment as a sign of growth. We use therefore a binary variable, *Technology*, that takes a value of one if the firm has acquired new production technology over the last 36 months, and zero otherwise. We also control for ownership type, *Foreign*, and legal status, *SOE*, which are binary variables taking a value of one if the firm is foreign-owned and State-Owned Enterprise, respectively, and zero otherwise. In addition, we include binary variables that represent firm's activity sector (*Construction*, *Manufacturing*, *Services*, and *Others*). In terms of the base categories, domestic ownership is the omitted category for ownership type, private-owned firms for legal status and other sector for the sectoral variables. All data refer to 2004.

In the vector Z_j , we control for other macroeconomic factors that we believe may affect the credit environment and a firm's use of TC. Following Beck et al. (2008), we include annual growth rate of GDP in constant 2005 US dollars (*GDP Growth*), and inflation rate as measured by the consumer price index reflecting the annual percentage change in the cost to

the average consumer of acquiring a basket of goods and services (*Inflation*). All these indicators are from World Development Indicators (WDI) and computed as 2000-2004 averages. Detailed variable definitions and sources are presented in Appendix 3.1.

As our dependent variable, TCUSE is censored by 0 and 100, we use Tobit regressions with error terms clustered at the country level, i.e. we allow that error terms across firms within a country are not independent of each other. This method is to take into account possible unobserved country-level effects that might result in error correlations between firms in a given country.

3.3.3 Descriptive Statistics

Deletion of missing values for the firm-level and country-level variables yields a sample of 12,606 firms in 36 countries⁶. Table 3.1 summarizes the BL constraints across size including the number of constrained firms and their proportion in the sample.

[Insert Table 3.1 here]

As shown in Table 3.1, firms constrained on BL represent 16.45% of our observations of which 13.07 percent are from discouraged firms, another 0.96 percent are from those with pending applications and the remaining 2.42 percent are from denied firms. The turndown rate of our sample is lower than the 16% in Danielson and Scott (2004), the 4% in Petersen and Rajan's (1997) and the 4.31% in Levenson and Willard (2000)⁷ with American samples of small businesses. This turndown rate is also lower than the 6.65% on average in Casey and O'Toole (2014) for a sample of 11 euro area countries during the financial crisis period 2009-2011. By contrast, we observe a large proportion of discouraged firms that is nearly six times greater (13.07% versus 2.42%). Burdensome procedures are the most important constraint that prevents firms from requesting a BL with 5.55% of the observations. The second and third most important constraints are strict collateral requirements and high interest rates with 3.44% and 3.24%⁸, respectively, and another 0.65% and 0.19% are from discouraged firms due to expected denial and corruption in the banking system, respectively.

We further find that BL constraints decrease significantly with size in every type of constraint. *z*-statistics indeed show that small firms are significantly more bank-constrained than large and medium firms and that medium firms are significantly more bank-constrained than large firms. More specifically, small firms are more frequently to be denied credit, to be discouraged from applying for a BL and to have a pending application.

Table 3.2 presents the country-level indicators and the correlation matrix for these indicators.

⁶ Deletion of missing values for the firm-level yields only 16 observations in Dominican Republic, we therefore exclude this country from our analyses.

⁷ In Levenson and Willard (2000), 2.14 percent of firms were totally rejected on their loan application and another 2.17 percent were initially denied but received the funding by the end of the sample period.

⁸ In Casey and O'Toole (2014), they define self-rationed firms as those that were offered bank credit but rejected the offer because of high cost with a mean value across countries of 0.71%.

[Insert Table 3.2 here]

We find that the highest percentage of domestic credit to private sector to GDP (Private Credit) is in Portugal, Germany, Ireland, Spain and South Korea at over 100%, respectively. The lowest level of Private Credit is in Kyrgyzstan, Albania, Malawi, Armenia, Azerbaijan, Georgia and Madagascar at below 10%, respectively. The countries with the highest scores of Rule of Law are Germany, Ireland, Portugal and Spain at over 1 unit, respectively. By contrast, Tajikistan, Belarus and Kazakhstan have the lowest scores of Rule of Law at below -1 unit, respectively. The correlation matrix suggests that the indicators of Private Credit and Rule of Law are higher in countries with higher level of income, implying that the development of financial intermediaries and the efficiency of legal systems are better in those countries.

The second set of indicators that we focus relates to the indicators of BL constraints and TC use across countries. These are presented in Table 3.3.

[Insert Table 3.3 here]

As shown in Table 3.3, we find that the highest denial rate is in Malawi and Madagascar at over 8% of all the firms in each country. The second highest denial rate is in Costa Rica, Czech, Kyrgyzstan, Mauritius and Vietnam at over 4% of all the firms in each country. The lowest level of bank denial is in Spain at 0.18% of all the firms in this country. On the other hand, Armenia has the highest rate of pending applications at 3.82% of the firms. The countries with the highest level of discouraged firms because of burdensome procedures for BL are Azerbaijan, Belarus, Macedonia, Madagascar, Russia, Serbia & Montenegro and Tajikistan at over 10% of all the firms in each country. Azerbaijan is also the country with the highest level of discouraged firms because of corruption in the banking system and strict collateral requirements with 3.20% and 9.25% of the firms, respectively. The country with the highest level of discouraged firms because of high interest rates is Malawi with 20.39% of the firms. Last, Lithuania is the country with the highest level of discouraged firms because of expected denial with 2.67% of the firms.

Regarding TC use, we find that the firms rely on TC to finance working capital the most heavily in Latvia (17.29%), Spain (13.26%) and Estonia (12.53%). By contrast, firms use TC the least in South Korea (0.36%) and Armenia (0.41%).

Descriptive statistics of all variables used in our analyses are presented in Table 3.4. On average, 6.4 percent of the working capital is financed by TC. We find that the use of TC increases in size. Large firms have the highest level of TC use at 8.5% of working capital whereas small firms have the lowest level of TC use at 5.7% of working capital. Medium firms rely on TC to finance 7.5% of working capital. These differences are significant according to *t*-test statistics.

[Insert Table 3.4 here]

3.4 Results and Discussion

3.4.1 Overall Effects

The regression results for overall effects of BL constraints on TC use are reported in Models 1-4, Table 3.5. Models 1 and 2 present the results of the effect of actual denial and pending applications on firm's usage of TC using the whole sample and the sub-sample of applying firms, respectively. Models 3 and 4 present the results of the effect of five categories of discouraged borrowing on firm's usage of TC using the whole sample and the sub-sample of non-applying firms, respectively.

[Insert Table 3.5 here]

As can be seen in Models 1 and 2, the results show that the overall effects of bank denial and pending applications are not statistically significant. By contrast, Models 3 and 4 suggest that discouraged firms because of burdensome procedures increase significantly their use of TC at the 0.05 and 0.01 levels, respectively. This result highlights the substitutability of TC for bank credit when constraints relate to complicated procedurals of bank lending. The marginal effects (ME) suggests that these discouraged firms increase their use of TC by 1.6% and 3.4%⁹ respectively, compared to the mean of 6.4% with standard deviation of 17.6%.

In contrast, Model 3 shows that discouraged firms because of high interest rates decrease their use of TC at the 0.1 level with a marginal effect of 2.06%, while Model 4 shows that discouraged firms because of strict collateral requirements increase their use of TC at the 0.05 level with a marginal effect of 1.6%. It is likely that discouraged firms because of high cost do not rely on TC as an alternative source, supporting the argument that TC is more expensive than BL. On the other hand, firms that do not request a BL because of required collateral may borrow from their suppliers. This finding provides evidence in support of the compelling argument in TC theories that suppliers have a monitoring advantage associated with collateral value and liquidation process (Burkart and Ellingsen, 2004; Frank and Maksimovic, 2005; Mian and Smith, 1992). By contrast, we do not find any significant effect of other categories of discouraged borrowing.

Focusing on the controls for firm characteristics, as expected, Model 1 shows that TC use decreases with size. Small firms use significantly 3 percent less TC at the 0.01 level. This finding suggests that larger firms have easier access to TC, which is consistent with several previous studies (Beck et al., 2008; Nilsen, 2002; Petersen and Rajan, 1997). On the other hand, the effect of age is positive but not statistically significant. Model 1 also reveals the effects of other firm characteristics on the use of TC. Our results suggest that technology development has a positive effect on the use of TC ($p < 0.1$). Besides, foreign-owned companies use significantly more TC at the 0.1 level. Legal status and internal financing are not significantly related to the use of TC. Last, firms in Construction sector use significantly

⁹ The marginal effects are calculated by multiplying the tobit coefficient by the percentage of the sample that is uncensored reported in parentheses at the bottom of the table.

more TC ($p < 0.05$). Looking at the country-level variables, the results suggest that these variables have limited impact on the use of TC with only one coefficient significant on lower-middle income level ($p < 0.05$). TC seems to be less prevalent in countries with higher income level, which are usually associated with a better institutional development. This is in line with Burkart and Ellingsen (2004) who theoretically suggest that TC is more prevalent in less developed credit markets; and Demirgüç-Kunt and Maksimovic (Demirgüç-Kunt and Maksimovic, 2001) who empirically show that firms use more TC in countries with worse legal institutions.

3.4.2 The Effects of BL Constraints on TC Use across Size and Age

The insignificant effect of some categories of BL constraint including actual denial in the previous analysis may be due to the difference in firm's credit quality that drives the supplier's willingness to extend credit. We therefore explore this potential impact by including the interaction terms between BL constraints and two proxies for firm's credit quality, i.e. size and age, in Table 3.6. Since discouraged firms because of corruption in the banking system and expected denial represent a small fraction of the observations, this does not allow us to investigate the TC use of these firms across size and age. Therefore, we focus on the other categories of BL constraints.

[Insert Table 3.6 here]

a) The Effects of Size

The results for the effects of firm size are reported in Panel A. Considering the effect of size on using TC by denied firms, as expected, Model 1 for the whole sample suggests that denied large firms increase significantly TC utilization ($p < 0.01$) and the result holds in Model 2 for the sub-sample of applying firms. By contrast, the results in both models suggest a negative link between bank denial and the use of TC by small firms and the interaction term is significant in Model 2 ($p < 0.1$). The marginal effects in Model 2 suggest that while denied large firms increase their use of TC use by 3.82 percent, denied small firms decrease their use of TC by 2.1 percent. This finding provides evidence in support of Hypothesis 1. Furthermore, this finding suggests that TC and BL tend to be substitutes for large firms and complements for small firms.

One possible explanation is that only large firms react by borrowing more from their suppliers when their loan application is turned down mostly because they are able to do so, which is explained by their larger TC limits whereas bank and TC limits move in the same directions for poorer firms (Burkart and Ellingsen, 2004). Our finding also provides empirical support for the signaling theory of Biais and Gollier (1997) who suggest an informational role of TC, thereby TC allows small firms to improve their reputation by revealing the private information of the supplier to banks, and in turn, banks can update their beliefs about customer default risk and agree to increase bank credit.

Our finding is also in line with the empirical study of Nilsen (2002) who demonstrates that unrated large firms rely more on TC than unrated small firms when bank channel is difficult to access; and the cross-country study of Beck et al. (2008) who show that TC does not compensate for a lower use of bank finance of small firms. In the same vein, Casey and O'Toole (2014) argue that TC use is determined not only by the buyer's demand but also by the supplier's willingness to lend to the buyer, thus bank-constrained firms use more TC as size increases. Our empirical results also provide an explanation for the curious finding by Petersen and Rajan (1997) that denied-credit small businesses do not increase TC. Hence, TC is somehow a weak substitute for bank credit.

By contrast, we do not find a significant effect of size on TC use by firms with pending applications. On the other hand, the positive effect of burdensome loan procedures on TC use is significant for small firms in Model 3 for the whole sample and Model 4 for the sub-sample of non-applying firms ($p < 0.05$, $ME = 1.84\%$ and $p < 0.01$, $ME = 3.54\%$ respectively), and significant for medium firms in Model 4 ($p < 0.1$, $ME = 2.22\%$). This finding however does not support Hypothesis 1. Our explanation is that compared to other discouraged firms, bank constraints are less severe to those firms because they may have good credit quality or valuable assets to provide as collateral but they refuse to request a loan because they have more financing choices such as borrowings from their suppliers who usually do not require a complicated process. In other words, those firms have choice and can choose to apply for BL or rely on alternative financing that is available to them. Besides, this constraint is particularly prevalent for small firms, since they usually request loans with smaller amounts than large firms do, thus they are less willing to follow a heavy procedure that costs money and time.

By contrast, discouraged medium firms because of strict collateral requirements tend to increase TC use as shown in Models 3 and 4 ($p < 0.1$, $ME = 2.15\%$ and $p < 0.01$, $ME = 3.75\%$ respectively). One possible explanation is that while the monitoring advantage of the suppliers in collateral value and in liquidation process may induce them to lend to firms that do not possess valuable assets for collateral, it is likely that the suppliers only lend to the firms that have a good creditworthiness. Hence, similarly to denial case, TC is not likely to be available to discouraged small firms that have no pledgeable assets. Instead, for those firms, TC and BL are complements rather than substitutes. This finding provides further support for Hypothesis 1.

Another evidence in support of Hypothesis 1 is that small firms tend to decrease TC use when they chose not to apply because of high interest rates in Model 3 ($p < 0.05$, $ME = 2.54\%$) but the effect is no longer significant in Model 4 using the sub-sample. That is, firms that are not willing to borrow from banks because of high cost, what is particularly the case of small firms, would not choose to finance their investments through a more expensive source.

Overall, our results suggest that TC and BL tend to be substitutes for larger firms and complements for small firms, especially when bank constraints relate to actual denial. While large firms are able to rely on TC when BL is not accessible, these two sources appear to

move in the same direction for small firms. By contrast, while Beck et al. (2008) show that TC does not compensate for the restricted access to bank borrowings of small firms, our results, by using a direct measure of BL constraints; indicate that TC does allow small firms to ease their financial difficulties at a certain level. Unlike discouraged borrowing because of high interest rate and strict collateral conditions, we find a substitution effect between BL and TC for discouraged small firms because of burdensome application procedures.

b) Alternative Measure of Size

In a sensitivity test, we use total sales as an alternative measure to define firm size. Since the original data is in local currency units, we convert total sales of all sample firms to US dollar using 2004 exchange rate. Given that small firms represent the majority in our sample, we define small firms as those with total sales that equal or are smaller than the 50th percentile (\$124,390); medium firms as those with total sales between the 50th percentile and the 75th percentile (\$995,120); and large firms as those with total sales greater than the 75th percentile. The results are reported in Panel B, Table 3.6. We observe that the coefficients of interest are statistically weaker but the main findings are consistent. We again observe: first, a substitution effect between BL and TC use for large firms and a complementary effect for small firms in case of actual denial; second, a substitution effect for discouraged firms because of burdensome procedures even in the case of small firms; third, the supplier's monitoring advantage associated with collateral conditions for larger firms.

a) The Effects of Age

Having investigated the effect of firm size on the link between financing constraints and TC use, we now focus on the effect of firm age. Models 1-4 in Panel C include the interaction terms between age indicators, Young (0-5 years), Mid-age (6-15 years) and Old (>15 years), and BL constraints. Compared to size effect, the differences across age groups appear to be relatively limited. We do not find any significant difference across age in the effects of bank denial and pending applications on TC use. However, we find a weak negative association between BL availability and TC use by denied young firms in Model 1 for the whole sample and Model 2 for the sub-sample of applying firms ($p=0.155$ and 0.121 respectively). By contrast, denied mid-age firms tend to increase their use of TC ($p=0.143$ in Model 1). This finding is in line with our expectation of a complementary effect between these two credit sources for younger firms, thus provides some support for Hypothesis 2. Our findings are also in line with Gama and Mateus (2010) who find that the substitution and complementary hypothesis are not mutually exclusive, especially for the younger and smaller firms. However, the oldest constrained firms in our sample are not likely to use TC as a substitute for bank credit. The sign of the coefficients on interaction terms suggests a non-monotonic relationship between age and the effect of actual denial on TC use.

Model 3 for the whole sample and Model 4 for the sub-sample of non-applying firms suggest that discouraged firms because of burdensome applications tend to increase their use of TC when they are younger with significant and positive coefficients on the interaction terms for

mid-age and young firms ($p < 0.01$). The results also suggest that younger firms tend to increase TC use when they are discouraged because of strict collateral requirements with positive coefficients for young and mid-age firms in Model 4 ($p < 0.05$ and $p = 0.114$ respectively) while the effect is negative for old firms ($p = 0.122$ in Model 3). By contrast, Model 3 shows that older firms including mid-age and old firms decrease TC use when they refuse to apply for a BL because of high interest rates ($p < 0.01$ and $p = 0.127$ respectively). However, this effect is no longer significant when using the sub-sample of non-applying firms in Model 4. By contrast, high interest rates appear to induce young firms to rely more on TC in both models with a significant effect in Model 4 ($p < 0.01$). The evidence on discouraged firms is not in line with our a priori expectation that younger bank-constrained firms use less TC than older counterparts. Our intuition behind this result lies with the fact that younger firms are often associated with more growth opportunities, thus are more likely to be offered TC. In order to protect non-salvageable investments in buyers, suppliers may lend to a specific class of risky buyers at a lower cost than financial institutions would offer (Smith, 1987). Overall, our results highlight the substitutability between BL and TC for younger discouraged firms whereas the two credit sources appear to be complements for the youngest firms in case of actual denial. Hence, our findings support partly (and weakly) Hypothesis 2.

3.4.3 The Effects of BL Constraints on TC Use across Levels of Institutional Development

The effects of BL constraints on firm's use of TC may reflect the heterogeneity in the level of institutional development across countries. To explore this potential impact, we create interaction terms between BL constraints and three country-level indicators: Income, Private Credit and Rule of Law. In this analysis, we are also able to include the interaction terms for discouraged borrowing because of expected denial. The regression results are reported in Panels A, B and C in Table 3.7.

[Insert Table 3.7 here]

a) The Effects of Income Level

Looking at the effects of income level in Panel A, we find that BL and TC are complements for denied firms in countries with lower-middle income ($p < 0.05$ and 0.01 in Models 1 and 2 respectively). In contrast, denied firms in countries with upper-middle income tend to substitute TC for BL marginally at the 0.1 level in Model 1. The marginal effects in Model 1 suggest that denied firms in countries with lower-middle income use less TC by 4.3%, while denied firms in countries with upper-middle income increase TC by 2.17%. This suggests that TC is not likely to compensate for firms' restricted access to bank finance in countries with lower income, conversely it appears to facilitate the access to bank finance in those countries by decreasing the probability of being denied. This finding provides empirical support for the signaling hypothesis suggested by Biais and Gollier (1997), Burkart and Ellingsen (2004). Hence, these results provide support for Hypothesis 3. By contrast, the

results suggest that firms having pending applications decrease their use of TC in countries with high-income level ($p < 0.05$). However, this result should be further investigated because of the small number of observations with only 27 firms. We find a mixed evidence for countries with lower level of income. While firms with pending applications decrease their use of TC in countries with lower-middle income ($p < 0.1$ and $p < 0.05$ in Models 1 and 2 respectively), they increase their use of TC in countries with the lowest income level ($p < 0.01$). This suggests that firms in those countries rely on TC as a short-term substitute during the waiting time for bank decision.

Moving to Models 3 and 4 focusing on discouraged borrowing, the results reveal that discouraged firms because of burdensome procedures for BL tend to increase TC use in all income groups. Model 3 for the whole sample shows a significant and stronger effect for countries with the lowest income level ($p < 0.01$, $ME = 2.08\%$) whereas Model 4 for the subsample of non-applying firms indicates a significant effect for countries of all four income groups at the 0.01 level with a larger marginal effect for countries with lower-middle income. This suggests that TC is an important substitute for BL especially in developing countries where heavy procedurals prevent frequently firms from obtaining loans in time; consequently, they choose to turn to an alternative financing. Hence, the finding is not in line with our third hypothesis. Consistent with the previous analysis relating to size and age, a possible explanation is that the informational role of TC helps decrease denial rate in developing countries, whereas this is not likely to be the case for discouraged firms because of burdensome procedures because those firms often have more financing choices as compared to actually denied firms.

While Model 3 shows a negative and significant effect of cost-based discouragement on TC use ($p < 0.05$, $ME = 3.4\%$), Model 4 shows a positive and significant effect of collateral-based discouragement on TC use in countries with lower-middle income ($p < 0.05$, $ME = 3.2\%$). This suggests that in those countries discouraged firms because of high interest rates are likely to decrease TC borrowings whilst discouraged firms because of strict collateral requirements increase TC borrowings. That is, firms that cannot afford a BL because of high cost or refuse to request a loan because of high cost do not rely on TC as a substitute in those countries, supporting the hypothesis that TC is an expensive substitute for BL. The results also show a negative but insignificant relationship between TC use and discouraged borrowing because of high interest rates, strict collateral requirements and expected denial for firms in countries with the lowest income level, suggesting a (weak) complementary effect between BL and TC. Taken together, these findings provide some (weak) support for Hypothesis 3.

b) The Effects of Financial Development

As can be seen in Panel B, in line with Hypothesis 3, Models 1 and 2 suggest that denied firms in countries with better financial development tend to increase their use of TC, whereas denied firms in countries with lower financial development tend to decrease their use of TC, implying a substitution and complementary effect, respectively. We find a significant and positive effect of actual denial on TC use in countries with upper-middle level of Private

Credit in both models ($p < 0.05$, $ME = 2.51\%$ and 0.1 , $ME = 1.8\%$ respectively), and a significant and negative effect in countries with low level of Private Credit ($p < 0.1$, $ME = 3.95\%$ and 0.05 , $ME = 5.67\%$ respectively). This is in line with the effects of income levels, i.e. in developed countries with higher income level and better financial development, firms denied on BL borrow more from their suppliers whereas TC and BL tend to move in the same direction in developing countries with lower income level and weaker financial development.

Like in countries with the highest income level, in those with the highest level of financial development, firms with pending applications use significantly less TC ($p < 0.05$ and $p < 0.01$). However, similarly, this finding needs to be further explored, since the number of observations is relatively small with only 28 firms. In contrast, firms in countries with the upper-middle level of financial development use significantly more TC at the 0.01 level in both models while waiting for bank decision.

Across categories of discouraged borrowing, in Model 3 for the whole sample, we find that burdensome loan procedures induce firms to increase their use of TC with a significant and stronger effect for those in countries with the upper-middle level of financial development ($p < 0.01$, $ME = 2.7\%$). The second largest effect is for countries with the lowest level of financial development ($ME = 1.42\%$). In Model 4 for the sub-sample of non-applying firms, the substitution effect is significant for all levels of financial development also with stronger effect for with the upper-middle level. A possible explanation is that in countries with the highest level of financial intermediaries, discouraged firms because of burdensome procedures have more financing choices, whereas in countries with the second highest level of financial development, such firms have an easier access to TC as compared to countries with weaker financial development (Demirgüç-Kunt and Maksimovic, 2001).

Model 3 also suggests that in countries with the lowest level of financial development, discouraged firms because of strict collateral requirements use significantly less TC ($p < 0.1$), implying a complementary effect between BL and TC. This effect is statistically weaker in Model 4 for the sub-sample of non-applying firms. In contrast, Model 4 suggests that collateral-based discouragement induces firms to increase TC use in countries with the lower-middle level of financial development ($p < 0.01$), implying a substitution effect. On the other hand, in countries with weaker financial development (Low and Lower-middle levels), Model 3 shows that discouraged firms because of high interest rates also use significantly less TC ($p < 0.1$ and 0.05 respectively). The results in this model also suggest a complementary effect between two credit sources in countries with the lower-middle level of financial development for discouraged firms because of expected denial ($p < 0.05$). However, these effects are statistically weaker in the sub-sample as shown in Model 4.

Overall, our results suggest that TC appears to be a complement to BL in countries with weaker financial development, and a substitute to BL in countries with stronger financial development, thus provide evidence in support of research for Hypothesis 3. However, the results highlight a stronger support for this hypothesis when constraints relate to actual denial. One possible explanation is that in those countries, suppliers have more financing

options as well as an easier access to capital markets, thus are able to extend more TC to their customers, which is consistent with the "redistribution view" suggested in TC literature (Meltzer, 1960; Petersen and Rajan, 1997; Schwartz, 1974). Besides, in developing countries with lower income and lower financial development, firms are characterized by a higher level of informational opacity and banks are not specialist in collecting information and evaluating the credit quality of borrowing firms. TC may therefore play an informational role to transfer the supplier's positive signal to banks and increase their willingness to lend, which may result in a complementary effect between BL and TC in those countries (Cook, 1999). Our finding is consistent with Demirgüç-Kunt and Maksimovic (2001) who find that firms in countries with better banking systems offer more financing to their customers and take more financing from them. While Beck et al. (2008) find that TC cannot compensate for a restricted use of BL of small firms worldwide, our findings reveal that such firms may be able to increase TC as an alternative financing in countries with better development of financial intermediaries.

c) The Effects of Legal Protection

Panel C reveals that the effects of Rule of Law are relatively limited as compared to Private Credit. Model 1 (whole sample) and Model 2 (applying firms) suggest a substitution effect in countries with better legal protection and a complementary effect in countries with weaker legal protection. Although the coefficients are not statistically significant, the results are in line with Hypothesis 3. We do not find a significant effect of legal protection on the use of TC by firms with pending applications. By contrast, in Model 3 (whole sample) and Model 4 (non-applying firms), we find a positive and significant relationship between TC use and discouraged borrowing because of burdensome loan procedures in countries with lower-middle level of legal protection ($p < 0.01$). This effect is also significant for other countries in Model 4. Overall, this substitution effect appears to be stronger in countries with lower level of legal protection. Model 3 also shows a negative and weakly significant relationship between TC use and discouraged borrowing because of strict collateral requirements in countries with upper-middle level of legal protection ($p = 0.105$), however the effect is not significant in Model 4. By contrast, Model 4 suggests that discouraged firms because of this constraint use more TC in countries with the lowest level of legal protection ($p < 0.05$), implying a substitution effect. This is the opposite of Hypothesis 3.

On the other hand, we find in Model 3, discouraged firms because of high interest rates and expected denial decrease their use of TC in countries with lower-middle level of legal protection ($p < 0.01$ and 0.1 respectively), suggesting a complementary effect. This negative effect is statistically weaker in Model 4. In contrast, Model 4 suggests that discouraged firms because of high interest rates increase their use of TC in countries with the lowest level of legal protection ($p < 0.05$). Hence, these findings provide mixed evidence on the effects of BL constraints on firm's TC usage in countries with lower level of legal protection.

Overall, although we do not find a robust difference across levels of legal protection in TC use by bank-constrained firms, our results provide some (weak) evidence in support for Hypothesis 3, with TC usage decreasing for denied firms in countries with two lowest levels

of legal protection, and decreasing for discouraged firms in countries with lower-middle level of legal protection.

3.5 Conclusion

In this chapter, we have investigated the effects of BL constraints on the use of TC by using a firm-level survey database in 36 developed and developing countries compiled by World Bank. Our estimates of financial constraints distinguish two main types of constrained firms: constrained firms that applied for a BL (denied firms and those with pending applications), and those that did not apply for a BL (discouraged firms). For the latter, we distinguish five categories of discouraged firms: those because of burdensome procedures for BL, corruption in the banking system, strict collateral requirements, high interest rates and expected denial. The results on overall effects suggest that discouraged firms because of burdensome procedures increase significantly TC use. Further, we explore whether or not these effects differ by firm size, age and country-level characteristics including income level, financial development and legal protection. Our results generally suggest that the substitution and complementary effect between BL and TC depends on the type of BL constraint, firm size, firm age and country's level of institutional development.

We hypothesize that the substitution effect between BL and TC is stronger for larger, older firms and those in countries with higher level of institutional development. Our findings highlight evidence in support of our hypotheses especially when constraints relate to actual denial, i.e. volume based-credit rationing. More specifically, we find that TC and BL tend to be substitutes for larger and older firms and those in developed countries with stronger institutional development; by contrast, they tend to be complements for smaller and younger firms and those in developing countries with weaker institutional development. These findings suggest that TC plays an informational role and thus facilitates the access to BL of small and young firms and those in developing countries with weaker institutional development.

Our findings first look at the effects of firm size. Consistent with Burkart and Ellingsen (2004), we find a substitution effect for large firms and a complementary effect for small firms. Indeed, we find that in case of bank credit denial, while large firms rely more on TC as a financing of last resort, small firms decrease their use of TC. Our results also indicate a substitution effect between TC and BL for discouraged medium firms because of strict collateral conditions. Among small firms, only discouraged ones because of burdensome application procedures use TC as a substitute for BL.

Looking at the effects of age, we find weak evidence in support of our hypothesis in case of actual denial; thereby TC tends to decrease for young denied firms and increase for mid-age firms. On the other hand, the analysis on discouraged borrowing provides mixed evidence on the link between BL constraints and TC use. Like small firms, young firms are the largest users of TC among firms that did not request a BL because of burdensome procedures for

BL. However, young firms tend to increase their use of TC in the case of discouraged borrowing because of strict collateral requirements and high interest rates.

Our results further suggest that TC and BL are complements in developing countries with weaker institutional development, and substitutes in developed countries with stronger institutional development, especially when constraints relate to actual denial and when institutional development relates to the development of financial intermediaries. This finding implies that the development of financial intermediaries facilitates the use of TC, consistent with Demirgüç-Kunt and Maksimovic (2001). This finding also suggests that on the one hand, TC does not compensate for the restricted access to BL in developing countries; instead, on the other hand, it plays an informational role to ease BL constraints in those countries. Hence, this emphasizes the importance of institutional development in order to improve the firms' access not only to formal financing sources but also to informal channels such as TC, especially for small business, what is consistently shown in the literature of external financing (Beck et al., 2008, 2005; Jøeveer, 2013). Therefore, the policymakers should focus on the improvement of banking system, legal protection and financial intermediaries as well as the development of TC channel in order to facilitate the financing of small firms. Further, our managerial implication is that small firms should use TC as a good signal to increase banks' willingness to offer credit.

In addition, since discouraged firms form a substantial part in all constrained small firms, given the role of small businesses in the economy growth, financial institutions should implement a lending process and screening mechanisms that take into account the characteristics of small firms. Besides, the troublesome procedures of BL appear to be one of the major obstacles in obtaining BL. Hence, policymakers as well as financial institutions, especially in transition economies, should play an active role in simplifying the lending process and improving the quality of banking services in order to facilitate firms in accessing bank credit.

In this study, the dataset does not allow us to run panel data analysis as well as to use the lagged variables of BL constraints. This may be necessary, since there is a potential causal relationship between the two credit sources. In addition, future research could be more specifically explore the effects of firm's credit quality on the nexus BL-TC using other proxies such as firm risk, profitability, liquidity ratio, or the ability of providing pledgeable assets. Besides, further investigation should be done to explore the differences between "constrained good firms" and "constrained bad ones", what should help better explain the availability of the alternative financing channels.

Appendix 3.1: Variable Definitions and Sources

This appendix provides the detailed definitions and sources of all the variables used in our analyses. Data have been collected from World Bank Enterprise Survey (WBES) in 2005 and World Development Indicators (WDI).

Variable name	Definition	Source
<i>Dependent variable</i>		
TCUSE	The fraction of the assets side of working capital financed by using TC	WBES
<i>Variables of interest</i>		
DENY (0,1)	A binary variable that equals 1 if a firm's last application on BL was denied, and zero otherwise.	WBES
PENDING (0,1)	A binary variable that equals 1 if a firm's loan application is still pending, and zero otherwise	WBES
Discouraged (0,1)	A vector of binary variables, <i>BDS</i> , <i>COR</i> , <i>COLLA</i> , <i>IR</i> and <i>EXPDENY</i> , that equal 1 if a firm did not apply for a BL because of burdensome loan procedures, corruption in the banking system, strict collateral requirements, high interest rates and expected denial, respectively, and zero otherwise	WBES
Size (0,1)	A vector of binary variables, <i>Large</i> , <i>Medium</i> and <i>Small</i> , that equal 1 if a firm is large-sized (≥ 250 permanent employees), medium-sized (50-249 permanent employees), and small-sized (< 50 permanent employees), respectively, and zero otherwise	WBES
Age	The natural logarithm of age plus one where age is the number of years since the founding year of the firm	WBES
Age (0,1)	A vector of binary variables, <i>Old</i> , <i>Mid-age</i> and <i>Young</i> , that equal 1 if a firm is defined as old (> 15 years), mid-age (6-15 years) and young (≤ 5 year), respectively, and zero otherwise	WBES
Private Credit	The percentage of domestic credit to private sector to Gross Domestic Product (GDP), 2000-2004 averages	WDI
Private Credit (0,1)	A vector of binary variables, <i>High</i> , <i>Upper-middle</i> , <i>Lower-middle</i> and <i>Low</i> , that equal 1 if the percentage of domestic credit to private sector is larger than the 75 th percentile, between the 50 th and 75 th percentile, between the 25 th - 50 th percentile and smaller than or equals the 25 th percentile, respectively, and zero otherwise	WDI
Rule of Law	Rule of Law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts. This is the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5 with greater values indicating a greater level of legal protection, 2000-2004 averages	WDI

Appendix 3.1 (continued): Variable Definitions and Sources

Variable name	Definition	
<i>Variables of interest (continued)</i>		
Rule of Law (0,1)	A vector of binary variables, <i>High</i> , <i>Upper-middle</i> , <i>Lower-middle</i> and <i>Low</i> , that equal 1 if rule of law score is larger than the 75 th percentile, between the 50 th and 75 th percentile, between the 25 th and 50 th percentile and smaller than or equals the 25 th percentile, respectively, and zero otherwise	WDI
Income (0,1)	A vector of binary variables, <i>High</i> , <i>Upper-middle</i> , <i>Lower-middle</i> and <i>Low</i> , that equal 1 if the firm operates in the country with high, upper-middle, lower-middle or low level of income, respectively, and zero otherwise	WBES
<i>Control variables</i>		
Internal funds	The share of net profits that were re-invested	WBES
Technology (0,1)	A binary variable that equals 1 if a firm has acquired new production technology over the last 36 months, and zero otherwise	WBES
Foreign (0,1)	A binary variable that equals 1 if a firm the firm is foreign-owned, and zero otherwise	WBES
SOE (0,1)	A binary variable that equals 1 if a firm is a State-Owned Enterprise, and zero otherwise	WBES
Sector (0,1)	A vector of binary variables, <i>Construction</i> , <i>Manufacturing</i> and <i>Services</i> , that equal 1 if a firm belongs to Construction, Manufacturing or Services sector, respectively, and zero otherwise	WBES
GDP Growth	The annual growth rate of GDP in constant 2005 US dollars, 2000-2004 averages	WDI
Inflation	The inflation rate as measured by the consumer price index reflecting the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services, 2000-2004 averages	WDI

3.6 References of Chapter 3

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3.7 Tables of Chapter 3

Table 3.1: BL Constraints across Size

This table provides the number of firms and proportions in the sample across BL constraints and firm size. Data have been collected from World Bank Enterprise Survey (WBES) in 2005. *Small firms* are those with fewer than 50 permanent employees. *Medium firms* are those with 50-249 permanent employees. *Large firms* are those that employ at least 250 permanent employees. *DENY* refers to the firms whose last loan application was turned down. *PENDING* refers to the firms whose loan application is pending. *BDS*, *COR*, *COLLA*, *IR* and *EXPDENY* refer to the firms that did not apply for a BL because of burdensome loan procedures, corruption in the banking system, strict collateral requirements, high interest rates and expected denial, respectively. Statistics are calculated on estimation sample so as to provide contest for results with 12,606 firms in 36 countries. The proportions in the sample are presented in parentheses. Statistics from a z-test for the significance of the difference in the proportions are calculated for each pair of size.

	DENY	PENDING	BDS	COR	COLLA	IR	EXPDENY	Total
All firms	306 (2.42%)	121 (0.96%)	701 (5.55%)	24 (0.19%)	434 (3.44%)	409 (3.24%)	82 (0.65%)	16.45%
<i>Size</i>								
Large firms	22 (0.17%)	14 (0.11%)	22 (0.17%)	0 (0%)	13 (0.10%)	18 (0.14%)	6 (0.05%)	0.74%
Medium firms	63 (0.50%)	19 (0.15%)	93 (0.74%)	6 (0.05%)	55 (0.44%)	52 (0.41%)	15 (0.12%)	2.41%
Small firms	221 (1.75%)	88 (0.70%)	586 (4.64%)	18 (0.14%)	366 (2.90%)	339 (2.69%)	61 (0.48%)	13.3%
<i>Small-Large</i>								
Diff (Std. Err.)	.015 (.001)	.005 (.0007)	.044 (.001)	.001 (.0003)	.027 (.001)	.025 (.001)	.004 (.0006)	.125 (.003)
z-test	12.82***	7.34***	23.15***	4.24***	18.27***	17.11***	6.72***	39.00***
<i>Small-Medium</i>								
Diff (Std. Err.)	.012 (.001)	.005 (.0008)	.039 (.002)	.0009(.0003)	.024 (.001)	.022 (.001)	.003 (.0006)	.109 (.003)
z-test	9.42***	6.68***	19.17***	2.45***	15.28***	14.62***	5.28***	32.19***
<i>Medium-Large</i>								
Diff (Std. Err.)	.003 (.0007)	.0003 (.0004)	.005 (.0008)	.0004 .0001)	.003 (.0006)	.002 (.0006)	.0007 (.0003)	.016 (.001)
z-test	4.45***	0.87	6.63***	2.44***	5.10***	4.06***	1.96**	10.50***

Table 3.2: Economic, Financial and Institutional Indicators and Correlation Table

This table provides the country-level indicators in Panel A and Pearson correlation coefficients for these indicators in Panel B. Data have been collected from World Bank Enterprise Survey (WBES) and World Development Indicators (WDI). *GDP Growth* is the annual growth rate of Gross Domestic Product (GDP) in constant 2005 US dollars. *Inflation* is the inflation rate as measured by the consumer price index. *Private Credit* is the percentage of domestic credit to private sector to GDP. *Rule of Law* is the country's score on the aggregate indicator measuring the extent to which agents have confidence in and abide by the rules of society. All these indicators are 2000–2004 averages. *Income* refers to four groups of country income level: Low, Lower-middle, Upper-middle and High. * Statistical significance at the 5% level. Detailed variable definitions and sources are given in Appendix 3.1.

Panel A. Economic, Financial and Institutional Indicators

	Country	GDP Growth	Inflation	Private Credit	Rule of Law	Income
1	Albania	5.76	2.73	6.80	-.94	Lower-middle
2	Armenia	10.63	3.01	7.39	-.40	Lower-middle
3	Azerbaija	10.6	3.01	7.43	-.90	Lower-middle
4	Belarus	6.81	63.75	10.37	-1.18	Lower-middle
5	Bulgaria	5.24	6.39	21.07	-.16	Lower-middle
6	Costa Rica	3.28	10.62	29.03	.58	Upper-middle
7	Croatia	4.41	2.77	40.69	-.03	Upper-middle
8	Czech	3.50	2.66	34.04	.75	Upper-middle
9	Estonia	7.18	3.54	46.27	.75	Upper-middle
10	Macedonia	1.66	3.23	18.57	-.52	Lower-middle
11	Georgia	5.80	4.94	8.46	-.98	Lower-middle
12	Germany	1.03	1.51	113.20	1.61	High
13	Greece	4.49	3.31	57.52	.81	High
14	Hungary	4.20	7.12	37.34	.89	Upper-middle
15	Ireland	5.63	4.15	110.78	1.52	High
16	Kazakhstan	10.4	8.13	18.86	-1.06	Lower-middle
17	Kyrgyzstan	4.95	6.96	4.80	-.79	Low
18	Latvia	7.46	3.23	33.81	.39	Upper-middle
19	Lithuania	6.88	.53	18.84	.41	Upper-middle
20	Madagascar	2.62	9.46	8.80	-.23	Low

Table 3.2 (continued): Economic, Financial and Institutional Indicators and Correlation Table

Panel A (continued). Economic, Financial and Institutional Indicators

	Country	GDP Growth	Inflation	Private Credit	Rule of Law	Low
21	Malawi	1.73	17.60	6.96	-.33	Low
22	Mauritius	4.62	4.93	64.04	1.00	Upper-middle
23	Moldova	6.00	14.02	17.23	-.54	Low
24	Poland	3.12	4.36	27.42	.54	Upper-middle
25	Portugal	1.47	3.28	131.44	1.24	High
26	Romania	5.41	25.96	11.03	-.21	Lower-middle
27	Russia	6.86	16.51	18.80	-.94	Upper-middle
28	Serbia & Montenegro	4.63	41.30	18.95	-.67	Lower-middle
29	Slovakia	3.98	7.75	37.35	.34	Upper-middle
30	Slovenia	3.98	7.75	37.35	.95	High
31	South Korea	5.72	3.24	104.03	.85	High
32	Spain	3.70	3.23	105.76	1.24	High
33	Tajikistan	10.12	18.57	15.00	-1.19	Low
34	Turkey	4.37	38.03	15.88	.03	Upper-middle
35	Ukraine	8.36	11.02	18.32	-.90	Lower-middle
36	Vietnam	6.74	2.53	41.53	-.46	Low

Panel B. Correlation Table

	1	2	3	4	5	6	7	8
1 GDP Growth	1							
2 Inflation	0.0542*	1						
3 Private Credit	-0.4607*	-0.4212*	1					
4 Rule of Law	-0.6301*	-0.3676*	0.8046*	1				
5 High	-0.4150*	-0.3306*	0.8933*	0.7495*	1			
6 Upper-middle	-0.1442*	0.1821*	-0.2638*	0.1538*	-0.3793*	1		
7 Lower-middle	0.4347*	0.2548*	-0.4330*	-0.5486*	-0.3313*	-0.4004*	1	
8 Low	0.1370*	-0.1416*	-0.1832*	-0.3859*	-0.2693*	-0.3254*	-0.2843*	1

Table 3.3: BL Constraints and TC Use - Country Means

This table provides the country means for the indicators of BL constraints and TC use. Data have been collected from World Bank Enterprise Survey (WBES) in 2005. *DENY* refers to the firms whose last loan application was turned down. *PENDING* refers to the firms whose loan application is pending. *BDS*, *COR*, *COLLA*, *IR* and *EXPDENY* refer to the firms that did not apply for a BL because of burdensome loan procedures, corruption in the banking system, strict collateral requirements, high interest rates and expected denial, respectively. *TCUSE* is the fraction of the assets side of working capital financed by using TC. Statistics are calculated on estimation sample so as to provide contest for results with 12,606 firms in 36 countries. Figures are given in percentage.

	Country	Obs.	DENY	PENDING	BDS	COR	COLLA	IR	EXPDENY	TCUSE
1	Albania	170	2.94	1.76	4.12	0.59	0.59	4.71	0.59	1.88
2	Armenia	340	1.18	3.82	5.29	0.59	6.76	4.41	2.35	.41
3	Azerbaijan	281	3.20	1.78	14.95	3.20	9.25	3.20	0.71	2.20
4	Belarus	223	2.69	0.45	19.73	0	1.79	3.59	2.24	4.36
5	Bulgaria	200	2.00	0.50	9.50	0	0.50	2.00	1.00	5.76
6	Costa Rica	263	4.94	1.14	8.75	0	5.70	6.08	1.14	11.29
7	Croatia	205	1.95	1.95	4.88	0	0	0.49	0.49	6.62
8	Czech	283	4.24	0	5.30	0	6.36	1.41	1.06	5.91
9	Estonia	163	1.84	0	1.23	0	2.45	1.84	0	12.53
10	Macedonia	151	0.66	1.32	11.92	0	5.30	7.95	1.32	5
11	Georgia	168	3.57	1.19	6.55	0	1.79	1.79	0.60	1.96
12	Germany	969	2.79	1.34	2.79	0	1.14	0.10	0.10	10.35
13	Greece	485	0.41	0.41	1.03	0.21	0.82	1.65	0	10.57
14	Hungary	489	1.43	0.61	4.91	0	6.34	3.48	0	5.61
15	Ireland	433	0.92	0.23	0.46	0	0	0.23	0	8.22
16	Kazakhstan	497	2.82	0.60	7.85	0.20	7.65	4.02	0.40	2.75
17	Kyrgyzstan	150	4.00	0	7.33	0	6.67	6.00	0	3.43
18	Latvia	131	3.82	0	0	0	1.53	4.58	0.76	17.29
19	Lithuania	150	0.67	2.00	4.00	0	3.33	0.67	2.67	10.98
20	Madagascar	178	8.43	2.81	10.67	1.12	4.49	14.61	1.69	5.01
21	Malawi	103	8.74	0.97	0.97	0	5.83	20.39	0.97	6.47

Table 3.3 (continued): BL Constraints and TC Use - Country Means

	Country	Obs.	DENY	PENDING	BDS	COR	COLLA	IR	EXPDENY	TCUSE
22	Mauritius	99	4.04	1.01	3.03	0	0	2.02	1.01	4.80
23	Moldova	173	2.31	1.16	8.09	0	2.31	0.58	0	7.12
24	Poland	842	2.49	0.83	8.31	0	6.65	4.75	0.95	4.61
25	Portugal	364	0.82	0.27	1.10	0.27	3.02	3.30	0.55	5.23
26	Romania	482	3.94	1.24	8.09	0	1.45	1.45	0.62	7.69
27	Russia	471	2.12	0.21	11.46	0.21	4.88	3.82	1.06	7.00
28	Serbia & Montenegro	218	0.46	3.21	11.47	0	3.67	7.34	0	4.58
29	Slovakia	157	1.27	0	4.46	0	1.27	1.91	1.27	2.94
30	Slovenia	177	1.13	0	2.82	0	0	0.56	0	2.57
31	South Korea	587	1.19	0.51	1.70	0.17	3.07	1.19	0.51	.36
32	Spain	551	0.18	0.18	0.54	0	0.36	1.09	0	13.26
33	Tajikistan	181	3.31	1.10	16.02	0.55	4.42	5.52	0	4.77
34	Turkey	746	1.74	1.47	0.80	0.27	1.74	7.10	0.40	5.40
35	Ukraine	449	0.89	0.67	8.46	0	6.68	6.68	0	6.22
36	Vietnam	1,077	4.83	1.02	4.74	0.19	3.16	0.93	1.39	7.24

Table 3.4: Descriptive Statistics

This table provides the descriptive statistics for our sample. Statistics are calculated on estimation sample so as to provide contest for results with 12,606 firms in 36 countries. Data have been collected from World Bank Enterprise Survey (WBES) and World Development Indicators (WDI). The dependent variable is *TCUSE*, which is the fraction of the assets side of working capital financed by using TC. Detailed variable definitions and sources are given in Appendix 3.1. Statistics from a *t*-test for the significance of the difference in the *TCUSE* mean for each pair of size are presented at the bottom of the table.

Variables	Mean	SD	Minimum	Maximum
TCUSE	6.395	17.590	0	100
DENY (0,1)	.024	.153	0	1
PENDING (0,1)	.009	.097	0	1
BDS (0,1)	.055	.229	0	1
COR (0,1)	.001	.043	0	1
COLLA (0,1)	.034	.182	0	1
IR (0,1)	.032	.177	0	1
EXPDENY (0,1)	.006	.080	0	1
Medium (0,1)	.199	.399	0	1
Small (0,1)	.690	.462	0	1
Age	2.551	.712	.693	5.303
Private Credit	45.300	38.736	4.805	131.449
Rule of Law	.188	.876	-1.192	1.613
Lower-middle Income (0,1)	.252	.434	0	1
Upper-middle Income (0,1)	.317	.465	0	1
High Income (0,1)	.282	.450	0	1
Internal funds	48.687	39.668	0	100
Technology (0,1)	.342	.474	0	1
Foreign (0,1)	.105	.307	0	1
SOE (0,1)	.075	.263	0	1
Construction (0,1)	.095	.293	0	1
Manufacturing (0,1)	.474	.499	0	1
Services (0,1)	.422	.493	0	1
GDP growth	5.228	2.550	1.030	10.630
Inflation	9.842	12.557	.539	63.759
<i>TCUSE</i>				
Large	8.513	19.444	0	100
Medium	7.494	17.982	0	100
Small	5.739	17.118	0	100
<i>TCUSE</i>	<i>Diff</i>	<i>Std. Err.</i>	<i>t-test</i>	<i>Prob.</i>
Large - Small	2.568	.448	5.72	0.0000
Medium - Small	1.448	.346	4.17	0.0000
Large - Medium	1.120	.535	2.09	0.0183

Table 3.5: Effects of BL Constraints on TC Use - Overall Effects

This table provides the regression results for the overall effects of BL constraints on firm's use of TC. The dependent variable is *TCUSE*, which is the fraction of the assets side of working capital financed by using TC. Detailed variable definitions and sources are given in Appendix 3.1. All regressions are tobit regressions with error terms clustered at the country level. *t*-statistics are reported in parentheses. *** Statistical significance at the 1% level, ** Statistical significance at the 5% level, * Statistical significance at the 10% level.

Variables	Denial and Pending		Discouraged borrowing	
	All firms (1)	Applying firms (2)	All firms (3)	Non-Applying firms (4)
DENY	2.19 (0.48)	-4.36 (-0.91)		
PENDING	1.37 (0.15)	-6.10 (-0.73)		
BDS			9.27** (2.28)	32.52*** (4.99)
COR			-15.19 (-0.61)	-2.71 (-0.08)
COLLA			-3.44 (-0.68)	15.26** (2.09)
IR			-11.94* (-1.77)	4.14 (0.44)
EXPDENY			-10.25 (-0.61)	8.26 (0.34)
Medium	-3.27 (-1.08)	-4.86* (-1.73)	-3.28 (-1.09)	13.35* (1.69)
Small	-17.06*** (-4.07)	-13.43*** (-4.01)	-17.05*** (-4.25)	-6.12 (-0.73)
Age	2.27 (1.23)	2.08 (1.07)	2.34 (1.27)	1.31 (0.43)
Internal funds	.05 (0.84)	.04 (0.87)	.05 (0.85)	.02 (0.22)
Technology	4.32* (1.80)	3.83 (1.49)	4.32* (1.79)	.02 (0.00)
Foreign	7.20*** (2.63)	10.22*** (4.71)	7.10*** (2.58)	4.94 (0.60)
SOE	3.67 (0.73)	6.90* (1.73)	3.70 (0.72)	2.87 (0.29)
Construction	23.55** (2.52)	25.17*** (2.61)	23.60** (2.54)	9.82 (0.55)
Manufacturing	9.04 (0.98)	10.79 (1.10)	9.27 (1.01)	1.13 (0.06)
Services	12.35 (1.26)	16.23 (1.60)	12.43 (1.28)	1.97 (0.11)
GDP Growth	-.95 (-0.51)	-1.46 (-1.06)	-.98 (-0.52)	-.42 (-0.14)
Inflation	.07 (0.46)	.07 (0.59)	.08 (0.48)	.002 (0.01)
Private Credit	.15 (0.72)	.24 (1.54)	.15 (0.71)	-.07 (-0.21)
Rule of Law	10.62 (0.95)	4.74 (0.53)	10.65 (0.97)	17.06 (1.01)
Lower-middle Income	-16.32** (-2.16)	-7.03 (-1.30)	-16.65** (-2.21)	-33.36** (-2.32)
Upper-middle Income	-11.50 (-0.99)	-1.19 (-0.12)	-11.54 (-1.01)	-24.95 (-1.33)
High Income	-26.44 (-1.24)	-20.60 (-1.10)	-26.33 (-1.24)	-23.78 (-0.70)
Constant	-61.01*** (-3.67)	-53.18*** (-3.59)	-60.92*** (-3.67)	-90.87*** (-2.89)
Obs.	12606	6675	12606	5931
Uncensored obs. (%)	2179 (17.28%)	1559 (23.35%)	2179 (17.28%)	620 (10.45%)
P-value	0.0000	0.0000	0.0000	0.0000

Table 3.6: Effects of BL Constraints on TC Use across Size and Age

This table provides the regression results for the interaction terms between the indicators of BL constraints and firm size in Panel A and Panel B, and firm age in Panel C. The dependent variable is *TCUSE*, which is the fraction of the assets side of working capital financed by using TC. In Panel B, *Large*, *Medium* and *Small* are binary variables that equal 1 if the firms has total sales greater than the 75th percentile, between the 50th percentile and the 75th percentile and smaller than the 50th percentile, respectively, and zero otherwise. Detailed variable definitions and sources are given in Appendix 3.1. All regressions are tobit regressions with error terms clustered at the country level. *t*-statistics are reported in parentheses. *** Statistical significance at the 1% level, ** Statistical significance at the 5% level, * Statistical significance at the 10% level.

Panel A. Effects of BL Constraints on TC Use across Size

Variables	Denial and Pending		Discouraged borrowing	
	All firms (1)	Applying firms (2)	All firms (3)	Non-Applying firms (4)
DENY Large	24.73*** (3.71)	16.36** (2.20)		
DENY Medium	3.21 (0.34)	-.04 (-0.01)		
DENY Small	-1.59 (-0.27)	-9.02* (-1.76)		
PENDING Large	-10.72 (-0.51)	-16.99 (-0.89)		
PENDING Medium	19.27 (1.14)	12.23 (0.84)		
PENDING Small	-2.00 (-0.19)	-9.83 (-1.09)		
BDS Large			6.27 (0.25)	41.52 (1.02)
BDS Medium			1.91 (0.17)	21.23* (1.81)
BDS Small			10.68** (2.42)	33.91*** (4.97)
COR			-15.23 (-0.61)	-3.03 (-0.09)
COLLA Large			-15.57 (-0.56)	18.97 (0.70)
COLLA Medium			12.44* (1.94)	35.85*** (3.19)
COLLA Small			-6.60 (-1.01)	10.11 (1.03)
IR Large			-11.27 (-0.46)	22.47 (0.60)
IR Medium			.52 (0.03)	16.90 (0.79)
IR Small			-14.68** (-2.08)	-.04 (-0.00)
EXPDENY			-10.27 (-0.61)	8.23 (0.34)
Firm and country-level controls	Yes	Yes	Yes	Yes
Obs.	12606	6675	12606	5931
Uncensored obs. (%)	2179 (17.28%)	1559 (23.35%)	2179 (17.28%)	620 (10.45%)
P-value	0.0000	0.0000	0.0000	0.0000

Table 3.6 (continued): Effects of BL Constraints on TC Use across Size and Age

Panel B. Effects of BL Constraints on TC Use across Size: Using Total Sales as an Alternative Measure

Variables	Denial and Pending		Discouraged borrowing	
	All firms (1)	Applying firms (2)	All firms (3)	Non-Applying firms (4)
DENY Large	20.80* (1.89)	16.50* (1.64)		
DENY Medium	-1.49 (-0.13)	-6.03 (-0.67)		
DENY Small	-7.07 (-0.73)	-14.25* (-1.66)		
PENDING Large	-4.33 (-0.26)	-8.47 (-0.59)		
PENDING Medium	14.22 (1.07)	8.75 (0.66)		
PENDING Small	3.23 (0.29)	-5.13 (-0.55)		
BDS Large			13.41 (1.34)	35.72** (2.09)
BDS Medium			11.83 (1.61)	31.67*** (4.07)
BDS Small			5.81 (1.19)	28.88*** (3.50)
COR			2.34 (0.09)	23.14 (0.63)
COLLA Large			16.03 (1.48)	38.16*** (3.11)
COLLA Medium			6.49 (0.61)	24.01 (1.51)
COLLA Small			-7.13 (-0.99)	11.19 (1.08)
IR Large			8.31 (0.38)	28.12 (0.90)
IR Medium			-1.48 (-0.12)	12.33 (0.79)
IR Small			-14.11 (-1.60)	3.27 (0.29)
EXPDENY			-5.60 (-0.30)	12.78 (0.47)
Firm and country-level controls	Yes	Yes	Yes	Yes
Obs.	10499	5853	10499	4646
Uncensored obs. (%)	1952 (18.6%)	1420 (24.26%)	1952 (18.6%)	532 (11.45%)
P-value	0.0000	0.0000	0.0000	0.0000

Table 3.6 (continued): Effects of BL Constraints on TC Use across Size and Age

Panel C. Effects of BL Constraints on TC Use across Age

Variables	Denial and Pending		Discouraged borrowing	
	All firms (1)	Applying firms (2)	All firms (3)	Non-Applying firms (4)
DENY Old	-3.61 (-0.41)	-8.90 (-1.10)		
DENY Mid-age	9.23 (1.46)	.81 (0.14)		
DENY Young	-15.15 (-1.42)	-16.92 (-1.55)		
PENDING Old	14.42 (0.86)	4.71 (0.35)		
PENDING Mid-age	-6.70 (-0.57)	-13.06 (-1.29)		
PENDING Young	-6.87 (-0.27)	-12.01 (-0.48)		
BDS Old			-8.12 (-0.89)	9.50 (0.83)
BDS Mid-age			12.15*** (2.62)	37.19*** (5.20)
BDS Young			21.67*** (2.83)	48.63*** (3.28)
COR			-14.66 (-0.58)	-.88 (-0.03)
COLLA Old			-18.39 (-1.55)	-4.02 (-0.29)
COLLA Mid-age			-1.34 (-0.17)	18.43 (1.58)
COLLA Young			9.66 (1.03)	33.28** (2.02)
IR Old			-22.18*** (-2.70)	-9.72 (-0.85)
IR Mid-age			-13.46 (-1.53)	1.82 (0.15)
IR Young			19.90 (1.41)	48.28*** (2.64)
EXPDENY			-10.17 (-0.61)	8.59 (0.35)
Firm and country-level controls	Yes	Yes	Yes	Yes
Obs.	12606	6675	12606	5931
Uncensored obs. (%)	2179 (17.28%)	1559 (23.35%)	2179 (17.28%)	620 (10.45%)
P-value	0.0000	0.0000	0.0000	0.0000

Table 3.7: Effects of BL Constraints on TC Use across Levels of Institutional Development

This table provides the regression results for the interaction terms between the indicators of BL constraints and *Income (0,1)* in Panel A, *Private Credit (0,1)* in Panel B, and *Rule of Law (0,1)* in Panel C. *Income (0,1)*, *Private Credit (0,1)* and *Rule of Law (0,1)* are vectors of binary variables defined in Appendix 3.1. The dependent variable is *TCUSE*, which is the fraction of the assets side of working capital financed by using TC. Detailed variable definitions and sources are given in Appendix 3.1. All regressions are tobit regressions with error terms clustered at the country level. *t*-statistics are reported in parentheses. *** Statistical significance at the 1% level, ** Statistical significance at the 5% level, * Statistical significance at the 10% level.

Panel A. Effects of BL Constraints on TC Use across Income Levels

Variables	Denial and Pending		Discouraged borrowing	
	All firms (1)	Applying firms (2)	All firms (3)	Non-Applying firms (4)
DENY High	3.46 (0.40)	-5.56 (-0.68)		
DENY Upper	12.56 (1.60)	2.62 (0.34)		
DENY Lower	-24.86** (-2.05)	-30.29*** (-3.14)		
DENY Low	2.10 (0.35)	.51 (0.08)		
PENDING High	-22.90** (-2.00)	-29.45*** (-3.29)		
PENDING Upper	10.95 (0.74)	.26 (0.02)		
PENDING Lower	-31.59* (-1.66)	-35.20** (-2.29)		
PENDING Low	34.63*** (4.38)	28.46*** (4.61)		
BDS High			4.94 (0.58)	29.67*** (3.53)
BDS Upper			6.57 (1.34)	32.18*** (3.66)
BDS Lower			11.59 (1.15)	38.50*** (2.77)
BDS Low			12.07*** (3.20)	23.75*** (2.67)
COR			-15.04 (-0.60)	-2.71 (-0.08)
COLLA High			-9.50 (-0.47)	9.44 (0.40)
COLLA Upper			-6.94 (-1.08)	13.06 (1.32)
COLLA Lower			6.21 (0.70)	30.52** (2.14)
COLLA Low			-6.81 (-0.70)	-.82 (-0.10)
IR High			3.86 (0.19)	27.73 (0.94)
IR Upper			-13.90 (-1.18)	3.53 (0.24)
IR Lower			-20.80** (-2.11)	-2.38 (-0.14)
IR Low			-7.62 (-0.70)	-2.95 (-0.21)
EXPDENY High			-13.14 (-0.42)	7.78 (0.21)
EXPDENY Upper			2.10 (0.09)	26.38 (0.81)
EXPDENY Lower			-.73 (-0.04)	21.49 (0.76)
EXPDENY Low			-54.72 (-1.40)	-56.21 (-0.95)
Firm and country-level controls	Yes	Yes	Yes	Yes
Obs.	12606	6675	12606	5931
Uncensored obs. (%)	2179 (17.28%)	1559 (23.35%)	2179 (17.28%)	620 (10.45%)
P-value	0.0000	0.0000	0.0000	0.0000

Table 3.7 (continued): Effects of Bank Loan Constraints on Trade Credit Use across Levels of Institutional Development

Panel B. Effects of BL Constraints on TC Use across Levels of Financial Development

Variables	Denial and Pending		Discouraged borrowing	
	All firms (1)	Applying firms (2)	All firms (3)	Non-Applying firms (4)
DENY High	13.82 (1.18)	3.70 (0.40)		
DENY Upper	14.52** (2.17)	7.64* (1.78)		
DENY Lower	-8.25 (-0.79)	-15.43 (-1.58)		
DENY Low	-22.87* (-1.83)	-24.27** (-2.34)		
PENDING High	-24.08** (-2.15)	-30.32*** (-3.38)		
PENDING Upper	40.16*** (6.17)	28.26*** (6.99)		
PENDING Lower	-12.54 (-0.82)	-20.31 (-1.58)		
PENDING Low	-6.01 (-0.33)	-8.68 (-0.57)		
BDS High			3.04 (0.33)	29.11*** (3.50)
BDS Upper			15.49*** (3.08)	40.20*** (3.25)
BDS Lower			7.67 (1.30)	32.36*** (3.76)
BDS Low			8.21 (0.68)	25.79* (1.65)
COR			-15.21 (-0.61)	-2.86 (-0.08)
COLLA High			-12.68 (-0.61)	5.96 (0.25)
COLLA Upper			-3.61 (-0.50)	16.56 (1.54)
COLLA Lower			7.59 (0.96)	31.08*** (2.67)
COLLA Low			-27.65* (-1.92)	-23.31 (-1.26)
IR High			-1.16 (-0.05)	22.50 (0.74)
IR Upper			8.02 (0.42)	31.69 (1.40)
IR Lower			-17.93* (-1.92)	-1.13 (-0.08)
IR Low			-22.43** (-1.99)	-17.85 (-1.12)
EXPDENY High			21.16 (-0.67)	-.89 (-0.02)
EXPDENY Upper			2.91 (0.08)	24.34 (0.44)
EXPDENY Lower			-53.36** (-1.99)	-44.61 (-1.27)
EXPDENY Low			6.14 (0.32)	26.17 (0.94)
Firm and country-level controls	Yes	Yes	Yes	Yes
Obs.	12606	6675	12606	5931
Uncensored obs. (%)	2179 (17.28%)	1559 (23.35%)	2179 (17.28%)	620 (10.45%)
P-value	0.0000	0.0000	0.0000	0.0000

Table 3.7 (continued): Effects of BL Constraints on TC Use across Levels of Institutional Development

Panel C. Effects of BL Constraints on TC Use across Levels of Legal Protection

Variables	Denial and Pending		Discouraged borrowing	
	All firms (1)	Applying firms (2)	All firms (3)	Non-Applying firms (4)
DENY High	11.46 (1.09)	1.78 (0.22)		
DENY Upper	8.37 (0.70)	-.71 (-0.06)		
DENY Lower	-2.39 (-0.30)	-5.66 (-0.64)		
DENY Low	-6.86 (-0.66)	-14.09 (-1.49)		
PENDING High	-3.40 (-0.17)	-12.79 (-0.85)		
PENDING Upper	-3.80 (-0.15)	-10.75 (-0.49)		
PENDING Lower	5.68 (0.42)	-.45 (-0.04)		
PENDING Low	-.41 (-0.03)	-9.46 (-0.65)		
BDS High			5.31 (0.78)	30.58*** (4.01)
BDS Upper			3.10 (0.36)	24.52* (1.78)
BDS Lower			13.98*** (2.70)	35.64*** (3.42)
BDS Low			11.04 (1.03)	36.98*** (2.61)
COR			-14.64 (-0.58)	-.98 (-0.03)
COLLA High			-8.48 (-0.49)	11.45 (0.59)
COLLA Upper			-15.88 (-1.62)	-.95 (-0.06)
COLLA Lower			-.28 (-0.04)	14.99 (1.38)
COLLA Low			8.53 (0.83)	33.44** (2.10)
IR High			-19.43 (-0.56)	.71 (0.02)
IR Upper			-7.26 (-0.38)	8.43 (0.34)
IR Lower			-24.14*** (-2.75)	-16.00 (-1.54)
IR Low			1.44 (0.18)	25.51** (2.21)
EXPDENY High			-3.55 (-0.10)	21.58 (0.54)
EXPDENY Upper			12.77 (0.50)	38.77 (1.13)
EXPDENY Lower			-43.12* (-1.72)	-36.88 (-0.98)
EXPDENY Low			-2.28 (-0.06)	22.26 (0.43)
Firm and country-level controls	Yes	Yes	Yes	Yes
Obs.	12606	6675	12606	5931
Uncensored obs. (%)	2179 (17.28%)	1559 (23.35%)	2179 (17.28%)	620 (10.45%)
P-value	0.0000	0.0000	0.0000	0.0000

Chapter 4: The Effects of Bank Loan Constraints on the Use of Alternative Financing: International Evidence from Small and Medium-sized Enterprises

Abstract

In this chapter, we investigate the effects of bank loan (BL) constraints on the use of six alternative financing sources by Small and Medium-sized Enterprises (SMEs), i.e. trade credit (TC), leasing, credit cards, informal finance, sources from family and friends, and equity. We use an international data set of 39 developed and developing countries compiled from two enterprise surveys led by World Bank in 2005. Controlling for firm's characteristics and country-specific variables, our results generally suggest that bank-constrained SMEs rely more on the alternative sources. Not only denied firms but also discouraged firms, those with pending applications and those having a BL but reporting access to finance as an obstacle to their growth rely more on alternative financing. However, the effects of bank constraints on the use of alternative financing vary across financing forms, constraint type and financing purpose. We find a stronger substitution effect for sources from family and friends and informal finance whereas leasing, TC, credit cards and equity compensate for BL to a lower extent. Besides, our findings indicate that constrained SMEs use alternative financing channels to finance working capital to a greater extent in comparison with new investments. In addition, discouraged firms because of burdensome loan procedures are more likely to increase alternative financing compared to the other discouragement categories.

Résumé

Dans ce chapitre, nous étudions les effets des contraintes sur les prêts bancaires (BL) sur l'utilisation de six sources alternatives de financement par les petites et moyennes entreprises (PME). Les formes de financement alternatives sont le crédit commercial (TC), le crédit-bail, les cartes de crédit, la finance informelle, les fonds provenant de la famille et des amis et les capitaux propres. Nous utilisons une base de données internationale de 39 pays développés et en développement compilées à partir de deux enquêtes auprès des entreprises menées par la Banque mondiale en 2005. Après avoir contrôlé pour les caractéristiques des entreprises et pour l'environnement propre à chaque pays, nos résultats suggèrent généralement que les PME financièrement contraintes comptent davantage sur les sources alternatives de financement. Non seulement les entreprises dont la demande a été refusée mais aussi les entreprises découragées, celles ayant des demandes en instance et celles ayant obtenu un BL mais déclarent l'accès au financement comme un obstacle à leur croissance comptent davantage sur un financement alternatif. Cependant, les effets des contraintes bancaires sur l'utilisation des différents modes de financement varient selon les formes de financement, la catégorie de la contrainte et l'objet de financement. Nous trouvons un effet plus fort de substitution pour les fonds apportés par la famille et les amis et la finance informelle tandis que le leasing, le TC, les cartes de crédit et les capitaux propres ne servent à compenser le manque de BL que dans une moindre mesure. En outre, nos résultats indiquent que les PME contraintes utilisent plus volontiers les canaux de financement alternatifs pour financer le fonds de roulement que pour financer de nouveaux investissements. En outre, les entreprises découragées par les procédures de BL compliquées sont plus susceptibles d'avoir recours au financement alternatif par rapport aux autres catégories de découragement.

Chapter 4: The Effects of Bank Loan Constraints on the Use of Alternative Financing: International Evidence from Small and Medium-sized Enterprises

4.1 Introduction

There has been an increased interest by policy makers, regulators and researchers about the functioning of the financial markets for small businesses. The Small and Medium-sized Enterprises (SMEs) sector has indeed become a valuable area of research largely because they form a substantial part of all enterprises in most countries and largely contribute to economic growth. However, there is concern that small firms may face difficulties in accessing formal financing due to their informational opacity and risky nature. The 2004 World Development Report (IBRD, World Bank, 2004) indicates that small firms are 50 percent more likely than large firms to report difficulty in finance access and finance cost as a major or severe constraint; and that small firms obtain only 30 percent of their financing from external sources, versus 48 percent for large firms.

Financial literature has further shown that small business is specific and their financing patterns are significantly different from large firms (Beck et al., 2008, 2005; Canton et al., 2013; Psillaki and Daskalakis, 2009; Vermoesen et al., 2013). Since SMEs have limited access to capital markets including bond and commercial paper markets, when bank loan (BL) is not available, they do not have any other choice but to rely on alternative financing sources. Those sources include trade credit (TC) (Cook, 1999; Danielson and Scott, 2004; Mateut et al., 2006; Nilsen, 2002; Petersen and Rajan, 1997, 1995, 1994), leasing (Erickson and Trevino, 1994; Marston and Harris, 1988; Severin and Filareto-Deghaye, 2007), credit cards (Danielson and Scott, 2004; Robb and Robinson, 2014), informal credit (Bell, 1990; Ghosh et al., 2000), and market financing (Leary, 2009). The alternative sources are often more expensive than BL in terms of cost but are less sensitive to the consequences of market imperfections. Hence, they may be (imperfect) substitutes for bank borrowings. As a type of informal financing, financially constrained firms may also rely more on sources from family and friends. The difference compared to the other financing forms is that those sources are not an expensive source because the family members and friends of the business owner are often willing to lend at a low rate, even a negative rate. Yet many borrowers tap family and friends only as a last resort because this financing discourages risk taking (Lee and Persson, 2013). Besides, several studies have demonstrated the important role of alternative financing to the growth and performance of small businesses (Allen et al., 2005; Fisman and Love, 2003; Yang, 2011; Yiu et al., 2013).

In this chapter, we investigate directly the effects of bank constraints on the use of these six alternative financing sources by SMEs. In order to obtain direct measures of BL constraints, we use a firm-level compiled dataset of 39 developed and developing countries from

enterprise surveys led by World Bank in 2005 (World Bank Enterprise Surveys-WBES), i.e. BEEPS (Business Environment and Enterprise Performance Survey) and ICS (Productivity and the Investment Climate Private Enterprise Survey).

This chapter further contributes to existing literature on the determinants of the use of alternative financing by distinguishing actually denied firms from those with pending applications, those that have been discouraged from applying for a BL and those having a BL but reporting an obstacle on finance access, i.e. partly constrained firms. Specifically, firms having BL may be still financially constrained if they have not obtained all the financing requested. Besides, Canton et al. (2013) show the importance to study perceived credit constraint (discouraged firms) because those firms form a substantial part of all SMEs (Han et al., 2009) and should not be neglected in studies of credit accessibility (Chakravarty and Xiang, 2013). To the best of our knowledge, in the literature on the link between credit constraints and alternative financing, Casey and O'Toole is the only study that distinguishes two types of constrained SMEs: denied firms and self-rationed borrowers because of high bank rates. In this study, we distinguish four categories of bank constraints, i.e. actual denial, pending request, discouragement and partly constraint. In addition, we explore the impact of the reasons given for discouragement on the use of the alternative financing sources. This is important because firms that did not apply for a BL because of burdensome procedures of loan application, strict collateral requirements or expected denial may rely on expensive sources, by contrast, firms that are not able to afford bank rates would not except for sources from family and friends.

Besides, previous studies investigating the effects of bank credit availability on the use of alternative financing commonly focus on one single country (Allen et al. 2012; Bell 1990; Cosci et al. 2015; Petersen and Rajan 1997). Casey and O'Toole (2014) is one of the rare papers using a multi-countries sample with a focus on EU members. Therefore, our study adds to existing literature by using an international dataset covering both developed and developing countries.

Another contribution of this study is to take a first step in investigating separately two financing purposes, i.e. working capital requirement (WC) and new investments (NI) to look at the differences in funding short-term assets versus long-term investments. Despite the considerable literature in the relationship between bank constraints and alternative financing, little research sheds light on such differences. We find only two related studies. Chavis et al. (2011) show that younger firms rely more on alternative financing sources than on bank credit to finance both WC and NI. Casey and O'Toole (2014) find that firms denied credit for WC are more likely to use TC whilst firms denied credit for NI tend to use more informal lending or other company loans.

Controlling for firm's characteristics and country-specific variables, our findings reveal that bank-constrained SMEs rely more on the alternative sources. However, the substitution effect varies across financing forms, constraint category and financing purpose. Our results suggest a stronger substitution effect for informal sources and those from family and friends.

Furthermore, we find that constrained SMEs use alternative financing channels to finance WC to a greater extent relative to NI in fixed assets. In addition, discouraged firms because of burdensome loan procedures are more likely to increase alternative financing compared to other discouragement categories.

The chapter is structured as follows. In the second section, we discuss the literature on the link between BL and the use of the six alternative financing sources, and the main conjectures to be tested. Data and methodological approach are presented in the third section. The fourth section reports empirical results. We conclude this chapter with discussion in the last section.

4.2 Theoretical Framework and Hypotheses

Existing literature has demonstrated that asymmetric information problems lie at the root of BL constraints. To compensate for the risk arising from those problems, banks may charge higher rates on loans. However, an increase in interest rates may cause adverse selection problems by attracting risky borrowers; and moral hazard problems by inducing safe borrowers to invest in risky projects (Stiglitz and Weiss, 1981). Consequently, banks may prefer to refuse credit to some borrowers, leading to credit rationing phenomenon. Alternatively, they may use screening and monitoring mechanisms to distinguish between good and bad borrowers by choosing collateral (Bester, 1985) or by using strict covenants (Berlin and Mester, 1992; Rajan and Winton, 1995; Smith and Warner, 1979). Such conditions may consequently discourage firms from demanding a BL, which leads to self-credit rationing phenomenon or discouraged borrowing (Kon and Storey, 2003). Both credit rationing and discouraged borrowing tend to be especially binding for SMEs because those firms are more informationally opaque than large firms (Beck et al., 2005, 2008; Berger et al., 2001; Berger and Udell, 1998; Canton et al., 2013; Vermoesen et al., 2013). A few studies indeed show that SMEs are more likely to be discouraged from applying for a BL (Canton et al., 2013; Chakravarty and Xiang, 2013; Han et al., 2009). Besides, SMEs have no or restricted access to capital markets, therefore one can expect that they turn to alternative channels such as informal sources.

A question arises as to why alternative financing sources are accessible to firms whereas BL are not. The question is even more puzzling because most of these alternative sources often have higher interest rates than BL. An explanation could be that frictions related to asymmetric information and agency problems, that are typical of SMEs, are better resolved using alternative financing sources relative to BL, since those sources are backed by alternative mechanisms such as reputation, relationships and trust (Allen et al., 2012a, 2005). Besides, alternative financing may be better than formal bank financing in terms of flexibility and timing of supplying cash needed in a short period of time (Yiu et al., 2013).

As can be seen hereafter, we provide a discussion on six alternative financing forms and the link with BL constraints, i.e. TC, leasing finance, credit cards, informal finance, sources from family and friends and equity, which are typically associated with SMEs. In Table 4.1,

we provide a summary on the comparison between BL and the six alternative financing forms.

[Insert Table 4.1 here]

4.2.1 Trade Credit

A considerable body of literature suggests that firms that are financially constrained by banks increase TC utilization as a financing of last resort (Danielson and Scott, 2004; Fisman and Love, 2003; Meltzer, 1960; Nilsen, 2002; Petersen and Rajan, 1994, 1995, 1997). When used in this manner, interest rates on TC are generally considered as higher than on BL (Cook, 1999; Ng et al., 1999; Petersen and Rajan, 1995, 1997; Wilson and Summers, 2002)¹⁰. By contrast, unlike financial institutions, trade creditors usually do not implement complicated and costly application procedures because TC involves relationship-based lending (McMillan and Woodruff, 1999; Wilner, 2000). In addition, the suppliers are able to lend to bank-constrained firms because TC offers advantages on other dimensions. Specifically, theories on TC provision posit that suppliers have a financial advantage over banks such as informational advantage (Biais and Gollier, 1997; Mateut et al., 2006; Smith, 1987) or monitoring advantage (Cuñat, 2007; Jain, 2001); thus this financing is associated with lower degree of adverse selection and better control of moral hazard. In particular, TC may be better in overcoming moral hazard problems because inputs are more difficult to divert than cash (Burkart and Ellingsen, 2004). Moreover, TC may offer advantage in liquidating collateral, which is the goods itself, in case of the borrower's default because suppliers have a network for selling its goods (Frank and Maksimovic, 2005; Mian and Smith, 1992). Hence, we generally hypothesize:

Hypothesis 1: Bank-constrained SMEs use more TC.

4.2.2 Leasing Finance

Adedeji and Stapleton (1996) indicate that leasing finance may be more expensive than debt because lessors tend to pass on costs of asset ownership to lessees in the form of higher charges. The firm can also limit its use and prefer BL because a leasing operation involved firm for an irrevocable period, implying a potential operational mobility loss for the firm. For instance, the firm cannot stop the leasing contract if the activity is no longer profitable. In an empirical paper, Lease et al. (1990), show that, only 46.6% operations come to an end, 31.4% of contracts are stopped before the end and in 19% of cases, the operation led to the firm's bankruptcy. As a result, leasing should rank below bank debt in management choice of finance, like TC, it often serves as a financing of last resort (Krishnan and Moyer, 1994).

However, leasing provides some advantages such as transferring excess tax shields (Lewellen et al., 1976; Miller and Upton, 1976; Myers et al., 1976) and alleviating moral hazard problems, thus offering better monitoring mechanism. Specifically, the use of leasing may

¹⁰ TC may not be more expensive than bank loan for a specific class of firms as suggested in a number of studies (Daripa and Nilsen 2011; Schwartz 1974; Smith 1987).

reduce agency costs of the separation between ownership and control. Lessors therefore have a monitoring advantage because they have first claim over the asset (Lasfer and Levis, 1998). On the other hand, leasing is particularly beneficial to lessees that have no pledgeable assets to obtain a BL because in leasing operations the collateral is the leased asset itself. Hence, a constraint in bank credit supply may induce the firm to increase its use of leasing.

Particularly, empirical studies on the determinants of leasing indicate that this financing form is used more by less profitable small firms and those constrained on bank debt (Ang and Peterson, 1984; Cosci et al., 2015; Eisfeldt and Rampini, 2009; Erickson and Trevino, 1994; Lasfer and Levis, 1998; Severin and Filareto-Deghaye, 2007; Sharpe and Nguyen, 1995). Particularly, Erickson and Trevino (1994) is the first to frame the lease choice within the financial pecking order and show that for firms with similar profitability and growth, leases and debt are indeed substitutes. In a more recent study, Severin and Filareto-Deghaye (2007) find a strong and significant relationship between credit rationing and the use of leasing that appears to be a last resort financing for constrained firms. In the same vein, Cosci et al. (2015), using a sample of Italian firms, suggest that more financially constrained firms use more lease than less constrained firms. However, they do not find a significant substitutability between debt and leasing for small firms. Besides, in the literature on leasing finance, the authors often do not use a direct measure of credit constraint; they use instead firm characteristics or TC use to proxy for financial difficulties.

Hence, we hypothesize:

Hypothesis 2: Bank-constrained SMEs use more leasing finance.

4.2.3 Credit Cards

While there is a very rich literature emphasizing the effects of bank constraints on the use of TC and leasing, there are few studies on the link between BL and credit cards.

The issuance of credit cards requires the creditworthiness of the borrowers and borrowings on credit cards are often charged higher rates than BL. Danielson and Scott (2004) show the substitution between credit cards use and BL availability, thereby credit-denied firms borrow more on credit cards. In another study, Robb and Robinson (2014) demonstrate that credit cards are an important financing tool to small businesses and often times, small firms' only access to the formal channels is through credit card financing. Therefore, firms that are constrained on BL may borrow more on credit cards at a higher cost.

According to the Report to the Congress on the Use of Credit Cards by American Small Businesses (2010), prepared by Board of Governors of the Federal Reserve System, nearly 50 percent of small business credit card offers between 2005 and 2009 advertised a cash advance annual percentage rate of at least 20 percent. The analysis in the Report is based largely on data obtained from the 2003 SSBF and the 2009 NFIB¹¹ survey and focuses on American

¹¹ 2003 Surveys of Small Business Finances (SSBF) and the 2009 Credit Access Poll conducted by the National Federation of Independent Business (2009 NFIB survey).

firms with 50 or fewer employees. Among small businesses, credit cards are the second most commonly used financial product after checking accounts. The Report shows that firms that borrowed on credit cards in 2009 had lower credit scores and were younger. While less-risky firms are likely to use more often credit cards than more-risky firms (88 percent versus 81 percent), more-risky firms nevertheless borrow more heavily on credit cards than less-risky firms (20 percent versus nearly 14 percent). Card charges as a percentage of expenses were higher for risky firms than for less-risky firms (20.3 percent compared with 14.2 percent).

Hence, we hypothesize:

Hypothesis 3: Bank-constrained SMEs borrow more on credit cards.

4.2.4 Informal Finance

Often provided by money lenders, informal finance has been also considered as an expensive, less desirable form of financing and often used by very constrained firms (Bell, 1990; Ghosh et al., 2000; Kon and Storey, 2003). Using data from India, Bell (1990) shows that the interest rates are set higher in informal credit markets because in those markets, borrowers are more risky and the cost of entry for new informal creditors is higher. In the same vein, Ghosh et al. (2000) suggest that credit rationed borrowers rely on informal credit as an alternative financing way. Unlike TC and leasing, the link between bank credit and informal finance is not well developed. Rather than cross-country studies, the empirical studies on informal finance are concentrated mostly on a single developing country (Ayyagari et al., 2010; Bell, 1990; Ghosh et al., 2000; Lainez, 2014) most likely because informal finance appears to be more prevalent in those countries. To the best of our knowledge, Beck et al. (2008) provide the only study investigating the use of informal finance using an international sample and they indeed find that small firms use significantly more this financing than large firms¹².

Degryse et al. (2014) suggest that informal finance offers informational and monitoring advantages. In another study, Kon and Storey (2003) noted that money lenders have a monitoring advantage over banks because of proximity and better assessment of creditworthiness among their neighbors. Additionally, unlike the banks' lending process, there is no application cost incurred, the requests are often quickly handled, the repayment is flexible and normally collateral is not required. Besides, while all firms are subject to screening when they demand a BL, all applicants to money lenders are successful. This gives the incentives for discouraged borrowers of BL to rely on informal sources.

Hence, we hypothesize:

Hypothesis 4: Bank-constrained SMEs use more informal finance.

¹² The definition of informal finance in our study, which are mainly provided by money lenders, is different from the one of Casey and O'Toole (2014) that also include inter-company loans.

4.2.5 Sources from Family and Friends

Sources from family members and friends are different from other financing sources to the extent that those sources are not expensive because of close relationship between the borrower and the lender¹³. Lee and Persson (2013) argue that family and friends are often willing to supply funds at negative returns, and yet many borrowers prefer other financing forms and consider family and friends only as a last resort. Their model explains this paradox with a theory based on altruistic ties between the entrepreneur and his family and friends, which reduce agency problems in financing but also increase the entrepreneur's aversion to failure, thus discourage the entrepreneur's willingness to take risks, consequently constrain growth. This makes financing from family and friends unattractive. Their model can provide an explanation for a low use of this financing, particularly by large firms, as shown in Robb and Robinson (2014). On the other hand, Allen et al. (2005; 2012) show that private held firms in China and India rely more on alternative financing channels such as funds from family and friends than on bank and market finance. This is mostly because like other alternative financing forms, sources from family and friends are relationship-based, thus associated with monitoring advantage and better in resolving informational asymmetry problems. Taken together, these arguments lead to the hypothesis that sources from family and friends rank below BL in the financing preferences of the firm. Hence, we hypothesize:

Hypothesis 5: Bank-constrained SMEs use more sources from family and friends.

4.2.6 Equity

The link between debt and equity has been traditionally investigated in alternative theories of capital structures. The static trade off theory that stems from Modigliani and Miller (1963) who postulate that there are optimal capital structures by trading off the benefits and cost of debt and equity. On the other hand, according to the pecking order theory (Myers and Majluf, 1984), due to information asymmetry between managers and investors, firms raise capital according to the following preference order: internal finance then debt, and finally equity. Therefore, firms with higher level of information asymmetry should issue debt to avoid selling under-priced shares. This is particular to SMEs that are often opaque firms. Therefore, SMEs are often reluctant to raise equity capital due to high cost of equity issuance. In another study, Leary (2009) examines the effect of bank funding constraints on firms' financial structures and find that finds that bank-dependent firms shift towards equity when bank debt is scarce. Moreover, in order to maintain the control of the company, the SMEs' managers may prefer debt to equity (Psillaki and Daskalakis, 2009), thus it could be that those firms only issue equity when they do not have any other choice.

¹³ As noted by Beck et al. (2008), whether this financing form qualifies as internal or external sources, as debt or equity might be controversial. However, like Beck et al. (2008), we are interested in sources rather than security types in this study.

While much of the research has focused on the use of equity by larger firms, little is known about SMEs. We therefore frame BL and equity into the pecking order theory and test whether bank-constrained SMEs increase their use of equity. Hence, we hypothesize:

Hypothesis 6: Bank-constrained SMEs issue more equity.

4.3 Data and Methodological Approach

4.3.1 Data

The data used for this study are compiled from the two cross-sectional Enterprise Surveys led by World Bank (WBES), BEEPS and ICS, in 40 developed and developing countries in 2005. One of the important strengths of the survey is its wide coverage of SMEs that represent approximately 90% of the observations. Another advantage of the WBES data is to provide information on the last loan application of the surveyed firms and on sources of financing that are often associated with small business such as leasing, TC, and informal sources.

Since we focus on the relationship between BL and alternative financing sources by SMEs, we exclude large firms from the sample. SMEs are defined as those having less than 250 permanent employees and consist of 15,322 firms in 40 countries in the original dataset. Micro enterprises (1-9 employees) comprise 39% of all SMEs, another 37% are from small firms (10-49 employees) and the remaining 24% are from medium firms. The information on BL applications and constraints are available for 14721 SMEs.

Another advantage of our data set is to allow us to distinguish between financing of working capital (WC) and new investments in fixed assets (NI), thus allow looking at differences in short-term and long-term financing. The number of SMEs reporting the use of the alternative financing sources varies depending on the financing source and purpose: from 14742 to 14866 firms for WC, and from 10623 to 10743 for NI.

4.3.2 Empirical Model, Variables and Identification Strategy

In general, we model the effects of BL constraints on the usage of an alternative source for firm i , in country j as:

$$\text{Alternative source}_{ij} = \beta_0 + \theta (BLC)_{ij} + \mu X_{ij} + \lambda Z_j + \kappa_j + \varepsilon_i$$

where *Alternative source* is the dependent variable, which is measured by the fraction of the assets side of WC or NI financed by using an alternative source; BLC_{ij} is our variable of interest and indicates measures of BL constraints; X_{ij} is a vector of firm-level controls; and Z_j is a vector of country controls. We also include country fixed effects κ_j in the error term. Our hypotheses concern the coefficient θ . Our a priori expectations would suggest a positive coefficient on the measures of BL constraints ($\theta > 0$).

The dependent variables are constructed from answers to the following question: “Please identify the contribution over the last year of each of the following sources of financing for

your establishment: i) WC (i.e. inventories, accounts receivable and cash); NI (i.e. new land, buildings, machinery and equipment). The sources are internal financial sources such as retained earnings and external financial sources such as equity, local commercial banks, foreign banks, TC, credit cards, leasing arrangements, development finance, funds from family and friends, informal sources such as money lenders, and other sources. These proportions add up to 100%. Since leasing arrangement is typically used to finance NI, we do not investigate this financing for WC¹⁴.

We investigate the effects of BL constraints on the use of six financing sources including TC, leasing, credit cards, informal finance, sources from family and friends, and equity. Since development finance including Investment Funds, Special Development Financing or Other State Services is a special financing form and often granted to privileged enterprises, we exclude this from the list of potential substitutes for BL. We also do not investigate "other sources" because these are a mixture of different financing forms.

The next step is to identify bank-constrained firms and construct measure of BL constraints. We create a series of dummy variables to represent BL constraints based on BL information of the surveyed firms. *DENY* equals one if the firm's last application on BL was denied; *PENDING* equals one if the firm's loan application is still pending, and zero otherwise.

To represent four categories of discouraged firms, we create four dummy variables taking the value of one if the firm did not apply for a BL because of the following reasons respectively: applications procedures for BL are too burdensome (*BDS*); collateral requirements are too strict (*COLLA*), expected denial (*EXPDENY*) and high interest rates (*IR*); and zero otherwise¹⁵.

Unfortunately, we do not have detailed information reporting whether firms need borrow more from banks. In an effort to distinguish constrained firms from unconstrained firms among those having a BL, we use the firm's perceived constraints on its finance access. In the survey, the firms were asked to evaluate their finance access as No, Minor, Moderate, Major or Very severe obstacle to their growth and operations. We construct a binary variable, *LOANOBS*, which equals one if the firm has a BL but reports finance access as an obstacle for its growth, and zero otherwise.

In X_{ij} , we control for several firm characteristics. To capture firm size effect, we introduce two dummy variables, *Small* and *Micro* that equal one if the firm is micro-sized (9 employees or less), small-sized (11-49 employees), respectively, and zero otherwise. The group of medium firms is used as the reference category in the analysis. *Age* is measured by the logarithm of firm age plus one and the square of this value (*Age squared*) to control for the potential non-linear effect (Petersen and Rajan, 1997). The ability to generate internal funds

¹⁴TC may be used to finance both WC and NI. As noted by Fisman and Love (2003), TC may also be loaded up on and rolled over to finance investments for constrained firms with no other source funds. We therefore investigate TC for both financing purposes in this chapter.

¹⁵Because there are only 30 SMEs that report corruption (required informal payment) or necessary contacts with banks as the reason of their discouragement, we exclude those firms from our sample.

is also expected to affect the use of the external financing sources (Petersen and Rajan 1997); we therefore include the share of net profits that were re-invested, *Internal funds*, to control for internal financing.

We define technology investment as a sign of growth. We use therefore the dummy variable, *Technology*, that takes a value of one if the firm has acquired new production technology over the last 36 months, and zero otherwise. We also control for ownership type, *Foreign*, and legal status, *SOE*, which are dummy variable taking a value of one if the firm is foreign-owned and State-Owned Enterprise, respectively, and zero otherwise. In addition, we include the dummy variables that represent the firm's activity sector (Construction, Manufacturing, Services, and Others). All data refer to 2004.

Several studies show a significant link between country characteristics and financing patterns (Beck et al., 2008; Booth et al., 2001; Demirgüç-Kunt and Maksimovic, 1998; Fisman and Love, 2003; Psillaki and Daskalakis, 2009; Rajan and Zingales, 1995). We therefore control for country-level indicators in the vector Z_j . Those indicators include the annual growth rate of Gross Domestic Product in constant 2005 US dollars (*GDP Growth*), the inflation rate as measured by the consumer price index (*Inflation*), and the percentage of domestic credit to private sector to GDP (*Private Credit*). In addition, we also control for legal protection efficiency by including *Rule of Law*, an indicator measured by World Bank. *Rule of Law* captures perceptions of the extent to which agents have confidence in and abide by the rules of society. All these indicators are from World Development Indicators (WDI) and computed as 2000-2004 averages. We also construct a series of dummy variables to reflect four levels of the country's income classified in WBES: *High*, *Upper-middle*, *Lower-middle* and *Low*. The group of Low-income is used as the reference category in the analysis. Detailed variable definitions and sources are given in Appendix 4.1.

Deletion of missing values for the firm-level variables yields a sample of 11585 SMEs for WC and 8459 SMEs for NI (except credit cards with 8179 SMEs) in 39 countries. Since country-level indicators are available for only 37 countries (not available for Bosnia and Herzegovina and Uzbekistan), in the second analysis controlling for those indicators, our sample becomes smaller with 11209 SMEs for WC, and 8300 SMEs for NI (8024 SMEs for credit cards).

Table 4.2 shows the distribution of the responses across countries regarding BL constraints and the use of the alternative financing sources.

[Insert Table 4.2 here]

As shown in Table 4.2, the highest proportion of bank-constrained SMEs is in Vietnam at 69.24%. By contrast, Greece has the lowest proportion of bank-constrained SMEs at 26.46%. Looking at the types of BL constraints, Vietnam has the highest proportion of SMEs that have a BL but report access to finance as an obstacle to their growth at 50.39%. SMEs in Malawi are denied BL the most frequently at 9.2%, whereas the highest proportion of

discouraged SMEs is in Madagascar at 34.78%. On the other hand, Armenia has the highest rate of pending applications at 4.08%.

We further find that on average, SMEs in Vietnam and Latvia are the largest users of the six alternative financing sources at over 40% of WC and 30% of NI. By contrast, SMEs in Uzbekistan use the least the alternative financing sources at 1.22% of WC and 0.17% of NI.

Descriptive statistics are presented in Table 4.3.

[Insert Table 4.3 here]

As can be seen in Table 4.3, equity and TC appear to be the most important alternative sources to fund WC by the firms in our sample with mean values of 6.5% and 6.4%, respectively. On the other hand, SMEs finance on average 0.5%, 0.66%, and 3.06% of their WC by using credit cards, informal finance, sources from family and friends, respectively. Regarding NI, leasing is the second most important financing sources (4.88%) after equity (6.72%) in comparison with 2.40%, 0.29%, 0.54% and 2.89% by TC, credit cards, informal finance and sources from family and friends, respectively. The latter is the third most important source for both WC and NI.

Table 4.3 also reports descriptive statistics on our measures of bank financing constraints. According to our measures of BL constraint, 2.7% of the SMEs are denied on their last loan application; 1% are from those with pending applications; 14.1% are from discouraged ones and 31.6% are partly constrained ones that have a BL but report finance access as an obstacle. This relatively low rate of denial can be explained by a large proportion of firms that choose not to apply because of a constraint, which is five times greater (14.1% versus 2.79%). Burdensome procedures are the most important reason for which firms did not request a BL with 6% of the observations, another 3.6%, 0.8% and 3.7% are from discouraged firms because of strict collateral requirement, expected denial and high interest rates, respectively. The omitted category is from SMEs without need for BL, and those having BL and reporting no obstacle on finance access.

As the observations of the dependent variables are censored by 0 and 100, we use Tobit regressions with error terms clustered at the country level, i.e. we allow that error terms across firms within a country are correlated to take into account possible unobserved country-level effects.

We run regressions separately for two financing purposes, i.e. WC and NI, in order to look at the potential differences between them. We exclude discouraged SMEs because of high interest rates from the regressions for credit cards to finance NI because the dependent variable is always zero for this group of discouraged firms.

Table 4.4 provide Pearson correlation coefficients for the bank constraints, firm and country-level variables.

[Insert Table 4.4 here]

4.4 Empirical Results

4.4.1 The Effects of BL Constraints on the Use of the Alternative Financing Sources

The empirical results on the use of six alternative financing sources by bank-constrained SMEs to finance WC and NI are reported in Table 4.5. Models 1 and 2 present the results for TC use, Model 3 for leasing, Models 4 and 5 for credit cards, Models 6 and 7 for informal sources, Models 8 and 9 for sources from family and friends, and Models 10 and 11 for equity.

[Insert Table 4.5 here]

Trade Credit

According to Models 1 and 2, discouraged SMEs because of burdensome procedures and partly constrained firms increase their use of TC for both financing purposes at 1%. The marginal effects of BDS and LOANOBS are 2.17% and 3.5% for WC compared to the mean of 6.4 percent; 1.45% and 1.67% for NI compared to the mean of 2.4 percent, respectively¹⁶. On the other hand, denied SMEs rely more on TC only for WC ($p < 0.05$). The marginal effects suggest that those firms increase their use of TC by 1.74 percent, twice smaller than the marginal effect of partly constrained firms. By contrast, actually denied SMEs do not increase significantly TC utilization for NI. We do not find a significant coefficient on PENDING, COLLA, EXPDENY. The coefficients on IR are negative and not statistically significant. These findings provide some support for Hypothesis 1.

Leasing Finance

The results in Model 3 show a relatively limited substitution effect between BL and leasing. DENY is positively but not significantly related to the use of lease finance whilst the coefficient on LOANOBS is positive and strongly significant at 1% with a marginal effect of 2.97% compared to the mean of 4.88%. By contrast, SMEs with pending applications and discouraged ones because of high interest rates decrease their use of leasing at 10% and 1% with marginal effects of 4.27% and 4.88%, respectively. Across categories of discouraged firms, the coefficients on BDS, COLLA, EXPDENY are all negative but not statistically significant. Hence, our results also provide some support for Hypothesis 2.

Credit Cards

As shown in Models 4 and 5, as expected, partly constrained SMEs increase their use of credit cards to finance both WC and NI at 1% and 10% with a larger marginal effect for the former (0.46% compared to the mean of 0.5% versus 0.11% compared to the mean of

¹⁶The marginal effects are calculated by multiplying the tobit coefficient by the percentage of the sample that is uncensored reported at the bottom of the table.

0.29%). In addition, we again find that compared to other categories of discouragement, discouraged SMEs because of burdensome procedures are more likely to increase the use of an alternative source with positive coefficients on BDS in both models ($p = 0.126$ for WC and $p < 0.01$ for NI). We do not find any significant coefficient for the other constrained firms. These results provide some evidence in support of research for Hypothesis 3.

Informal Finance

As reported in Models 6 and 7, we observe a significant substitution effect between BL and informal sources in case of bank denial and partly constraints for both financing purposes ($p < 0.01$ or $p < 0.05$). The marginal effects suggest that denied SMEs increase their use of informal finance by 0.66 percent (compared to the mean of 0.66 percent) and 0.58 percent (compared to the mean of 0.54 percent) for WC and NI, respectively. The marginal effects for partly constrained firms are 0.53% and 0.44%, respectively. Besides, those with pending applications rely on this financing only to finance WC at 5% with a marginal effect of 0.73%. In addition, discouraged SMEs because of burdensome loan procedures rely more on informal sources for both WC and NI at 5% and those because of strict collateral conditions use more this financing for WC at 10%. The coefficients on the other constrained firms are not statistically significant. These findings provide a significant support for Hypothesis 4.

Sources from Family and Friends

As can be seen in Models 8 and 9, compared to the other financing forms, SMEs rely more heavily on sources from family and friends when they are constrained on BL. We observe a significant substitution effect in every category of bank constraints except for discouraged SMEs because of expected denial. The effects of BL constraints on the use of this funding source are quite similar for WC and NI. All the coefficients are positive and significant at 1%. Denied SMEs are the largest users of this financing for both WC and NI with marginal effects of 3.6% (compared to the mean of 3.06%) and 2.97% (compared to the mean of 2.9%), respectively. Although partly constrained SMEs also use significantly more this source, the marginal effects are lower than other constraint categories including actual denial with 1.53% and 1.27% for WC and NI, respectively. Besides, discouraged firms due to high interest rates significantly increase their reliance on sources from family and friends and are the second largest users of this financing form with marginal effects of 2.94% and 2.76% for WC and NI, respectively. In general, these results highlight a strong support for Hypothesis 5.

Equity

Models 10 and 11 suggest that constrained SMEs are likely to increase their use of equity in case of pending applications at 5% for both WC and NI, with marginal effects of 3.33% (compared to the mean of 6.52%) and 3.23% (compared to the mean of 6.72%), respectively. We find a positive and significant coefficient on LOANOBS at 1% only for WC with a marginal effect of 1.95 percent. Additionally, actual bank denial is positively but weakly related to the use of equity. In contrast, we find a negative coefficient on COLLA in Model 10 for WC but only at 10%. This may imply that the access to equity financing is also

difficult to SMEs that have no valuable assets to provide as collateral to banks. In general, discouraged SMEs are not likely to increase their use of equity. These results generally provide some evidence in support of research for Hypothesis 6.

4.4.2 Control Variables at the Firm Level

Table 4.5 also shows the effects of firm characteristics on the use of the alternative financing sources.

Size and Age

While both small and micro firms use less TC for WC ($p < 0.01$), only micro firms use less TC for NI ($p < 0.01$) and less equity for WC ($p < 0.1$). In contrast, small firms borrow more on credit cards for WC ($p < 0.05$). Besides, both small and micro firms rely more on sources from family and friends for both WC and NI ($p < 0.1$). This finding implies that larger firms have easier access to TC and equity and thus smaller firms have to rely on sources from family and friends. Besides, the latter also increase their use of credit cards; however, it is likely that very small firms such as micro firms cannot obtain credit through this financing form. We do not find any significant difference across size for the use of leasing and informal sources.

On the other hand, the results indicate a significant and non-monotonic relationship between firm age and the use of leasing, equity and sources from family and friends for NI. The use of leasing may first increase with firm age ($p < 0.01$) and decrease for oldest SMEs ($p < 0.1$). In contrast, the use of the other sources first decreases with firm age and eventually rises later. Besides, older firms are likely to rely less on family and friends to finance WC at 5%.

Other firm characteristics

Our results suggest that internal funds and technology development have a negative effect on the use credit cards and equity for NI. The results also indicate that foreign-owned companies use significantly more TC for WC, less credit cards for NI, sources from family and friends and equity for both financing purposes. Legal status is not significantly related to the use of equity and informal sources whereas it appears to affect negatively the other five financing sources. That is, State-Owned Enterprises use significantly less alternative financing compared to private held companies, mostly because they have easier access to finance including government special funds (Beck et al., 2008). Last, SMEs in Construction sector use more TC for WC, leasing for NI whilst those in manufacturing sector use more sources from family and friends for both WC and NI, and less leasing and TC for NI.

4.4.3 Control Variables at the Country Level

The models in Table 4.6 add country-level variables. As can be seen in Models 1-11, our main results on the link between BL constraints and the alternative sources generally remain consistent with those obtained in Table 4.5. In addition, our results suggest a significant link between country-level indicators and the use of alternative financing by SMEs.

[Insert Table 4.6 here]

GDP Growth and Inflation

Our results suggest that in countries with higher GDP growth, SMEs use significantly more informal finance for both financing sources ($p < 0.05$ for WC and $p < 0.01$ for NI) and sources from family and friends to finance NI ($p < 0.05$). Inflation is positively and significantly related to the use of leasing at 1% and sources from family and friends for NI at 10%.

Financial Development and Legal Protection

Higher level of private credit increases the use of equity by SMEs for WC at 10% and for NI marginally at 10%. On the other hand, the effect of legal protection seems to be larger. The use of leasing and credit cards for NI increases with Rule of Law at 1% and 10%, respectively, whereas better legal protection decreases the use of informal finance for WC at 5%. By contrast, the reliance on sources from family and friends is significantly higher in countries with higher rule of law at 5% for WC and 1% for NI. This can be explained by the fact that while informal finance provided by money lenders is an illegal financing form in many countries and therefore in countries with higher quality of legal system, sources from family and relatives seem to be preferred to those from money lenders. It should be noted that there is a high correlation between rule of law and private credit as can be seen in Table 4.4.

Income

In countries with lower-middle and upper-middle income, SMEs use significantly more leasing ($p < 0.05$) whereas the use of credit cards for WC is significantly higher only in upper-middle countries ($p < 0.05$). By contrast, informal finance, sources from family and friends, and equity are shown to be more prevalent in low-income countries.

Overall, country-level variables have limited impact on the use of TC.

4.4.4 Sensitivity Test with Two Sub-samples of Applying and Non-Applying Firms

In an additional test, we distinguish two groups of bank-constrained firms: a) constrained firms that applied for a BL, i.e. denied firms, partly constrained firms and those with pending applications; b) constrained firms that did not apply for a BL, i.e. discouraged firms. Then we run separate regressions for two sub-samples of firms: firms that applied for a BL (Applying firms) and those that did not apply for a BL (Non-applying firms). The reference group in the former is from firms that have a BL and report no obstacle on access to finance. The reference group in the latter is from firms that did not apply for a BL because they do not need loans. The results are reported in Table 4.7.

[Insert Table 4.7 here]

Models 1-4 report the results for TC. We observe that the substitution effect holds for BDS and LOANOBS. By contrast, the coefficient on DENY is no longer statistically significant.

Besides, discouraged SMEs because of strict collateral requirements tend to use more TC for WC ($p < 0.1$).

Models 5 and 6 report the results for Leasing Finance. The coefficient on PENDING remains negative and significant. However, the coefficients on LOANOBS and IR are no longer significant. By contrast, the coefficient on BDS becomes significant at 10%, suggesting that discouraged firms because of burdensome loan procedures use more leasing to finance NI.

Models 7-10 report the results for Credit Cards. We find that the substitution effect holds for BDS. LOANOBS remains positive and significant for WC in Model 7 but becomes insignificant for NI in Model 9. Besides, we find that discouraged firms because of expected denial use significantly more credit cards to finance WC at 5%.

Models 11-14 report the results for Informal Finance. We find that the positive effects of LOANOBS, BDS and COLLA remain consistent. The positive effect of DENY remains consistent but becomes statistically weaker. The coefficient on PENDING also becomes statistically weaker in Model 11 for WC.

Models 15-18 report the results for Sources from Family and Friends. We find that the results remain consistent.

Models 19-22 report the results for Equity. We find that the coefficients on PENDING remain positive and significant. The coefficient on LOANOBS remains positive but becomes weakly significant. The results in Model 20 further suggest that discouraged firms because of burdensome loan procedures use significantly more equity to finance WC at 5%.

4.5 Discussion and Conclusion

This chapter has investigated the effects of BL constraints on the use of alternative financing by using a firm-level survey database in 39 developed and developing countries compiled by World Bank. We investigate the use of six alternative financing sources by SMEs, i.e. TC, leasing, credit cards, informal finance, sources from family and friends, and equity. In general, our results suggest that bank-constrained firms rely more on those sources, thus supporting a substitution effect. However, the effect of BL constraints varies across financing forms; across categories of constrained firms, e.g., denied firms versus discouraged firms; and across financing purposes, i.e. WC versus NI. Specifically, our general results suggest a stronger substitution effect for sources from family and friends compared to other alternative sources, for WC compared to NI, for partly constrained SMEs compared to other categories of bank constraints, for discouraged firms because of burdensome loan procedures compared to other categories of discouraged borrowing. Particularly, partly constrained firms also use more alternative financing, most likely because they have not obtained sufficient financing from banks.

Our results are consistent with Beck et al. (2008) to the extent that SMEs are more likely to rely on informal sources such as those from money lenders or from their family and relatives

whereas TC, leasing and equity compensate at a lower degree for their limited access to bank borrowings. Specifically, we find that partly constrained SMEs have a higher level of TC than actual denied counterparts. This finding points out the limited role of TC in easing financing constraints of SMEs. One possible theoretical explanation comes from Biais and Gollier (1997) who suggest an informational role of TC to banks and Burkart and Ellingsen (2004) who suggest a complementary effect for firms with low wealth level by arguing that “the only thing worse than having to increase TC borrowing is to be unable to do so”. Our finding is also in line with the empirical study of Nilsen (2002) who demonstrate that unrated large firms rely more on TC than unrated small firms do when bank channel is difficult to access. Like unrated large firms, our results imply that partly constrained firms can borrow more easily from their suppliers.

The same rationale may also explain our finding on the positive impact of partly constraint on leasing. In addition, firms with pending applications are likely to decrease the reliance on this funding, mostly because leasing arrangements are often associated with a contract of an irrevocable period, thus firms are less likely to use leasing finance during the time waiting for the bank's decision. Likewise, borrowings on credit cards seem to be available for partly constrained firms mostly because they have existing relationships with financial institutions, and limited for those facing more severe bank constraints such as bank refusals likely because an actually denied firm would not be able to obtain financing through credit card channel either. Besides, in line with Casey and O’Toole (2014), our results reveal that the effect of bank constraints on the use of equity is somehow limited. This financing form appears to be used the most by those having pending applications, which represent a very small fraction of all constrained firms. Taken together, our managerial implication is that SMEs should build relationships with banks to have an easier access to bank credit.

On the other hand, constrained SMEs rely heavily on informal sources or those from their family and relatives that are often more expensive or less desired compared to the other funding forms. Our results indeed show that these two financing forms, especially the latter, are used largely by a broad range of constrained SMEs including denied firms. Unlike other alternative sources, our results show a lower substitution effect for partly constrained firms for sources from their family and relatives. Clearly, those sources are more commonly used when SMEs face severe credit constraints.

Our study extends the paper of Beck et al. (2008) by providing a close look and a direct investigation on the compensation degree of the alternative sources for the low use of bank credit of small businesses. However, while Beck et al. (2008) suggest that TC, leasing and equity do not compensate for the limited access to BL of small firms, our results, by using a direct measure of BL constraints, indicate that such sources do allow SMEs to ease their financial difficulties at a certain level.

Furthermore, in this study we distinguish two financing purposes, i.e. WC and NI. The studies on the differences in the financing purposes are rare in the literature related to external financing sources, thus our study takes a first step in providing evidence on how

bank-constrained firms rely on the other sources to finance short-term assets such as inventories and long-term assets such as buildings. In general, we find a stronger substitution effect for WC requirement financing and over a broader range of constrained firms compared to NI financing. It is likely that the alternative sources are expensive, limited in the volume and short-term oriented, thus making it easier for constrained SMEs to rely on those sources to fund short-term assets. This is particularly true for TC that is often used to finance WC (Casey and O'Toole, 2014; Petersen and Rajan, 1997). A higher use of credit cards and informal sources to fund WC rather than NI may be explained by the cost of these sources, whereas sources from family and friends seem to be limited in amount to finance long-term assets. Regarding the use of equity, one possible explanation may come from the cost of this financing to SMEs due to high level of opaqueness that may induce investors to undervalue stocks issued (Myers and Majluf, 1984). Alternatively, SMEs are often managed by very few managers whose main objective is to avoid losing decision-making power, thus they choose not to issue equity (Psillaki and Daskalakis, 2009). These reasons may explain the low reliance on equity by SMEs in both financing purposes, especially NI that often require a larger amount of funding.

Particularly, Vermoesen et al. (2013) highlight the role of long-term debt maturity in the financing of SMEs and demonstrate that the negative effects of the Global Financial Crisis (2008) seriously reduce their access to bank finance in the form of long-term debt and thus cause a large drop in NI. While BL to SMEs are often short-term oriented and bank constraints may severely restrict their ability to finance value-creating investments, alternative financing seems to do little to limit reductions in investment. As above-mentioned, we find a heavy reliance on informal finance and sources from family and relatives by bank-constrained SMEs. However, these financing sources are often associated with higher interest rates or inefficiency of the investments, limited supply and higher level of informality, i.e. hiding revenues for tax evasion purpose (Dabla-Norris and Koeda, 2008). Our results further suggest that better legal protection and financial development (importance of private credit) facilitate the use of leasing and equity and reduce the reliance on informal finance of SMEs. We also find that firm characteristics are significant determinants of the use of alternative financing. Particularly, larger firms have a higher use of TC, leasing and equity and rely less on informal sources. Therefore, our policy implication is that the governments should focus on the development of financial intermediaries, the improvement of legal systems as well as the development of special financing channels such as government grants or subsidized loans to support the access of SMEs to external financing sources, especially for NI.

Across categories of discouraged borrowing, burdensome loan procedures appear to be the most important reason for firms' increased usage of alternative financing. Our explanation is that compared to other discouraged firms, bank constraints are less severe to those firms. That is, they are able choose to apply for BL or to rely on alternative financing that is available to them. By contrast, it is likely that alternative financing is not always available to SMEs that did not request a BL because they did not have valuable assets for collateral provision or they judged themselves as "bad borrowers", thus predicted a bank refusal. Besides, it is not surprising that discouraged SMEs because of high bank rates do not increase alternative

financing. That is, firms that are not willing to borrow from banks because of high cost would not choose to finance their investments through a more expensive source. Our findings are in line with Casey and O'Toole (2014) who find no significant link between self-rationing because of high cost and the use of TC. In contrast, discouraged firms because of high bank rates increase significantly the use of sources from family and friends, which confirms the nature of a cheap financing that this alternative channel represents.

Overall, our results indicate that bank credit constraints for SMEs are more widespread than previously believed if not only denied firms but also discouraged firms and even partly constrained firms are taken into account. However, alternative financing channels cannot fully compensate the low use of bank finance of SMEs; hence, the development of institutions should be central consideration in the policymaking process.

Besides, burdensome lending procedures seem to be the most important reason of discouraged borrowing, which induces many SMEs to bypass investment opportunities or to borrow from an alternative source more expensive or less desired. Hence, policymakers and financial institutions, especially in transition economies, should put more effort into improving the lending procedures in order to encourage SMEs to apply for bank credit.

This study addresses cross-country data in both developed and developing countries. It might be interesting to look at the differences between these two groups of countries. Because informal financing may be more prevalent in developing countries (Ayyagari et al., 2010; Lainez, 2014) whereas leasing may be used more in developed countries (Beck et al., 2008). Besides, further research should develop better proxies for bank constraints, especially for partly constrained firms, since there is a potential endogeneity between the usage of alternative financing sources and the likelihood of a firm reporting access to finance as an obstacle to their growth.

Appendix 4.1: Variable Definitions and Sources

This appendix provides the detailed definitions and sources of all the variables used in our analyses. Data have been collected from World Bank Enterprise Survey (WBES) in 2005 and World Development Indicators (WDI).

Variable name	Definition	Source
<i>Dependent variables</i>		
WC-TC, WC-Credit cards, WC-Informal, WC-Family, WC-Equity	The fraction of the assets side of WC financed by using TC, credit cards, informal finance, sources from family and friends, and equity, respectively	WBES
NI-Leasing, NI-TC, NI- Credit cards, NI- Informal, NI-Family, NI-Equity	The fraction of NI financed by using leasing, TC, credit cards, informal finance, sources from family and friends, and equity, respectively.	WBES
<i>Variables of interest</i>		
DENY (0,1)	A binary variable that equals 1 if a firm's last application on BL was denied, and zero otherwise.	WBES
PENDING (0,1)	A binary variable that equals 1 if a firm's loan application is still pending, and zero otherwise	WBES
Discouraged (0,1)	A vector of binary variables, <i>BDS</i> , <i>COLLA</i> , <i>IR</i> and <i>EXPDENY</i> , that equal 1 if a firm did not apply for a BL because of burdensome loan procedures, strict collateral requirements, high interest rates and expected denial, respectively, and zero otherwise	WBES
LOANOBS (0,1)	A binary variable that equals 1 if a firm has a BL and reports access to finance as an obstacle, and zero otherwise	WBES
<i>Control variables</i>		
Size (0,1)	A vector of binary variables, <i>Medium</i> , <i>Small</i> , and <i>Micro</i> that equal 1 if a firm is medium-sized (50-249 permanent employees), small-sized (10-49 permanent employees), and micro-sized (<10 permanent employees), respectively, and zero otherwise	WBES
Age	The natural logarithm of age plus one where age is the number of years since the founding year of the firm	WBES
Age squared	The square of Age	WBES

Appendix 4.1 (continued): Variable Definitions and Sources

Variable name	Definition	Source
<i>Control variables (continued)</i>		
Internal funds	The share of net profits that were re-invested	WBES
Technology (0,1)	A binary variable that equals 1 if a firm has acquired new production technology over the last 36 months, and zero otherwise	WBES
Foreign (0,1)	A binary variable that equals 1 if a firm the firm is foreign-owned, and zero otherwise	WBES
SOE (0,1)	A binary variable that equals 1 if a firm is a State-Owned Enterprise, and zero otherwise	WBES
Sector (0,1)	A vector of binary variables, <i>Construction</i> , <i>Manufacturing</i> and <i>Others</i> , that equal 1 if a firm belongs to Construction, Manufacturing or Others sector, respectively, and zero otherwise	WBES
GDP Growth	The annual growth rate of Gross Domestic Product (GDP) in constant 2005 US dollars, 2000-2004 averages	WDI
Inflation	The inflation rate as measured by the consumer price index reflecting the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services, 2000-2004 averages	WDI
Private Credit	The percentage of domestic credit to private sector to GDP, 2000-2004 averages	WDI
Rule of Law	Rule of Law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts. This is the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5 with greater values indicating a greater level of legal protection, 2000-2004 averages	WDI
Income (0,1)	A vector of binary variables, <i>High</i> , <i>Upper-middle</i> , <i>Lower-middle</i> and <i>Low</i> , that equal 1 if the firm operates in the country with high, upper-middle, lower-middle or low level of income, respectively, and zero otherwise	WBES

4.6 References of Chapter 4

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4.7 Tables of Chapter 4

Table 4.1: Comparison of Financing Sources

This table provides the comparison of seven financing sources, i.e., Bank Loan, Trade Credit, Leasing, Credit Cards, Informal Finance, Sources from family and friends, and Equity, in terms of nine features: 1) associated informational asymmetry problem, 2) associated adverse selection problem, 3) associated moral hazard problem, 4) lender's monitoring advantage, 5) application costs incurred, 6) collateral requirements, 7) interest rates, 8) screening mechanism to distinguish bad and good borrowers, and 9) flexibility/timing in obtaining funds. This comparison draws on the literature linking bank constraints to firm's use of alternative sources.

	Feature	Bank loan	Trade credit	Leasing	Credit cards	Informal	Family and friends	Equity
1	Information asymmetry	High	Low	High	Medium	Low	Low	High
2	Adverse selection	High	Low	High	High	Low	Low	High
3	Moral hazard	High	Low	Low	Medium	Low	Low	High
4	Monitoring advantage	Low	High	High	Medium	High	High	High
5	Application costs	Yes	No	Yes	Yes	No	No	No
6	Collateral	Yes/No	No	No	Yes/No	Yes/No	No	No
7	Interest rate	Low/High	High/Low	High	High	High	Low	High
8	Screening	Yes	Yes	Yes	Yes	No	No	Yes
9	Flexibility/Timing	Low	High	Low	High	High	High	Medium

Table 4.2: BL Constraints and the Use of the Alternative Financing Sources by SMEs across Countries

This table provides the proportions of bank-constrained firms in each country and the country means for the use of the alternative financing sources. Data have been collected from World Bank Enterprise Survey (WBES) in 2005. *DENY* refers to the firms whose last loan application was turned down. *PENDING* refers to the firms whose loan application is pending. *DISC* refers to the firms that needed loans but did not apply for a BL. *LOANOBS* refers to the firms that have a BL but report access to finance as an obstacle to their growth. *BLC* is the sum of *DENY*, *PENDING*, *DISC* and *LOANOBS*. *Alternative sources* are the total fraction of the assets side of working capital (WC) or new investments (NI) are financed externally by TC, Leasing, Credit cards, Informal finance, Sources from family and friends and equity, computed as country means, where leasing is used for new investments only. Statistics are calculated on estimation sample so as to provide contest for results on WC financing by using TC with 11,585 firms in 39 countries. Figures are given in percentage.

	Country	Obs.	BL constraints					Alternative sources	
			BLC	DENY	DISC	PENDING	LOANOBS	WC	NI
	Total	11,585	49.70	2.47	14.04	0.96	32.23	15.93	16.78
1	Albania	157	56.96	2.53	11.39	1.27	41.77	3.74	3.71
2	Armenia	317	65.20	1.25	20.38	4.08	39.50	9.26	10.8
3	Azerbaija	239	43.95	3.23	33.06	1.61	6.05	6.77	5.27
4	Belarus	199	43.95	3.02	30.15	0.50	29.65	14.97	18.92
5	BiH	133	57.14	0.75	8.27	0.75	47.37	7.22	4.94
6	Bulgaria	187	40.64	2.14	13.90	0.53	24.06	18.67	12.77
7	Costa Rica	252	56.75	5.16	22.62	1.19	27.78	21.25	14.43
8	Croatia	177	51.41	2.26	6.78	1.69	40.68	13.77	13.9
9	Czech	262	46.18	4.58	15.27	0	26.34	21.80	27.18
10	Dominican	13	46.15	0	0	0	46.15	29.46	17
11	Estonia	145	26.90	2.07	6.21	0	18.62	18.62	21.99
12	FYROM	140	49.29	0.71	27.86	1.43	19.29	9.5	10.25
13	Georgia	155	41.29	3.87	11.61	1.29	24.52	3.39	2.41
14	Germany	876	50.11	3.08	4.22	1.37	41.44	23.52	25.79
15	Greece	445	26.46	0.45	4.04	0.45	21.52	16.19	12
16	Hungary	452	56.42	1.55	15.93	0.66	38.27	25.03	26
17	Ireland	401	29.68	1.00	0.75	0.25	27.68	11.49	19.19
18	Kazakhstan	449	50.00	3.11	22.00	0.67	24.22	5.26	4.40

Table 4.2 (continued): BL Constraints and the Use of the Alternative Financing Sources by SMEs across Countries

Country		Obs.	BL constraints					Alternative sources	
			BLC	DENY	DISC	PENDING	LOANOBS	WC	NI
19	Kyrgyzstan	135	56.30	4.44	21.48	0	30.37	8.92	6.28
20	Latvia	114	30.70	4.39	7.89	0	18.42	46.18	31.07
21	Lithuania	136	41.18	0.74	11.76	2.21	26.47	17.26	25.61
22	Madagascar	159	62.73	8.70	34.78	3.11	16.15	11.16	9.15
23	Malawi	87	60.92	9.20	27.59	1.15	22.99	10.25	11.22
24	Mauritius	88	60.23	4.55	6.82	1.14	47.73	5.86	14.80
25	Moldova	157	56.05	2.55	11.46	1.27	40.76	16.70	10.68
26	Poland	791	57.02	2.40	21.62	0.76	32.24	8.19	8.52
27	Portugal	327	32.93	0.91	8.54	0.30	23.17	6.68	11.07
28	Romania	443	53.27	4.29	12.64	1.35	34.99	12.75	11.29
29	Russia	416	47.72	2.40	23.26	0.24	21.82	11.20	6.69
30	Serbia& Montenegro	199	60.30	0.50	23.12	3.02	33.67	9.24	3.61
31	Slovakia	143	34.27	1.40	9.79	0	23.08	19.84	24.26
32	Slovenia	150	47.33	1.33	4.00	0	42.00	4.07	6.21
33	South Korea	528	37.43	1.13	7.37	0.38	28.54	13.98	14.84
34	Spain	502	39.84	0.20	2.19	0.20	37.25	17.02	15.51
35	Tajikistan	161	40.74	3.70	24.69	0.62	11.73	7.69	8.67
36	Turkey	640	61.21	1.87	11.68	1.25	46.42	18.25	23.15
37	Ukraine	405	56.05	0.99	23.95	0.74	30.37	20.18	18.64
38	Uzbekistan	243	35.66	0.82	11.48	1.23	22.13	1.22	.168
39	Vietnam	762	69.24	4.97	12.83	1.05	50.39	41.10	36.80

Table 4.3: Descriptive Statistics

This table provides the descriptive statistics for our sample. Data have been collected from World Bank Enterprise Survey (WBES) and World Development Indicators (WDI). The dependent variables are *TC*, *Leasing*, *Credit cards*, *Informal*, *Family* and *Equity*, which are the proportions of the assets side of Working Capital (*WC*) or New Investments (*NI*) financed externally by *TC*, *Leasing*, *Credit cards*, *Informal* finance, Sources from family and friends, *Equity* and sale of stock, respectively. Detailed variable definitions and sources are given in Appendix 4.1.

Variable	Obs.	Mean	Std. dev.	Min	Max
WC-TC	14866	6.399	17.956	0	100
WC-Credit cards	14742	.504	4.187	0	100
WC-Informal	14866	.659	5.519	0	100
WC-Family	14866	3.058	12.704	0	100
WC-Equity	14742	6.518	20.022	0	100
NI-Leasing	10623	4.882	17.644	0	100
NI-TC	10743	2.406	11.887	0	100
NI- Credit cards	10623	.293	3.558	0	100
NI-Informal	10743	.542	5.378	0	100
NI-Family	10743	2.892	13.372	0	100
NI-Equity	10743	6.719	22.072	0	100
DENY (0,1)	14691	.027	.164	0	1
PENDING (0,1)	14691	.010	.103	0	1
BDS (0,1)	14691	.06	.237	0	1
COLLA (0,1)	14691	.036	.188	0	1
EXPDENY (0,1)	14691	.008	.089	0	1
IR (0,1)	14691	.037	.190	0	1
LOANOBS (0,1)	14691	.316	.465	0	1
Small (0,1)	15322	.371	.483	0	1
Micro (0,1)	15322	.390	.487	0	1
Age	15229	2.502	.692	0	5.303
Age squared	15229	6.740	3.775	0	28.125
Internal funds	12555	48.361	39.705	0	100
Technology (0,1)	14947	.308	.461	0	1
Foreign (0,1)	15215	.091	.288	0	1
SOE (0,1)	15320	.061	.239	0	1
Construction (0,1)	15260	.088	.284	0	1
Manufacturing (0,1)	15260	.464	.498	0	1
Others (0,1)	15260	.011	.108	0	1
GDP growth	15322	5.129	2.459	1.030	10.630
Inflation	14872	10.687	13.169	.539	63.759
Private credit	15052	43.026	37.644	4.805	131.449
Rule of law	15322	.112	.874	-1.269	1.613
Lower-middle (0,1)	15322	.261	.439	0	1
Upper-middle (0,1)	15322	.317	.465	0	1
High (0,1)	15322	.245	.430	0	1

Table 4.4: Correlation Table

This table shows Pearson correlation coefficients for the independent variables. * Statistical significance at the 5% level. Detailed variable definitions and sources are given in Appendix 4.1.

Variables	1	2	3	4	5	6	7	8	9	10	11
1 DENY	1										
2 PENDING	-0.01*	1									
3 DISC	-0.06*	-0.04*	1								
4 LOANOBS	-0.11*	-0.07*	-0.27*	1							
5 Small	-0.00	0.00	0.00	0.04*	1						
6 Micro	0.00	0.00	0.06*	-0.14*	-0.61*	1					
7 Age	-0.02*	-0.01	-0.06*	0.0*	-0.02*	-0.14*	1				
8 Age squared	-0.02*	-0.01	-0.05*	0.01	-0.02*	-0.15*	0.98*	1			
9 Internal funds	-0.01	-0.00	-0.02*	0.09*	0.02*	-0.05*	0.01	0.01*	1		
10 Technology	-0.01	0.01*	-0.03*	0.10*	0.05*	-0.17*	0.03*	0.03*	0.07*	1	
11 Foreign	-0.01*	-0.00	-0.03*	-0.03*	0.00	-0.12*	-0.05*	-0.05*	-0.00	0.00	1
12 SOE	0.01	-0.00	0.00	-0.01	-0.01*	-0.16*	0.17*	0.19*	-0.05*	-0.00	-0.03*
13 Construction	-0.00	-0.00	-0.00	0.02*	0.03*	-0.03*	0.01	0.00	-0.00	-0.00	-0.05*
14 Manufacturing	0.04*	0.01	0.05*	0.08*	0.09*	-0.27*	0.04*	0.06*	0.05*	0.18*	0.02*
15 Others	-0.00	0.01*	0.000	-0.03*	0.03*	-0.03*	0.03*	0.03*	0.01	-0.00	0.03*
16 GDP growth	0.00	0.00	0.09*	-0.04*	0.09*	-0.13*	-0.21*	-0.20*	-0.05*	0.05*	0.01*
17 Inflation	0.00	0.01	0.05*	0.03*	0.03*	-0.12*	0.01*	0.01	0.07*	0.05*	-0.02*
18 Private credit	-0.04*	-0.02*	-0.17*	0.03*	-0.10*	0.19*	0.12*	0.11*	-0.02*	-0.08*	-0.04*
19 Rule of law	-0.02*	-0.02*	-0.16*	0.04*	-0.11*	0.19*	0.21*	0.19*	0.05*	-0.07*	-0.04*
20 Lower-middle	0.00	0.01*	0.09*	-0.04*	0.03*	-0.01	-0.07*	-0.07*	-0.01	0.05*	0.02*
21 Upper-middle	0.00	-0.0	0.0*	0.01	-0.02*	-0.01*	0.06*	0.05*	0.10*	-0.01	-0.03*
22 High	-0.04*	-0.02*	-0.16*	0.01	-0.10*	0.21*	0.14*	0.14*	-0.06*	-0.06*	-0.03*

Table 4.4 (continued): Correlation Table

Variables	12	13	14	15	16	17	18	19	20	21	22
12 SOE	1										
13 Construction	0.00	1									
14 Manufacturing	-0.01*	-0.29*	1								
15 Others	0.00	-0.03*	-0.10*	1							
16 GDP growth	0.07*	-0.03*	0.06*	-0.03*	1						
17 Inflation	-0.02*	-0.03*	0.16*	-0.05*	0.06*	1					
18 Private credit	-0.07*	0.10*	-0.23*	-0.03*	-0.47*	-0.41*	1				
19 Rule of law	-0.11*	0.07*	-0.13*	-0.04*	-0.63*	-0.37*	0.80*	1			
20 Lower-middle	0.03*	-0.00	-0.02*	-0.03*	0.46*	0.26*	-0.43*	-0.56*	1		
21 Upper-middle	-0.03*	-0.04*	0.14*	-0.03*	-0.15*	0.16*	-0.26*	0.14*	-0.40*	1	
22 High	-0.09*	0.11*	-0.27*	-0.01	-0.42*	-0.33*	0.89*	0.74*	-0.34*	-0.389	1

Table 4.5: Effects of BL Constraints on the Use of the Alternative Financing Sources without Country-Level Variables

This table provides the regression results for the effects of BL constraints on the use of the alternative financing sources without controlling for country-level variables. The dependent variables are *TC*, *Leasing*, *Credit cards*, *Informal*, *Family and Equity*, which are the proportions of the assets side of Working Capital (*WC*) or New Investments (*NI*) financed externally by TC, Leasing, Credit cards, Informal finance, Sources from family and friends, Equity and sale of stock, respectively. Detailed variable definitions and sources are given in Appendix 4.1. All regressions are tobit regressions with error terms clustered at the country level. *t*-statistics are in parentheses. ***, **, and * Statistical significance at the 1, 5, and 10 % levels, respectively.

Variables	TC		Leasing	Credit cards	
	Model 1 - WC	Model 2 - NI	Model 3 - NI	Model 4- WC	Model 5 - NI
DENY	10.89** (1.96)	9.20 (0.77)	13.87 (0.93)	7.44 (1.06)	-7.82 (-0.54)
PENDING	11.14 (1.26)	-21.90 (-0.76)	-42.17* (-1.71)	.68 (0.07)	2.86 (0.14)
BDS	13.58*** (2.86)	26.16*** (2.83)	-16.23 (-1.11)	6.50 (1.53)	18.63*** (2.75)
COLLA	3.29 (0.59)	-4.55 (-0.37)	-14.69 (-1.20)	-1.09 (-0.17)	6.93 (0.57)
EXPDENY	-.69 (-0.04)	-.02 (-0.00)	-39.43 (-1.38)	13.19 (1.36)	11.58 (0.67)
IR	-6.72 (-0.93)	-.20 (-0.02)	-48.47*** (-3.53)	-.034 (-0.00)	
LOANOBS	21.80*** (5.80)	30.21*** (8.79)	29.32*** (5.29)	15.91*** (5.48)	8.23* (1.77)
Small	-9.71*** (-2.58)	-12.68 (-1.60)	-5.86 (-0.67)	6.75** (2.17)	-.34 (-0.07)
Micro	-17.75*** (-3.55)	-23.56*** (-2.90)	-17.15 (-1.44)	4.52 (1.21)	-6.18 (-0.93)
Age	1.29 (0.09)	24.67 (1.22)	50.59*** (2.56)	7.96 (0.60)	14.43 (0.86)
Age squared	.81 (0.39)	-4.51 (-1.23)	-5.97* (-1.86)	-.51 (-0.22)	-2.82 (-0.90)
Internal funds	.03 (0.36)	-.12 (-0.97)	.06 (0.37)	-.04 (-0.65)	-.28** (-2.40)
Technology	.72 (0.27)	-5.01 (-0.94)	-1.05 (-0.31)	-4.25* (1.69)	-16.19** (-2.05)
Foreign	7.12** (2.24)	2.36 (0.28)	-4.96 (-0.84)	-6.38 (-1.30)	-21.03*** (-2.82)
SOE	-9.16 (-0.92)	-32.66*** (-3.87)	-48.07** (-2.52)	-24.39*** (-2.81)	-9.97 (-0.98)
Construction	10.02*** (2.85)	8.02 (0.95)	12.50* (1.70)	-.02 (-0.01)	5.71 (0.89)
Manufacturing	-5.45 (-1.05)	-12.64* (-1.70)	-25.52*** (-3.67)	-1.40 (-0.23)	-7.11 (-1.20)
Others	-6.47 (-0.60)	-27.59 (-0.97)	30.87* (1.81)	3.79 (0.29)	5.28 (0.33)
Constant	-72.74*** (-3.32)	-160.99*** (-6.06)	-193.30*** (-4.09)	-105.20*** (-5.73)	-118.10*** (-2.80)
Obs.	11585	8459	8459	11585	8179
Uncensored obs. (%)	1853 (16%)	470 (5.55%)	856 (10.12%)	343 (2.89%)	113 (1.38%)
P-value	0.0000	0.0000	0.0000	0.0000	0.0000

Table 4.5 (continued): Effects of BL Constraints on the Use of the Alternative Financing Sources without Country-Level Variables

Variables	Informal		Family		Equity	
	Model 6 - WC	Model 7 - NI	Model 8 - WC	Model 9- NI	Model 10 - WC	Model 11- NI
DENY	27.60*** (3.04)	37.75** (2.17)	39.83*** (5.90)	49.26*** (4.73)	11.69 (1.33)	20.03 (1.56)
PENDING	30.62** (2.26)	18.25 (0.83)	31.02*** (4.77)	39.11*** (2.95)	27.93** (2.43)	40.85** (2.01)
BDS	13.86** (1.97)	28.81** (2.30)	28.77*** (5.20)	44.90*** (4.93)	.019 (0.00)	5.00 (0.39)
COLLA	14.82* (1.80)	5.05 (0.27)	30.44*** (5.26)	37.31*** (3.05)	-20.47* (-1.75)	-8.37 (-0.53)
EXPDENY	-9.37 (-0.41)	24.52 (0.66)	16.92 (1.61)	17.49 (0.48)	7.36 (0.36)	10.74 (0.28)
IR	4.13 (0.39)	-10.94 (-0.46)	32.44*** (5.28)	45.81*** (6.68)	-11.33 (-0.85)	-6.02 (-0.24)
LOANOBS	22.08*** (4.92)	28.59*** (3.13)	16.92*** (5.63)	21.04*** (4.05)	16.34*** (3.21)	13.09 (1.28)
Small	1.91 (0.38)	-5.33 (-0.65)	6.44* (1.87)	13.93* (1.80)	-6.21 (-0.76)	-8.33 (-0.67)
Micro	-6.92 (-1.00)	-4.23 (-0.41)	11.15* (1.70)	18.61* (1.94)	-21.79* (-1.70)	-40.75 (-1.43)
Age	-4.61 (-0.32)	31.02 (1.00)	-27.09** (-2.44)	-63.88*** (-3.33)	-44.05 (-1.08)	-117.14* (-1.78)
Age squared	-1.06 (-0.38)	-9.30 (-1.42)	1.72 (0.72)	7.74** (2.08)	6.37 (1.13)	19.21** (2.15)
Internal funds	-.08 (-1.57)	-.13 (-1.18)	.01 (0.30)	-.06 (-0.95)	-.18 (-1.42)	-.38** (-2.44)
Technology	5.32 (1.33)	2.97 (0.52)	2.02 (0.56)	8.11 (1.31)	-4.87 (-0.95)	-20.01*** (-3.34)
Foreign	-1.79 (-0.31)	4.48 (0.46)	-33.14*** (-4.64)	-40.00** (-2.11)	-11.68* (-1.90)	-23.97** (-1.97)
SOE	-2.46 (-0.33)	-18.79 (-1.25)	-28.14*** (-4.05)	-69.70*** (-5.86)	9.23 (0.62)	14.92 (0.89)
Construction	6.00 (1.21)	8.22 (0.83)	-1.89 (-0.44)	-1.82 (-0.25)	1.12 (0.17)	-.42 (-0.05)
Manufacturing	1.79 (0.30)	8.33 (0.85)	11.30** (2.31)	18.17** (2.30)	9.37 (0.61)	28.78 (1.07)
Others	28.02* (1.77)	15.05 (0.42)	9.55 (0.61)	-3.04 (-0.11)	-5.91 (-0.37)	-16.25 (-0.56)
Constant	-119.68*** (-5.38)	-223.05*** (-5.58)	-54.08*** (-5.18)	-68.78*** (-3.34)	-22.60 (-0.35)	13.74 (0.16)
Obs.	11585	8459	11585	8459	11585	8459
Uncensored obs.	278	130	1049	511	1380	669
(%)	(2.4%)	(1.54%)	(9.05%)	(6.04%)	(11.91%)	(7.90%)
P-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 4.6: Effects of BL Constraints on the Use of the Alternative Financing Sources with Country-Level Variables

This table provides the regression results for the effects of BL constraints on the use of the alternative financing sources controlling for country-level variables. The dependent variables are *TC*, *Leasing*, *Credit cards*, *Informal*, *Family and Equity*, which are the proportions of the assets side of Working Capital (*WC*) or New Investments (*NI*) financed externally by TC, Leasing, Credit cards, Informal finance, Sources from family and friends, Equity and sale of stock, respectively. Detailed variable definitions and sources are given in Appendix 4.1. All regressions are tobit regressions with error terms clustered at the country level. *t*-statistics are in parentheses. ***, **, and * Statistical significance at the 1, 5, and 10 % levels, respectively.

Variables	TC		Leasing	Credit cards	
	Model 1 - WC	Model 2 - NI	Model 3 - NI	Model 4- WC	Model 5 - NI
DENY	10.08* (1.86)	8.55 (0.76)	16.77 (1.51)	8.84 (1.15)	-9.28 (-0.63)
PENDING	13.35 (1.42)	-19.62 (-0.67)	-40.01** (-1.96)	2.87 (0.36)	4.38 (0.20)
BDS	19.71*** (4.73)	31.05*** (2.93)	1.37 (0.13)	12.58*** (2.65)	25.71*** (4.00)
COLLA	7.16 (1.21)	.62 (0.05)	-3.16 (-0.26)	1.62 (0.25)	10.68 (0.84)
EXPDENY	1.73 (0.10)	5.34 (0.23)	-26.84 (-0.92)	14.05 (1.59)	14.43 (0.78)
IR	-1.54 (-0.23)	5.64 (0.43)	-27.44** (-2.34)	2.53 (0.26)	
LOANOBS	20.40*** (5.62)	28.01*** (8.48)	25.94*** (6.35)	14.55*** (4.57)	5.08 (1.24)
GDP Growth	-.84 (-0.42)	-2.54 (-0.96)	.67 (0.28)	-1.96 (-1.56)	-1.77 (-0.92)
Inflation	.05 (0.2)	.45 (1.40)	1.04*** (2.93)	.18 (0.93)	.12 (0.46)
Private Credit	.11 (0.49)	.006 (0.02)	.40 (1.58)	-.04 (-0.41)	-.09 (-0.41)
Rule of Law	11.79 (1.00)	8.73 (0.67)	59.22*** (4.02)	11.18 (1.64)	16.44* (1.65)
Lower-middle	-12.38 (-1.57)	10.43 (0.74)	38.89** (2.19)	-3.90 (-0.53)	-12.56 (-1.04)
Upper-middle	-8.53 (-0.70)	10.40 (0.72)	44.22** (2.14)	18.15** (2.07)	5.67 (0.55)
High	-18.74 (-0.79)	17.74 (0.61)	-11.50 (-0.46)	9.64 (0.86)	11.49 (0.51)
Constant	-52.23*** (-2.67)	-130.86*** (-3.80)	-165.25*** (-4.09)	-78.57*** (-5.73)	-76.77** (-1.99)
Firm-level controls	Yes	Yes	Yes	Yes	Yes
Obs.	11209	8300	8300	11209	8024
Uncensored obs. (%)	1836 (16.36%)	467 (5.62%)	852 (10.26%)	340 (3.03%)	112 (1.39%)
P-value	0.0000	0.0000	0.0000	0.0000	0.0000

Table 4.6 (continued): Effects of BL Constraints on the Use of the Alternative Financing Sources with Country-Level Variables

Variables	Informal		Family		Equity	
	Model 6 - WC	Model 7 - NI	Model 8 - WC	Model 9- NI	Model 10 - WC	Model 11- NI
DENY	24.91*** (2.82)	36.77** (2.15)	33.20*** (5.18)	42.82*** (4.39)	7.21 (0.91)	5.20 (0.48)
PENDING	29.99** (2.24)	18.86 (0.83)	25.94*** (3.91)	30.76*** (2.81)	31.53*** (4.22)	47.41*** (2.66)
BDS	9.18 (1.39)	21.90* (1.70)	22.00*** (4.59)	35.99*** (4.59)	10.96 (1.56)	15.81 (1.48)
COLLA	9.93 (1.23)	-2.45 (-0.13)	25.07*** (4.77)	30.12** (2.42)	-13.26 (-1.21)	.43 (0.03)
EXPDENY	-11.46 (-0.49)	16.39 (0.45)	8.84 (0.85)	6.51 (0.18)	9.85 (0.65)	1.98 (0.06)
IR	1.99 (0.18)	-17.16 (-0.72)	24.83*** (4.14)	40.49*** (5.72)	4.72 (0.49)	14.07 (0.72)
LOANOBS	22.15*** (5.66)	32.27*** (3.65)	15.62*** (4.45)	20.38*** (3.74)	11.44** (2.41)	1.59 (0.20)
GDP Growth	2.24** (2.38)	5.83*** (3.10)	1.90 (1.39)	5.09** (2.43)	3.35 (0.53)	2.72 (0.34)
Inflation	-.33 (-1.53)	.13 (0.41)	.24 (1.36)	.52* (1.84)	.80 (1.04)	1.01 (0.84)
Private Credit	.09 (0.70)	.08 (0.28)	.06 (0.41)	-.05 (-0.24)	1.28* (1.78)	2.03 (1.62)
Rule of Law	-8.73** (-2.30)	-2.13 (-0.24)	15.18** (1.97)	31.16*** (2.84)	29.17 (0.89)	26.57 (0.57)
Lower-middle	-10.26** (-2.29)	-12.04 (-1.03)	-19.75*** (-2.59)	-21.72** (-2.28)	-70.15* (-1.87)	-106.57* (-1.79)
Upper-middle	6.62 (1.36)	1.26 (0.11)	-30.88*** (-3.29)	-51.18*** (-5.61)	-55.50* (-1.68)	-91.07* (-1.80)
High	-24.34** (-2.33)	-65.42** (-2.13)	-72.76*** (-4.56)	-97.02*** (-4.53)	-145.78** (-2.48)	-217.31* (-1.92)
Constant	-141.59*** (-5.40)	-269.81*** (-6.77)	-48.37*** (-2.95)	-69.49*** (-2.59)	-62.52 (-1.13)	-65.67 (-0.87)
Firm-level controls	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	11209	8300	11209	8300	11209	8300
Uncensored obs.	275	128	1041	507	1372	669
(%)	(2.45%)	(1.54%)	(9.28%)	(6.10%)	(12.24%)	(8.06%)
P-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 4.7: Effects of BL Constraints on the Use of the Alternative Financing Sources for Sub-samples of Applying and Non-Applying firms

This table provides the regression results for the effects of BL constraints on the use of the alternative financing sources for two sub-samples of Applying (AP) and Non-Applying (NAP) firms. The dependent variables are *TC*, *Leasing*, *Credit cards*, *Informal*, *Family and Equity*, which are the proportions of the assets side of Working Capital (WC) or New Investments (NI) financed externally by TC, Leasing, Credit cards, Informal finance, Sources from family and friends, Equity and sale of stock, respectively. Detailed variable definitions and sources are given in Appendix 4.1. All regressions are tobit regressions with error terms clustered at the country level and including the control variables at the firm-level and the country-level. *t*-statistics are in parentheses. ***, **, and * Statistical significance at the 1, 5, and 10 % levels, respectively.

Variables	TC				Leasing		Credit cards			
	WC		NI		NI		WC		NI	
	AP (1)	NAP (2)	AP (3)	NAP (4)	AP (5)	NAP (6)	AP (7)	NAP (8)	AP (9)	NAP (10)
DENY	-.13 (-0.03)		1.37 (0.13)		-.40 (-0.02)		-.22 (-0.04)		-14.33 (-0.55)	
PENDING	1.97 (0.26)		-20.94 (-0.88)		-55.18** (-2.00)		-4.58 (-0.49)		1.24 (0.06)	
LOANOBS	8.35** (2.32)		17.91*** (3.40)		8.39 (0.89)		6.06*** (2.63)		2.86 (0.23)	
BDS		32.64*** (5.31)		49.30*** (3.43)		17.44* (1.92)		24.51*** (3.84)		23.84*** (4.99)
COLLA		15.70* (1.95)		5.21 (0.32)		9.35 (0.74)		12.28 (1.34)		12.72 (1.43)
EXPDENY		9.64 (0.40)		13.39 (0.44)		-18.69 (-0.55)		26.69** (2.41)		12.54 (0.98)
IR		3.86 (0.42)		12.57 (0.68)		-10.58 (-0.71)		13.02 (1.24)		
Obs.	5711	5498	4540	3760	4540	3760	5711	5498	4540	3484
Uncensored obs. (%)	1259 (22.04%)	577 (10.49%)	330 (7.26%)	137 (3.64%)	635 (13.98%)	217 (5.77%)	238 (4.16%)	102 (1.85%)	61 (1.34%)	51 (1.46%)
P-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 4.7 (continued): Effects of BL Constraints on the Use of the Alternative Financing Sources for Sub-samples of Applying and Non-Applying firms

Variables	Informal				Family				Equity			
	WC		NI		WC		NI		WC		NI	
	AP (11)	NAP (12)	AP (13)	NAP (14)	AP (15)	NAP (16)	AP (17)	NAP (18)	AP (19)	NAP (20)	AP (21)	NAP (22)
DENY	12.71 (1.49)		26.64 (1.58)		26.13*** (5.56)		40.80*** (5.10)		.76 (0.11)		6.82 (0.68)	
PENDING	16.58 (1.41)		6.88 (0.33)		19.86*** (3.05)		31.32*** (2.73)		21.10*** (2.67)		42.23** (2.37)	
LOANOBS	10.90** (2.55)		24.01** (2.12)		11.68*** (4.04)		21.52*** (4.18)		4.36 (1.20)		3.95 (0.61)	
BDS		23.76*** (2.86)		32.65** (2.24)		31.39*** (3.92)		42.25*** (4.23)		20.25** (2.27)		18.14 (1.30)
COLLA		21.88* (1.90)		2.21 (0.10)		34.52*** (4.71)		33.18** (2.05)		-16.25 (-1.14)		-5.81 (-0.24)
EXPDENY		-3.83 (-0.14)		26.34 (0.64)		13.30 (1.00)		-3.45 (-0.07)		17.69 (0.92)		-4.97 (-0.15)
IR		8.27 (0.58)		-15.12 (-0.56)		34.95*** (4.45)		49.75*** (4.84)		9.00 (0.70)		16.55 (0.64)
Obs.	5711	5498	4540	3760	5711	5498	4540	3760	5711	5498	4540	3760
Uncensored	192	83	87	41	608	433	300	207	944	428	463	206
obs. (%)	(3.36%)	(1.50%)	(1.91%)	(1.09%)	(10.64%)	(7.87%)	(6.60%)	(5.50%)	(16.52%)	(7.78%)	(10.19%)	(5.47%)
P-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Chapter 5: The Choice between Commercial Paper, Bank Credit Lines and Trade Credit during the Global Financial Crisis: Evidence from Micro data of US firms

Abstract

In this chapter, by using a sample of nonfinancial S&P 500 firms, we examine the relationship between the use of commercial paper (CP), bank credit lines (CL) and trade credit (TC); and whether the Global Financial Crisis (2008-2009) has an impact on this relationship. More specifically, we investigate whether asymmetric information, moral hazard problems and rollover risk have an impact on this relationship. Our results suggest that rollover risk has a significant impact on the choice between these sources. Specifically, we find that firms with higher rollover risk borrow more from CL and TC relative to CP. Further, by showing that during the financial crisis, higher rollover risk induces firms to decrease CP issuance and increase CL utilization; we provide evidence on the role of bank CL in compensating for the reduction in the usage of cheaper sources such as CP in such difficult times. We also find that higher level of asymmetric information is associated with more usage of TC relative to CP. However, our results show that firms use less TC during the financial crisis, suggesting a limited role of this financing in easing their financing constraints. We further provide evidence on the transaction hypothesis by showing that CP issuance is driven by investment need. In addition, our results suggest that while CL and TC are better in overcoming asymmetric information problems, both CP and CL are efficient in resolving moral hazard problems. Overall, we find little evidence on the substitutability of TC for bank credit.

Résumé

Dans ce chapitre, à partir d'un échantillon d'entreprises non financières du S&P 500, nous examinons l'interaction entre l'utilisation de papier commercial (CP), des lignes de crédit bancaires (CL) et du crédit commercial (TC). Nous examinons également si la crise financière mondiale (2008-2009) a un impact sur ces interactions. Sur le plan théorique, nous étudions si les opportunités d'investissement, l'asymétrie d'information, les problèmes d'aléa moral et le risque de refinancement ont un impact sur ces interactions. Nos résultats suggèrent que le risque de refinancement a un impact significatif sur le choix entre ces sources. Plus précisément, nous constatons que les entreprises avec le risque de refinancement le plus élevé puisent plus dans leurs CL et leurs TC par rapport au CP. En outre, en montrant que pendant la crise financière, l'augmentation du risque de refinancement incite les entreprises à diminuer l'émission de CP et à augmenter l'utilisation des CL, nous apportons la preuve du rôle fondamental des CL pour compenser l'assèchement de sources moins onéreuses telles que le CP. Nous constatons également qu'à un plus haut niveau d'asymétrie d'information est associé une plus forte utilisation du TC par rapport au CP. Cependant, nos résultats montrent que les entreprises utilisent moins de TC au cours de la crise financière, ce qui suggère un rôle limité de ce financement pour alléger les contraintes de financement dans les périodes difficiles. Nous fournissons une preuve supplémentaire de l'hypothèse des coûts de transaction en montrant que CP est utilisé pour financer de nouveaux investissements. En outre, nos résultats suggèrent que tandis que les CL et TC permettent de surmonter les problèmes d'asymétrie d'information, le CP et le CL sont efficaces dans la résolution des problèmes d'aléa moral. Dans l'ensemble, nous trouvons peu de preuves sur la substituabilité du TC et du CL.

Chapter 5: The Choice between Commercial Paper, Bank Credit Lines and Trade Credit during the Global Financial Crisis: Evidence from Micro data of US firms

5.1 Introduction

Existing literature have consistently shown that the availability of external financing sources plays a critical role in the firm's operation and growth (Beck et al., 2005; Demirgüç-Kunt and Maksimovic, 1998; Fisman and Love, 2003; Vermoesen et al., 2013). Several studies further have demonstrated that market frictions arising from informational asymmetry and its consequences including adverse selection and moral hazard problems may restrict access to those sources (Beck et al., 2008, 2005; Berger et al., 2001; Myers and Majluf, 1984; Stiglitz and Weiss, 1981). Many firms therefore turn to short-term debt to reduce the costs arising from such problems (Dewatripont and Tirole, 1994; Diamond, 1991; Flannery, 1986; Myers and Majluf, 1984; Zwiebel, 1996). In spite of substantial evidence on the role of financial intermediation, much less is known about how firms use non-intermediated short-term debt such as commercial paper (CP).

CP is an unsecured, short-term debt instrument issued by a corporation, typically for the financing of working capital. It typically has a maturity of up to 270 days with average maturity of about 45 days (Ou et al., 2004). Besides, CP borrowing concentrates among large creditworthy businesses (Oliner and Rudebusch, 1996). Bank credit lines (CL) and trade credit (TC) are perhaps the closest substitutes of CP. As noted in Nilsen (2002), small firms prefer TC after bank loans as credit source while large firms prefer CP, bank loans and finally TC. A considerable body of literature has suggested that bank-constrained firms increase borrowings from their suppliers, implying a substitution effect between bank credit and TC (Cuñat, 2007; Nilsen, 2002; Petersen and Rajan, 1997, 1995, 1994). On the other hand, a number of studies suggest that CP financing and bank credit can be used as substitutable sources (Gao and Yun, 2009; Kahl et al., 2015; Kashyap et al., 1993). However, as argued by Kashyap et al. (1993), the change in CP volume may also represent substitutions away from other nonbank sources of finance such as TC, especially as CP and TC may stand out as the closest short-term substitutes for bank loans. While the substitutability between bank debt and TC, and between CL and CP have been documented in financial literature, there is no study shedding light on the relationship between the usage of CP and TC as well as the nexus between these three potential substitutes.

In this study, we use firm-level data to examine the choice between CP, CL and TC by nonfinancial S&P 500 firms during the period 2003-2014 with a focus on the effect of the recent financial crisis (2008-2009). The main dataset used in our analyses is extracted from Bloomberg database. An advantage of Bloomberg database is to provide us information on the amounts of CP outstanding and CL used as well as on other accounting records. In times

of crisis, a period when investors' confidence in credit markets erodes and the default risk increases substantially, firms may have difficulty in borrowing through CP financing, they therefore should be more likely to increase their use of alternative sources such as CL and TC. Our study is an extension of the study of Kahl et al. (2015) who provide an influential research on firms' usage of CP financing and the substitutability between CP and CL. Our main contribution is to provide additional insights into the determinants of the usage of CP, CL and TC and to investigate whether CL and TC are substitutes to CP, especially during the financial crisis.

Our study contributes to the small literature on CP and on the link between CP and bank credit. Kashyap et al. (1993) provide an important study on the substitutability between bank loan and CP by showing that firms issue more CP during monetary contractions to compensate for reduced bank financing. By contrast, Calomiris et al. (1995) argue that, in downturns, CP issuers act as financial intermediaries by increasing inventories and extending more credit to their non-CP issuing customers. Unlike Calomiris et al. (1995), Kahl et al. (2015) demonstrate that despite its short maturity, the lower cost in issuing CP induces firms to use CP to finance long-term investments, which will be refinanced with long-term debt. In this way, they provide a transaction theory of CP and show that the primary cost of CP is its rollover risk. Their results further suggest that firms with high rollover risk are less likely to enter the CP market, issue less CP, and increase their borrowing from CL, supporting the substitutability between CP and CL.

Our study also adds to the literature on TC. As discussed earlier, a large body of literature emphasizes the role of TC as a financing of last resort for constrained firms, particularly, in times of crisis (Casey and O'Toole, 2014; Garcia-Appendini and Montoriol-Garriga, 2013; Love et al., 2007). In spite of rich literature on TC and the link with bank credit, there is no study investigating the substitutability between TC and CP. We therefore take a first step in exploring the link between these two potential alternatives by relating inter-firm credit to CP, a money market instrument.

Our study further contributes to the literature on corporate liquidity. While several studies (Acharya et al., 2013; Campello et al., 2011, 2010; Lins et al., 2010; Sufi, 2009) investigate firms' choice between internal liquidity through cash and external liquidity through CL, Kahl et al. (2015) illustrate that CP serves as another important source of liquidity for large firms and an alternative to both CL access and corporate cash holdings. We add TC as another alternative liquidity source to explore whether this financing compensate for the (potential) lower use of CP and CL during the crisis period.

In a firm fixed effects framework, we find that firms with higher rollover risk borrow more from CL and TC relative to CP. We further show that during the financial crisis, higher rollover risk is negatively associated with a lower use of CP issuance and a higher use of CL. A higher level of asymmetric information is associated with more usage of CL and TC relative to CP. In addition, our results show that during the financial crisis, CL usage increases whereas TC usage decreases. We further find that at CP issuance is driven by

investment need most likely because of its lower cost. Our results also reveal that more severe moral hazard issues are associated with a higher use of both CP and CL and a lower use of TC.

The chapter is structured as follows. In the second section, we discuss the theoretical framework on the link between CP, CL and TC, and the main hypotheses to be tested. Data and methodological approach are presented in the third section. The fourth section reports empirical results and discussion. We conclude this chapter with suggestions for future research in the last section.

5.2 Theoretical Framework and Hypotheses

5.2.1 Determinants of CP Use

In line with Gatev and Strahan (2006) and Kahl et al. (2015), we argue that under normal circumstances, CP offers the lowest cost source of short-term financing for large, well-established firms, since investors are willing to accept lower returns on CP, a near-money asset, as compared to CL. In particular, Kahl et al. (2015) show that CP spreads are about 90 basis points cheaper than CL on average. Moreover, United States (US) firms prefer CP financing to other credit sources such as CL because by issuing CP, they can obtain funds quickly, since the registration is not required by Securities and Exchange Commission (SEC). Another advantage of CP financing concerns the flexibility in terms of borrowing amounts that can be easily adjusted based on funding needs, and savings on the costs of financial intermediation, including the greater stability of the funding commitment. CP issuers further may use back-up CL to reduce the default risk. CP is of much shorter maturity than bank debt (up to 270 days) and perhaps for this reason CP is used primarily to finance working capital investments that are also of short maturity (Calomiris et al., 1995).

Following Kahl et al. (2015), we discuss two arguments posited in the existing literature on the debt maturity choice. Accordingly, short-term debt is better than long-term debt in alleviating informational asymmetries (Diamond, 1991; Flannery, 1986) and in resolving moral hazard problems (Dewatripont and Tirole, 1994; Zwiebel, 1996).

The *asymmetric information hypothesis* implies that firms subject to greater information asymmetry should issue more short-term debt. Myers and Majluf (1984) argue that firms with higher level of information asymmetry should issue debt rather than equity to avoid selling under-priced shares. Furthermore, adverse selection problem is expected to be less severe for short-term, safe and highly liquid instrument such as CP compared to riskier and longer-term debt, such as bonds. Flannery (1986) suggests that firms with positive private information about their investment project value can minimize their market value loss in a pooling equilibrium by issuing short-term debt, whereas firms with negative private information about their investment project value can maximize their gain by issuing long debt. In the same vein, Diamond (1991) argues that firms with positive private information about their credit quality issue short-term debt until investors learn about their high credit quality, at

which point they refinance the short-term debt with long-term bonds, i.e. short-term debt is used as a bridge financing.

On the other hand, the *agency hypothesis* implies that firms with more severe agency problems should issue more short-term debt to reduce costs arising from moral hazard problems. As argued by Jensen (1986) and Stulz (1990), firms use debt as a disciplinary mechanism to mitigate their managers' private incentives. Short-term debt is particularly appropriate for this purpose. Dewatripont and Tirole (1994) argue that since low short-term profits result in control transfer from managers to creditors, short-term debt provides incentives for managers to exert effort to avoid low short-term profits. In Zwiebel (1996), short-term debt disciplines managers more efficiently than long-term debt by requiring frequent repayments and committing managers more frequently to avoid bad projects.

Kahl et al. (2015) add two more explanations for the usage of CP as a form of short-term debt. The first explanation concerns the transaction cost hypothesis and the second concerns the importance of rollover risk.

The *transaction cost hypothesis* implies that firms issue CP to minimize transaction costs associated with raising capital for new investments. Kahl et al. (2015) argue that firms' CP issuance is driven by a desire to have quick access to low-cost capital without Securities and Exchange Commission (SEC) registration, and borrowing amounts can be easily adjusted based on funding needs. The low-cost feature of CP financing is particularly beneficial to firms with projects requiring quick access to capital markets, associated with uncertain funding needs, or those for which bond market issuance is costly because of small borrowing amounts. They further show that CP appears to lower transaction costs by providing a bridge to long-term financing, i.e. once CP is used to finance long-term investments; the latter are often refinanced with long-term bond issuance to reduce rollover risk.

The second argument addressed by Kahl et al. (2015) involves the effect of rollover risk on the usage of CP. They argue that while CP can overcome market frictions associated with transaction costs, asymmetric information, and moral hazard, the disadvantage of using CP, especially for long-term projects, is the rollover risk created by its short maturity. Their results suggest that firms are less likely to enter CP market, issue less CP and borrow more from CL if their rollover risk is high.

5.2.2 Relationship between CP, CL and TC

While CP is normally preferred by large well-established firms, the question then arises as to which credit sources may compensate for the potential reduction in CP usage during the financial crisis when market liquidity dries up.

Kashyap et al. (1993) find that during tighter monetary policy, CP issuance rises while bank loans fall, implying a substitution effect between these two credit sources. In another study, Gertler and Gilchrist (1994) show that small and large firms behave differently during tight monetary policy. While small firms experience decline in loan growth, large firms increase

their borrowings from banks. Moreover, as argued by Kahl et al. (2015), CL are perhaps the closest substitute for CP financing and share many features with the latter such as (possible) short-term maturity, quick access, flexibility of borrowing amounts. Besides, banks have a comparative advantage over CP investors in collecting information about borrowers and in monitoring of borrowers. Therefore, CL may be better than CP in overcoming frictions arising from moral hazard and asymmetric information. Moreover, compared to CP, CL is less vulnerable to performance shocks because CL are not subject to fragile demand by public investors, which is particularly the case in times of crisis. In addition, Campello et al. (2011) show that CL have on average a maturity of three to four years for public firms. Hence, CL have much longer maturity than CP, thereby lower rollover risk is entailed. Kahl et al. (2015) indeed show that rollover risk is negatively correlated with CP issuance and positively correlated with CL usage and that for firms with low rollover risk, CP is a cheaper alternative to CL. Hence, one can expect that firms subject to more severe moral hazard and asymmetric information problems and exposed to substantial rollover risk prefer CL to CP.

During financial crises, market frictions and rollover risk become more severe, and the access to CP market may be particularly restricted because of increased default risk and declined market liquidity. One can therefore expect a stronger substitution effect of CL for CP in such difficult times. This indeed finds empirical evidence in a number of studies. Kahl et al. (2015) argue that firms cannot issue new CP when their credit quality deteriorates substantially, which is more likely to be the case in times of crisis. Gatev and Strahan (2006) posit that the cost of CP borrowings may increase because of a decline in the firm's credit quality or in the overall supply of market liquidity, which is likely to be the case during the financial crisis. Similarly, Anderson and Gascon (2009) show that in times of crisis, issuers of secured paper have more difficulty in rolling over their paper, even at shorter maturity and higher cost.

Ivashina and Scharfstein (2010) find a reduction of 79% of bank lending during the last quarter of 2008 relative to the second quarter of 2007. By contrast, Demiroglu and James (2011) show that reductions in bank lending, in firm cash flows and uncertainty in capital markets induced firms to draw down unused portions of their CL to protect against future liquidity shortfalls. Gao and Yun (2009) find that, during the last quarter of 2008, manufacturing firms with high credit risk decreased their CP borrowing and instead borrowed more from their CP backup CL. They further find that the decline in CP borrowing was concentrated among firms with high default risk.

In the same vein, Gatev and Strahan (2006) argue that during periods of market stress, large public firms switch to using bank financing when market liquidity dries up and CP borrowing becomes costly. They actually show that CP backup CL effectively compensate for the reduction in CP issuance, thereby allowing CP issuers to hedge the risk of funding supply shocks. Firms' increased use of CL during the financial crisis is also documented in more recent papers (Campello et al., 2011, 2010; Ivashina and Scharfstein, 2010). Particularly, Campello et al. (2011) show that CL eased the negative impact of the financial crisis on corporate spending.

Another external financing source that can be considered as a close substitute to CP and CL concerns TC. Several empirical studies have investigated the effect of bank financing constraints on firms' use of TC (Danielson and Scott, 2004; Fisman and Love, 2003; Meltzer, 1960; Nilsen, 2002; Petersen and Rajan, 1997, 1995, 1994). Overall, these studies suggest that firms that are financially constrained by banks use TC as a financing of last resort, supporting the substitution effect between bank credit and TC. TC theories explain the availability of TC to bank-constrained firms by showing that suppliers may have advantage over banks in overcoming market frictions associated with asymmetric information and moral hazard problems (Burkart and Ellingsen, 2004; Smith, 1987). Alternatively, suppliers may have comparative advantage in controlling borrowers (Cuñat, 2007) or in seizing goods in case of the borrower's default (Frank and Maksimovic, 2005; Mian and Smith, 1992). Therefore, suppliers may lend more liberally than banks.

TC is generally considered as costly financing as compared to bank loan (Cook, 1999; Cuñat, 2007; Ng et al., 1999; Petersen and Rajan, 1997, 1995; Wilson and Summers, 2002). The relatively high implicit interest rates of TC may be the result of sunk costs incurred in case of renegotiation of debts, for which suppliers give more concessions to customers than banks do (Wilner, 2000). Alternatively, it may be the result of the risk of default and the premium for providing insurance against potential liquidity shocks, especially whenever suppliers obtain funds at a high cost (Cuñat, 2007).

The evidence from the credit crisis suggests that financially constrained firms had difficulties in using and renewing their CL and as a result cut back on investment (Demiroglu and James, 2011). Therefore, those firms may turn to another source such as TC to compensate for a reduction in CL utilization

On the other hand, there are good reasons to believe that TC is a close substitute for CP because the two sources have both short-term maturity and are usually used to finance working capital (Casey and O'Toole, 2014; Petersen and Rajan, 1997). Moreover, like CP, TC may be rolled over and used to finance long-term projects (Fisman and Love, 2003).

Nilsen (2002) famously shows that at times of tight monetary policy, large firms increase their use of TC more than small firms. This finding is puzzling since large firms are generally assumed to have access to cheaper sources such as CP. The author provides an explanation by showing that those firms lack a bond rating, thus do not have alternatives. In line with other studies supporting the substitutability between bank credit and TC, his findings suggest that firms without attractive alternatives are turning to costly alternative channels such as TC. This evidence suggests that firms use TC for financial reasons during monetary contractions when preferred sources including bank lending and CP are not available. Like CL, an advantage of TC is to overcome informational asymmetry and moral hazard problems. Therefore, one can expect that firms with higher degree of informational asymmetry and more severe moral hazard problems increase their use of TC and that firms borrow more from their suppliers during the crisis period to offset the potential reduction in CP and CL usage. Besides, since TC is often associated with more concessions in renegotiation (Wilner, 2000),

while rollover risk is expected to affect negatively CP usage, one can predict that firms with higher rollover risk will use more TC relative to CP.

A number of studies focus on firms' TC utilization in times of crisis. Love et al. (2007) investigate the effect of financial crises on the use of TC during financial crises in East Asia. They find that TC usage increases immediately after crises and gradually decreases afterwards. In Casey and O'Toole (2014), credit-rationed firms are more likely to use, and apply for TC during the recent crisis, especially to finance working capital. In another study, Garcia-Appendini and Montoriol-Garriga (2013) show that constrained firms increase their use of TC during the 2007–2008 financial crisis. Using over 2.5 million observations for 600,000 firms in 8 euro area countries in the period 1993–2009, Ferrando and Mulier (2013) find that firms use the TC channel to manage growth.

5.2.3 Hypotheses

Drawing on the theoretical framework discussed in the previous subsection, we investigate whether transaction cost, asymmetric information, moral hazard problems and rollover risk are significant determinants of CP, CL and TC usage and importantly whether these factors have an impact on the choice between these sources. We therefore test four following hypotheses:

Transaction cost hypothesis: Firms use CP to finance long-term investments.

We also expect that firms use CL to finance long-term investments because CL are associated with lower rollover risk. On the other hand, one can expect that TC may be used to finance those investments but at a lower extent.

Asymmetric information hypothesis: Firms with more severe asymmetric information problems use more CP, CL and TC with stronger effects for CL and TC.

Agency hypothesis: Firms with more severe moral hazard problems use more CP, CL and TC with stronger effects for CL and TC.

Rollover risk hypothesis: Firms with higher rollover risk use less CP and use more CL and TC.

5.3 Data and Methodological Approach

The data used in our analysis are mainly collected from Bloomberg database for non-financial S&P 500 firms. Importantly for our research, Bloomberg database provide information on firms' total outstanding amount of CP and CL borrowings. We collect firm-level data from 2003 to 2014 on CP borrowings for 304 firms, covering 1581 firm-years, on CL for 403 firms, covering 3913 firm-years, on TC (Accounts payable) for 412 firms, covering 4708 firm-years. We are also able to collect firm-level accounting data to test our hypotheses.

In general, we model the determinants of the usage of three credit sources, CP, CL and TC for firm i at time t as:

$$\text{Credit source}_{i,t} = \beta_0 + \beta_1 \text{Capex}_{i,t-1} + \beta_2 \text{Change in Capex}_{i,t-1} + \beta_3 \text{IVOL}_{i,t-1} + \beta_4 \text{FCF}_{i,t-1} + \beta_5 \text{EVOL}_{i,t-1} + \beta_6 \text{High VIX} + \mu X_{i,t-1} + c_i + \varepsilon_{i,t-1}$$

where *Credit source* represents our dependent variables; *Capex*, *Change in Capex*, *IVOL*, *FCF*, *EVOL* (lagged one period) and *High VIX* are our variables of interest; and $X_{i,t-1}$ is a vector of firm-level controls, lagged one period. We also include firm fixed effects, c_i , in the model.

The first step is to construct the dependent variables. We provide two multivariate analysis frameworks. We observe an important number of zero values in outstanding CP amounts with nearly 48% of our observations and in CL amounts currently used with nearly 41% of our observations of which only 7% report a zero value on CL capacity (the total of all the CL that the company has access to). Hence, in the first multivariate analysis, we identify the determinants of the likelihood of CP and CL usage in a probit framework with firm-level fixed effects. In this framework, the dependent variables, *CP* (0,1) and *CL* (0,1), equal one if a firm's outstanding CP amount is greater than 0, and if a firm's CL amount currently used is greater than 0, respectively; and zero if the amount equals 0.

In the second multivariate analysis, we investigate the determinants of CP, CL and TC borrowing amounts by using OLS panel regressions with firm-level fixed effects that isolate the time-series correlation between the dependent variables and other firm-level variables. Standard errors are clustered at the firm level. The dependent variables, *CP/TA*, *CL/TA* and *TC/TA*, are the outstanding amount of CP, the CL amount currently used and the accounts payable scaled by total assets, respectively.

We further investigate the choice between three sources by using as dependent variables the ratio of CP borrowing to the sum of CP and CL borrowing, TC borrowing to the sum of TC and CP borrowing, TC borrowing to the sum of TC and CL borrowing, and TC borrowing to the sum of all three sources.

The next step is to measure our variables of interest. Following Kahl et al. (2015), we use the capital expenditures divided by total assets (*Capex*) to test the transaction cost hypothesis for CP usage as well as to investigate whether the usage of CL and TC are driven by an investment need. However, our dataset does not allow us to investigate whether such investments will be refinanced using long-term debt. We also include the annual change in capital expenditures (*Change in Capex*) to examine if changes in investment policy influence the use of three credit sources.

The second variable of interest is Idiosyncratic Volatility (*IVOL*) that is to test the asymmetric information hypothesis. Following the method of Kahl et al. (2015) and Fu (2009), we construct Idiosyncratic Risk as follows: In every year, daily stock returns of each individual stock are regressed on the daily S&P 500 index return. We next compute the

yearly idiosyncratic volatility of the stock as the product of the standard deviation of the regression residuals and the square root of the number of observations in the year.

The third variable of interest is Free Cash Flow divided by sales (*FCF*) that is to test the agency hypothesis.

The fourth variable of interest is rollover risk (*EVOL*), measured as the volatility of earnings. We compute this variable as the standard deviation of earnings, scaled by total assets, over four-year horizon. Kahl et al. (2015) argue that since firms with more volatile earnings face greater rollover risk, they are more likely to encounter difficulty in repaying outstanding CP, thus they should be less likely to issue CP. All these variables of interest are lagged one period.

Following Kahl et al. (2015) and Acharya et al. (2013), we also consider a measure of economy-wide CP rollover risk, *High VIX*, an indicator variable that equals one for years in which the average daily VIX is at least one standard deviation above its mean for the years included in our analysis¹⁷. Based on this criterion, 2008 and 2009, i.e. the financial period, are two years when VIX is high. Therefore, in another analysis, we include *Pre-crisis* and *Crisis*, that equal 1 if the year is before the financial crisis, i.e. 2003 to 2007, and is in the financial crisis period, i.e. 2008 and 2009, and zero otherwise. The period after the financial crisis, *Post-crisis*, (2010 to 2014) is used as the reference category in the analysis.

The selection of the firm-level controls in $X_{i,t-1}$ also draws mainly on the study of Kahl et al. (2015). We include *Cash*, measured as cash and cash equivalents divided by total assets to examine the substitutability between cash and CP, CL and TC. We also include the annual sales growth, *Growth*, because fast-growing firms may have higher demand for external capital; the annual change in net working capital, *Change in NWC*, because CP, CL and TC may be used to finance working capital investments. In addition, we include net working capital excluding cash to measure cash substitutes, *NWC without Cash*. Firms with more cash substitutes are likely to use less CP, CL and TC as are firms with more cash. We also include the logarithm of Cash Conversion Cycle, *CCC*; because firms with a longer cash conversion cycle may have higher demand for cash or cash substitutes such as CP, CL or TC. As additional controls, we include operating cash flow (*Operating CF*), the market-to-book ratio (*M/B*), leverage (*Leverage*) and the logarithm of equity (*Equity*). The observations with negative equity are excluded from our regressions. All control variables are lagged one period. Detailed variable definitions and sources are given in Appendix 5.1.

Table 5.1 provides descriptive statistics for all the variables used in our regression analyses, averaged over all firm-years.

[Insert Table 5.1 here]

¹⁷ VIX stands for the Chicago Board Options Exchange (CBOE) Volatility Index, a measure of the implied volatility of S&P 500 index options. We extract daily VIX from <http://finance.yahoo.com/q/hp?s=%5EVIX&a=00&b=1&c=2003&d=11&e=31&f=2014&g=d>.

We winsorize all continuous variables at the 1th and 99th percentiles. We find that at the end of the fiscal year, mean CP borrowing corresponds to 1.9% of total assets (3.6% of total assets conditional on positive CP borrowing), lower than 4.19% (6.16%) in Kahl et al. (2015) for a larger sample with 321 firms during the period from 1991 to 2008. Year-end mean CL amount outstanding is 2.2% of total assets. Conditional on positive CL borrowing, year-end mean CL amount outstanding is 3.7% of total assets. Conditional on positive CP borrowing, year-end mean CL amount outstanding is approximately 1.8% of total assets, whereas the average draw on CL in Kahl et al. (2015) decreases from 6.1% of total assets in the three years before entering the CP market to 2.5% in the three years after entry. TC appears to be an important financing source representing 7.5% of total assets. Conditional on positive CL utilized, mean TC amount represents 7.7% of total assets. The ratio decreases to 7.3% conditional on positive CP borrowing. *t*-statistics suggest that active borrowers with positive CP borrowing use significantly less TC at the 10% level compared to those with zero CP borrowing, suggesting a substitution effect between the two sources.

The correlations among the independent variables are presented in Table 5.2.

[Insert Table 5.2 here]

Table 5.3 reports the levels of CP, CL and TC use for three periods, i.e. before, during and after the financial crisis over different year horizons; and the changes in firms' use of CP, CL and TC during the financial crisis from 2007 to 2009.

[Insert Table 5.3 here]

Panel A in Table 5.3 shows that there is no significant difference in terms of borrowings amount on CP and CL scaled by total assets between the periods before and during the financial crisis. By contrast, at the average CP borrowings amounts conditional on positive borrowing decrease significantly at the 5% level from 4.75% of total assets in the five years before the financial crisis to 3.84% during the financial crisis and to 3.24% in the five years after the financial crisis. In addition, we observe that CL amounts scaled by assets is higher during the financial crisis (2.68%) compared to the pre-crisis period (2.53%) and the post-crisis (1.72%). Similarly, the average CL borrowings amounts scaled by CL capacity increase from 18.01% in the five years before the financial crisis to 21.16% during the financial crisis and then decrease to 13.9% in the five years after the financial crisis at the 1% level. However, the average CL borrowing amounts conditional on positive borrowing decrease from 4.49% of total assets in the five years before the financial crisis to 3.93% during the financial crisis and 2.96% in the five years after the financial crisis. These findings suggest that firms are more likely to borrow from CL and tend to draw a larger portion from their existing bank CL in times of crisis. However, active CL borrowers may have more difficulty in drawing down on their CL to compensate for a reduction in market financing such as CP in such times.

On the other hand, the level of accounts payable decreases significantly during the financial crisis. The average borrowings on TC decrease from 8.13% of total assets in the five years

before the financial crisis to 7.21% during the financial crisis and to 7.18% in the five years after the financial crisis. The difference between the period before the crisis and during the crisis is significant at the 1% level. By contrast, there is no significant difference in terms of TC use between the crisis period and the period after the financial crisis.

Similar findings are presented for 3-year and 1-year horizon as can be seen in Panels B and C.

Panel D reports the annual changes in firms' use of CP, CL and TC during the financial crisis from 2007 to 2008 and 2008 to 2009. In line with Kahl et al. (2015), the test statistics show a significant decrease of 1.33% of total assets in the level of CP borrowings at the 1% level for the period 2008 to 2009. In contrast, firms draw 4.06% more of CL capacity from their bank CL for the period 2007 to 2008 while the borrowings through CL channel for the period 2008 to 2009 decrease by 9.42% of CL capacity. These changes are significant at the 1% level. On the other hand, the use of TC decreases significantly during the first half of the crisis period, by 0.2% of total assets at the 5% level.

Overall, we find that firms decrease their borrowings on CP during the financial crisis and increase CL to compensate for CP financing while they are not likely to increase TC in this period.

5.4 Empirical Results and Discussion

5.4.1 Determinants of the Likelihood of CP and CL Use

Table 5.4 shows the coefficients from the probit model for the likelihood of issuing CP and using CL. Models 1-3 display the results for the likelihood of CP issuance. Models 4-6 display the results for the likelihood of CL utilization.

[Insert Table 5.4 here]

We do not find support for the transaction cost hypothesis because the coefficients on Capex and Change in Capex are not statistically significant. Besides, our results show that firms with higher idiosyncratic volatility are less likely to use CP financing at 1%, in contrast to the prediction of the asymmetric information hypothesis. On the other hand, consistent with the agency hypothesis, firms with higher free cash flow are more likely to issue CP, this effect is however weakly significant. The marginal effects suggest that a one standard deviation increase in FCF increases the probability that a firm issuing CP by 8.4 percentage points whereas a one standard deviation increase in Idiosyncratic Volatility reduces the probability that a firm issuing CP by about 10 percentage points. On the other hand, consistent with the rollover risk hypothesis, we find that firms with higher earnings volatility is less likely to issue CP, however the coefficient is weakly significant. A one standard deviation increase in Earnings volatility decreases the probability of issuing CP by 3.9 percentage points. We do not find any significant impact of VIX on the likelihood of issuing CP since the coefficient on High VIX is not significant.

Focusing on control variables, consistent with Kahl et al. (2015), we find a negative and significant coefficient on Cash and NWC without Cash at the 5% and 1% level, respectively. That is, firms are more likely to issue CP when cash holdings are low or when they have fewer cash substitutes. The results further reveal that equity is positively associated with the likelihood of issuing CP. We obtain similar results in Models 2 and 3, which uses Pre-Crisis and Crisis as indicators for years and year fixed effects instead of VIX indicator, respectively.

Models 4-6 show that firms' use of CL is likely to be driven by investment need. We find a positive and significant coefficient on Capex at the 1% level with a marginal effect of 1.85 compared to the mean of 0.051 and standard deviation of 0.047. We do not find any significant evidence in support the asymmetric information and agency hypotheses. Earnings volatility appears to affect positively the likelihood of CL usage but the effect is not significant. By contrast, the coefficient on High VIX is positive and significant at 5%, suggesting that during the financial crisis (2008-2009) with higher implied stock market volatility, the probability of utilizing CL is significantly higher with a marginal effect of 5.3%. This provides evidence in support of the rollover risk hypothesis. This finding is in line with the research strand that highlights the importance of bank CL in times of crisis as a valuable financing source in overcoming the substantial decline in market liquidity and easing the negative effects of the financial constraints during such difficult times (Almeida et al., 2004; Campello et al., 2011, 2010; Gao and Yun, 2009; Gatev and Strahan, 2006; Ivashina and Scharfstein, 2010; Sufi, 2009).

Looking at the control variables, consistent with Campello et al. (2011), our results reveal that firms with larger cash holdings are less likely to borrow from their CL at 1%. We also find that firms with larger increases in net working capital are more likely to borrow from their CL at 1%. This suggests that CL borrowings are motivated not only by investment opportunities but also by a need to finance working capital. However, the market-to-book ratio is negatively correlated with the probability of using CL at 1%. Besides, we find a (weak) negative correlation between cash substitutes and the likelihood of using CL marginally at 10%. While firms with larger equity are more likely to issue CP, they are less likely to borrow from CL, most likely because they are larger firms and have a higher creditworthiness, hence have easier access to CP market.

We obtain similar results in Models 5 and 6. However, in Model 5, the coefficient on Crisis is positive but not significant while the coefficient on Pre-crisis is negative and significant at 5%, suggesting that CL is less likely to be utilized in the period before 2008. In addition, the results in Model 6 using year fixed effects reveal that firms are more likely to borrow from CL in 2008 at 1%. In another test where we exclude the observations with zero CL capacity, the results remain consistent (results not reported).

In summary, our results show that firms are more likely to issue CP when they have lower informational asymmetry, more severe moral hazard problems, lower cash holdings and fewer cash substitutes. On the other hand, firms are more likely to borrow through CL channel when they have demand to raise external capital to finance new investments and

working capital, lower cash holdings, fewer cash substitutes. While we do not find a significant effect of the financial crisis on the likelihood of CP issuance, we find a higher probability of utilizing CL during the financial crisis with higher implied stock market volatility especially as compared to the pre-crisis period, highlighting the role of bank lending in difficult times.

5.4.2 Determinants of CP, CL and TC Borrowing Amounts

Table 5.5 analyzes the determinants of CP borrowing amounts using OLS panel regressions with firm fixed effects.

[Insert Table 5.5 here]

Consistent with Kahl et al. (2015), Model 1 shows that CP borrowing is positively correlated with Capex at the 5% level. Hence, CP borrowing is higher when firm expenditures on investments are greater, providing evidence in support of the transaction cost hypothesis that predicts that firms use CP, short-term financing at a relatively low cost, as bridge financing to fund long-term investments. On the other hand, firms with higher idiosyncratic volatility issue less CP financing at 1%, in contrast to the prediction of the asymmetric information hypothesis. Unlike Kahl et al. (2015), we find support for the agency hypothesis: FCF is positive and significant at the 1% level, suggesting firms subject to more severe agency problems issue more CP. We do not find a significant effect of rollover risk measured by EVOL. Surprisingly, the coefficient on High VIX is positive and significant at 5%, suggesting that firms issue significantly more CP during the financial crisis that is associated with higher implied stock market volatility. This finding does not support the rollover risk hypothesis.

For control variables, we find that firms with more cash substitutes decrease their use of CP and that firms with higher operating cash flow and larger equity rely less on CP. By contrast, firms with higher market-to-book ratios issue more CP, further suggesting that CP usage is motivated by a need to finance investment opportunities. In the same vein, Kahl et al. (2015) find that higher market-to-book ratios are positively associated with the likelihood of entering CP market. Our results remain consistent in Models 2 and 3, which include both Pre-crisis and Crisis indicators, and year fixed effects, respectively.

Increased issuance of CP during the financial crisis may reflect the reaction of firms with higher creditworthiness, which are able to raise capital in CP market in such difficult times. Therefore, to shed light on this curious finding, we explore further the potential difference in CP issuance across firm's rollover risk in Model 4. Specifically, we investigate the effect of rollover risk by including three interaction terms between Pre-Crisis, Crisis, Post-crisis and LOWEVOL where LOWEVOL is a dummy variable that equals 1 if a firm has earnings volatility lower than the median of EVOL, which is 1.92%, and zero otherwise.

The results show that only firms with lower rollover risk increase significantly their issuance of CP during the financial crisis at the 10% level, likely because only those firms are able to do so. This finding provides further evidence in support of the rollover risk hypothesis. This

is consistent with Kahl et al. (2015) that indicate that rollover risk is negatively correlated with CP issuing.

To check whether our findings hold for the sub-sample of the actives CP borrowers with positive CP outstanding, in Model 5, we run the regression for this sub-sample. One can see that our results remain consistent.

Table 5.6 reports the results for CL borrowing amounts.

[Insert Table 5.6 here]

As can be seen in Model 1, capital expenditures increase the CL borrowing amount at 1%. Thus, investment opportunities increase not only the likelihood of using CL but also CL borrowing amounts. We do not find a significant effect of asymmetric information on CL usage whereas we find that firms subject to more severe agency problem, i.e. higher FCF, borrow more from CL at 5%, supporting the agency hypothesis. Rollover risk is negatively correlated with CL borrowing but only at 10% marginally, in contrast to the rollover risk hypothesis. In line with the effect of VIX on the likelihood of a firm using CL, we also find that firms increase their CL borrowing amounts in times of crisis with high VIX at 10%. This is in support of the rollover risk hypothesis.

As control variables, higher operating cash flow and larger equity are negatively and significantly associated with CL borrowing amounts at 1%. We find similar results with Pre-crisis and Crisis included in Model 2 and with year fixed effects included in Model 3. We also observe that in Model 3, the coefficient on IVOL is positive and significant at 10%, suggesting that firms subject to higher informational asymmetry borrow more from their CL. The effect of rollover risk is also more significant at 5%. This finding is not in line with Kahl et al. (2015) who suggest that firms with high rollover risk borrow more from bank CL. This is however consistent with Acharya et al. (2014, 2013) who suggest that firms with higher liquidity risk and greater aggregate risk face greater costs on their CL, in turn are likely to use cash instead of CL. This is also in line with Martin and Santomero (1997) who suggest that while CL demand is positively related to business growth prospects, it is potentially negatively related to uncertainty in those prospects. Model 3 further shows that firms increase significantly their CL borrowing in 2007 and 2008 at 5% and 1%, respectively. By contrast, CL borrowing tends to decrease afterwards with a significant coefficient at 5% for 2010.

Considering the effects of rollover risk on CL borrowing amounts before, during and after the financial crisis, Model 4 includes the interaction terms between Pre-Crisis, Crisis, Post-crisis and LOWEVOL. In contrast to CP, firms with lower rollover risk borrow less from their CL during the financial crisis at 5%, implying that firms with higher rollover risk increase their use of CL (by 0.9% of total assets) to compensate for a lower use of CP (by 0.9% of total assets) in times of crisis. Hence, our results suggest that firms with high rollover risk use CL as a substitute for CP since for those firms CP may become either unavailable or too costly in time of crises (Anderson and Gascon, 2009; Gatev and Strahan, 2006). On the other hand, firms with low rollover risk use CP instead of CL because CP is substantially cheaper for

them. This finding is consistent with Kahl et al. (2015) and provides further support for the rollover risk hypothesis. This is also in line with Gao and Yun (2009) who suggest that the decline in aggregate CP borrowing after the collapse of Lehman Brothers was concentrated among firms with high default risk. They show that these high default risk firms drew heavily from existing CL to compensate for their lost borrowing the CP market whereas firms with low default risk are not likely to do so. We find consistent results using the sub-sample of active borrowers with positive CL amounts in Model 5.

The results on the determinants of TC borrowing amounts are reported in Table 5.7.

[Insert Table 5.7 here]

In sharp contrast to CP and CL debt, Model 1 shows a negative coefficient on Capex at the 1% level, suggesting that firms are not likely to use TC to finance new investments. This is in line with Petersen and Rajan (1997) who argue that it is unlikely that a firm will finance long-term projects with TC for the purpose of matching the maturity of assets and liabilities, and with Casey and O'Toole (2014) who find that TC is used mainly to finance working capital requirement. We do not find support for the asymmetric information hypothesis because the coefficient on IVOL is not statistically significant. Unlike CP and CL, moral hazard problems lead firms to use less TC at the 1% level, which is contrary to the prediction of the agency hypothesis. EVOL is negatively related to TC usage but only marginally at 10%. Firms with high rollover risk appear to use less TC, in contrast to the rollover risk hypothesis. One possible explanation is that the suppliers are less willing to lend to firms with high risk, which is suggested with many studies on TC (Danielson and Scott, 2004; Giannetti et al., 2011; Petersen and Rajan, 1997).

Looking at the effect of VIX, we find that high VIX, that is associated with the financial crisis period, decreases TC usage at 1%. This finding also does not support the rollover risk hypothesis. The result is supported in Model 2, which shows that while firms use more TC in the period before the financial crisis at the 1% level, they use less TC during the crisis period at 10%. These findings suggest that financial crises restrict the access to TC of firms, most likely because the reduction in bank loans in such difficult times causes the reduction in TC availability, thus the liquidity shocks may be propagated along the supply chains. This is in line with several previous studies (Garcia-Appendini and Montoriol-Garriga, 2013; Love et al., 2007; Love and Zaidi, 2010) that show a limited role of TC in offsetting the negative shock in the bank credit supply in times of crisis. Particularly, Love and Zaidi (2010) find a positive correlation between bank credit and TC in times of the crisis, suggesting a complementary effect. However, our results suggest that firms may increase TC after the financial crisis. This is consistent with Love et al. (2007) who find that the provision of TC increases right after a crisis and gradually declines afterwards, suggesting that TC terms cannot fully compensate for the long-term contraction in bank credit that stems from a financial crisis.

Additionally, our results provide mixed support for the view that TC usage is driven by a need to finance working capital. While firms with more cash substitutes use more TC at 1%, consistent with TC financing working capital, we also find that firms with longer cash conversion cycle and larger increases in net working capital use less TC at 1%. Operating cash flow and Leverage affect positively TC usage at 1%. We obtain similar results in both models 2 and 3, which include Pre-crisis and Crisis indicators, and year fixed effects, respectively.

The results for the interaction terms between Pre-Crisis, Crisis, Post-crisis and LOWEVOL are reported in Model 4. We do not find any significant effect of rollover risk on the firms' usage of TC during the financial crisis.

5.4.3 The Choice between CP, CL and TC

We investigate the choice between CP, CL and TC in Table 5.8. The regressions in Panel A include High VIX indicator whereas those in Panel B use year fixed effects instead. We use the ratio of CP borrowing to the sum of CP and CL borrowing; TC borrowing to the sum of TC and CP borrowing; TC borrowing to the sum of TC and CL borrowing; and TC borrowing to the sum of all three sources as dependent variables in Models 1-4 for both panels, respectively.

[Insert Table 5.8 here]

Consistent with Kahl et al. (2015), Model 1 in Panel A shows that Capex and Change in Capex are not statistically significant, suggesting that both CP and CL are used to finance new investments; and higher rollover risk is associated with significantly less usage of CP relative to CL at 10%. This provides further evidence for the rollover risk hypothesis. However, the coefficient on High VIX is not significant. In addition, higher level of asymmetric information is associated with significantly less usage of CP relative to CL ($p < 0.01$), supporting the asymmetric information hypothesis. By contrast, we find that higher FCF, i.e. more severe agency problems, increases CP more than CL ($p < 0.05$). This finding is again in contrast to the agency hypothesis. We also find that higher market-to-book ratios and larger equity are associated with significantly more usage of CP relative to CL. On the other hand, we do not any significant coefficient on the variables measuring working capital requirement.

The results in Model 2 show that higher demand for new investments is associated with significantly less usage of TC relative to CP at 1%. Asymmetric information increases significantly TC more than CP at 1%, in line with the asymmetric information hypothesis. On the other hand, moral hazard problems increase significantly CP more than TC at 1%, in contrast to the agency hypothesis. Hence, while CP appears to be better than TC in overcoming moral hazard problems, TC may substitute for CP when firms are subject to higher level of asymmetric information. TC theories provide an explanation for this finding; thereby suppliers have comparative advantage in information acquisition (Biais and Gollier, 1997; Jain, 2001; Smith, 1987).

Furthermore, as expected, we find that higher rollover risk is associated with significantly higher use of TC relative to CP at 5%, which is consistent with Kahl et al. (2015) who find the same relationship between the rollover risk and Non-CP debt. This suggests that TC may be used as a substitute for CP by firms with high rollover risk and provides some evidence for the rollover risk hypothesis. By contrast, we do not find a significant coefficient on High VIX. In addition, firms with more cash substitutes use significantly more TC relative to CP whereas firms with longer cash conversion cycle use significantly less TC relative to CP. Higher operating cash flows are also associated with more usage of TC relative to CP. These findings suggest that firms use both TC and CP to finance working capital.

As can be seen in Model 3, a higher demand for new investments is also associated with significantly less usage of TC relative to CL at 1%. We do not find a significant effect of asymmetric information on the choice between TC and CL. By contrast, more severe moral hazard problems tend to increase significantly CL more than TC at 1%. These findings do not support the compelling hypothesis in TC literature that TC is better than bank credit in overcoming market frictions, especially for small businesses. It is likely that the suppliers' advantage in information acquisition is less beneficial to large listed firms, which forms our sample. Since they are more transparent than small private-held businesses, it is easier for banks to collect information and engage in more monitoring, especially in United States with a very developed banking system. Similarly, in countries with efficient legal systems, the suppliers' advantage over banks in controlling the borrower tends to be also weaker. Besides, large listed firms tend to rely on bank credit rather than on TC when they have difficulty in raising funds from capital markets most likely because bank credit is available to them. A theoretical support is provided by Burkart and Ellingsen (2004) who suggest that very wealthy entrepreneurs do not use TC whereas those with intermediate level of wealth substitute TC for bank credit and those with the lowest level of wealth are not able to do so.

While we do not find a significant coefficient on earnings volatility, we find that during the period with high VIX (2008-2009), firms use significantly less TC relative to CL at 5%, in line with our earlier findings.

The results also suggest that while firms with longer cash conversion cycle use less TC relative to CL at 10%, firms with more cash substitutes use more TC relative to CL at 10%. Combined with the findings in Model 2, our results suggest that all three sources, CP, CL and TC are used to finance working capital requirement. Further, firms with higher operating cash flow, higher market-to-book ratios and larger equity tend to use TC more than CL.

The results in Model 4 further confirm our earlier findings. Firms with higher capital expenditures use significantly less TC relative to CP and CL at 1%. That is, TC is more likely to be used for working capital financing whereas CP and CL tend to be both used to finance investments opportunities. While asymmetric information induces firms to increase significantly TC more than CP and CL at 1%, moral hazard problems induce firms to increase significantly CP and CL more than TC at 1%. This again suggests that CP and CL are better than TC in mitigating those problems. Further, Higher VIX is associated with more usage of

CL and CP relative to TC. We also find that the usage of three sources, CP, CL and TC, is motivated by a need to finance working capital. That is, firms with more cash substitutes use significantly more TC at 1% while firms with longer cash conversion cycle use significantly less TC at 1%. Last, firms with higher operating cash flow and larger equity tend to use TC more than CP and CL.

Our main results remain consistent in Panel B, which uses year dummies. However, the coefficient on IVOL in Model 3 for the choice between CL and TC becomes significant at 10%, suggesting that firms subject to more severe asymmetric information problems use more CL relative to TC. Furthermore, the results suggest that TC tends to decrease relative to CL in 2008 and increase relative to CP and CL afterwards, consistent with Love et al. (2007).

5.5 Conclusion

In this chapter, we investigate the use of CP, CL and TC by non-financial S&P 500 firms during the financial crisis with an attempt to explore the relationship between them. Based on the study of Kahl et al. (2015), to address our research question, we test four hypotheses, i.e. the transaction cost hypothesis, the asymmetric information hypothesis, the agency hypothesis and the rollover risk hypothesis. We find that firms with higher rollover risk tend to borrow more from bank CL and TC relative to CP, supporting the substitutability of CL and TC for CP. We also find that firms with higher rollover risk use more CL to compensate for a lower use of CP in times of crisis, supporting the role of bank CL in easing firms' financing constraints in such difficult times. Besides, TC may be used as a substitute to CP by firms with severe asymmetric information problems. Our results also suggest that during the financial crisis firms increase significantly their borrowing from CL whereas TC usage decreases. Furthermore, TC tends to decrease relative to CL in 2008 and increase relative to CP and CL afterwards. This finding is consistent with previous studies that demonstrate a limited role of TC in compensating for a decline in bank credit stemming from such a crisis (Love et al., 2007; Love and Zaidi, 2010). Our results, on the other hand, provide little evidence on the substitutability of TC for bank CL.

Consistent with Kahl et al. (2015), we find evidence in support of the transaction cost hypothesis of CP issuance by showing that CP, a very short-term debt, is used to finance investment projects most likely because it lowers the transaction costs associated with raising external capital. Besides, we show that CL are used to finance both investments and working capital requirement whereas firms do not use TC to finance investments. We provide some evidence in support of the asymmetric information hypothesis. More specifically, our results suggest that CL and TC are better than CP in overcoming asymmetric information problems. We find mixed evidence on the agency hypothesis. We show that both CP and CL are likely to help mitigate moral hazard problems with a stronger effect for CP. By contrast, TC is used less by firms with more severe moral hazard problems.

In addition, we find that firms are more likely to issue CP when they have lower informational asymmetry and more severe moral hazard problems. Our analyses on the usage

of CP, CL and TC over different year horizons further show that for active borrowers with positive CP outstanding amounts, on average, CP usage decreases significantly from 4.75% of assets in the five years before the financial crisis to 3.84% during the financial crisis and 3.24% in the five years after the financial crisis.

Although our study sheds some new light on the relationship between firm's usage of CP, bank CL and TC, it leaves many areas for future research. For instance, further investigation is needed to explore the reason why CP is better in resolving moral hazard problems while bank CL and TC are better in overcoming asymmetric information problems, and whether rollover risk and other factors such as tangible assets and size affect these outcomes. In addition, in this study, unlike Kahl et al. (2015), we do not construct a control sample of firms that are able to access the CP market but choose not to do so to compare with CP issuers, which would provide additional insights into the relationship between the usage of CP, CL and TC. Kahl et al. (2015) define those firms as firms that have a long-term credit rating of BBB or higher but never have a short-term credit rating. Identifying such firms take time to collect information on long-term issuer ratings from Bloomberg database. We therefore hope that in a future research, we will be able to construct this control sample. Further, our data include only US firms, and thus future research may investigate whether our results hold for other countries as well as for multi-country sample. Besides, more research is needed to test whether the patterns we find hold for different firm sizes and whether our results are robust to a different sample of crisis episodes.

Appendix 5.1: Variable Definitions and Sources

This appendix provides the detailed definitions and sources of all the variables used in our analyses. Data have been collected from Bloomberg database and Yahoo Finance.

Variable name	Definition	Source
<i>Dependent variables</i>		
CP (0,1)	A binary variable that equals 1 if a firm's total amount of CP issued by the company at the balance sheet date (Outstanding CP amount) is greater than 0, and zero if the amount equals 0	Bloomberg
CL (0,1)	A binary variable that equals 1 if a firm's CL amount currently used (Outstanding CL amount) is greater than 0, and zero if the amount equals 0	Bloomberg
CP/TA	Outstanding CP amount scaled by total assets	Bloomberg
CL/TA	Outstanding CL amount scaled by total assets	Bloomberg
TC/TA	Accounts payable scaled by total assets	Bloomberg
CP/(CP+CL)	The ratio of outstanding CP amount to the sum of outstanding CP and CL amount	Bloomberg
TC/(TC+CP)	The ratio of accounts payable to the sum of accounts payable and outstanding CP amount	Bloomberg
TC/(TC+CL)	The ratio of accounts payable to the sum of accounts payable and outstanding CL amount	Bloomberg
TC/(TC+CL+CP)	The ratio of accounts payable to the sum of accounts payable, outstanding CL and CP amount	Bloomberg
<i>Variables of interest</i>		
Capex	The capital expenditures scaled by total assets	Bloomberg
Change in Capex	The annual change in capital expenditures	Bloomberg
IVOL	Yearly Idiosyncratic Volatility, measured as the product of the standard deviation of the regression residuals of daily returns of the company's stock on the daily S&P 500 index return and the square root of the number of observations in the year	Bloomberg
FCF	Free Cash Flow scaled by sales	Bloomberg
EVOL	Rollover risk, measured as the volatility of earnings by computing the standard deviation of earnings, scaled by total assets, over four-year horizon	Bloomberg
High VIX (Crisis)	A binary variable that equals 1 for years in which the average daily VIX is at least one standard deviation above its mean for the years included in our analysis	Yahoo Finance
Period	A vector of binary variables, <i>Pre-crisis</i> , <i>Crisis</i> and <i>Post-Crisis</i> , that equal 1 if the year is before the financial crisis (2003-2007), and is in the financial crisis period (2008-2009), and after the financial crisis (2010-2014), respectively, and zero otherwise.	

Appendix 5.1 (continued): Variable Definitions and Sources

Variable name	Definition	Source
<i>Control variables</i>		
Cash	Cash and cash equivalents scaled by total assets	Bloomberg
Growth	The annual sales growth	Bloomberg
Change in NWC	The annual change in net working capital	Bloomberg
NWC without Cash	Net working capital excluding cash scaled by total assets	Bloomberg
CCC	The natural logarithm of Cash Conversion Cycle	Bloomberg
Operating CF	Operating cash flow scaled by total assets	Bloomberg
M/B	The market-to-book ratio	Bloomberg
Leverage	Total liabilities scaled by total assets	Bloomberg
Equity	The natural logarithm of equity	Bloomberg

5.6 References of Chapter 5

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5.7 Tables of Chapter 5

Table 5.1: Descriptive Statistics

This table provides the descriptive statistics for our sample. Data have been collected from Bloomberg database and Yahoo Finance. *High VIX* is a binary variable that equals 1 for years in which the average daily VIX is at least one standard deviation above its mean for the years included in our analysis, and zero otherwise. *Pre-crisis* is a binary variable that equals 1 if the year is before 2008, and zero otherwise. *Crisis* is a binary variable that equals 1 if the year is 2008 or 2009, and zero otherwise. All other variables are lagged one period and winsorized at the 1% and 99% level. Detailed variable definitions and sources are given in Appendix 5.1.

Variables	Obs	Mean	SD	Min	Max
CP (0,1)	1581	.521	.499	0	1
CL (0,1)	3913	.592	.491	0	1
CP/TA	1581	.019	.033	0	.188
CP/TA (CP>0)	824	.036	.038	.0000265	.188
CL/TA	3912	.022	.042	0	.259
CL/TA (CL>0)	2317	.037	.049	1.93e-06	.259
CL/TA (CP>0)	736	.017	.032	0	.252
TC/TA	4708	.075	.073	.004	.408
TC/TA (CL>0)	2305	.077	.072	.004	.408
TC/TA (CP>0)	823	.073	.06	.004	.408
CP/(CP+CL)	1064	.510	.421	0	1
TC/(TC+CP)	1576	.824	.236	.070	1
TC/(TC+CL)	3900	.820	.247	0	1
TC/(TC+CL+CP)	1380	.708	.279	.042	1
Capex	4328	.051	.047	.003	.265
Change in Capex	4275	.004	.020	-.071	.098
IVOL	4048	.258	.122	.084	1
FCF	4331	.083	.124	-.551	.385
EVOL	4277	.032	.036	0	.281
High VIX (Crisis)	4917	.166	.372	0	1
Pre-crisis	4917	.414	.492	0	1
Crisis	4917	.166	.372	0	1
Cash	4632	.092	.090	.0009	.449
Growth	4282	.109	.195	-.391	.997
Change in NWC	4275	.017	.072	-.228	.264
NWC without Cash	4285	.061	.143	-.253	.552
CCC	3465	3.961	1.002	.601	5.828
Operating CF	4329	.121	.066	-.066	.326
M/B	4085	3.649	4.057	-12.266	26.446
Leverage	4691	.565	.197	.126	1.164
Equity	4241	8.286	1.265	2.574	12.103

Table 5.1 (continued): Descriptive Statistics

Variables				
<i>CL/TA</i>	<i>Difference</i>	<i>Std. Err.</i>	<i>t-test</i>	<i>Prob.</i>
CP=0 versus CP>0	.0007	.0019	0.37	0.353
<i>TC/TA</i>	<i>Difference</i>	<i>Std. Err.</i>	<i>t-test</i>	<i>Prob.</i>
CL=0 versus CL>0	-.001	.002	-0.425	0.6648
CP=0 versus CP>0	.004	.003	1.359	0.087

Table 5.2: Correlation Table

This table shows Pearson correlation coefficients for the independent variables. *High VIX* is a binary variable that equals 1 for years in which the average daily VIX is at least one standard deviation above its mean for the years included in our analysis, and zero otherwise. *Pre-crisis* is a binary variable that equals 1 if the year is before 2008, and zero otherwise. *Crisis* is a binary variable that equals 1 if the year is 2008 or 2009, and zero otherwise. All other variables are lagged one period and winsorized at the 1% and 99% level. Detailed variable definitions and sources are given in Appendix 5.1. * Statistical significance at the 5% level.

Variables	1	2	3	4	5	6	7	8	9
1 Capex	1								
2 Change in Capex	0.49*	1							
3 IVOL	0.11*	0.02	1						
4 FCF	-0.52*	-0.25*	-0.10*	1					
5 EVOL	0.002	0.001	0.39*	0.06*	1				
6 Pre-crisis	0.01	0.08*	-0.05*	-0.03*	0.03*	1			
7 Crisis (High VIX)	0.07*	0.04*	0.28*	-0.04*	-0.01	-0.37*	1		
8 Cash	-0.19*	-0.01	0.26*	0.28*	0.24*	-0.05*	-0.01	1	
9 Growth	0.12*	0.31*	0.16*	0.007	0.11*	0.19*	0.02	0.13*	1
10 Change in NWC	-0.07*	-0.05*	0.13*	0.13*	0.07*	0.03*	-0.06*	0.30*	0.17*
11 NWC without Cash	-0.14*	-0.01	0.14*	0.13*	0.12*	0.04*	-0.03*	0.10*	0.10*
12 CCC	-0.29*	-0.07*	0.02	0.21*	0.07*	-0.02	-0.02	0.11*	-0.02
13 Operating CF	0.24*	0.13*	0.04*	0.47*	0.06*	-0.03*	0.03*	0.33*	0.13*
14 M/B	-0.05*	0.04*	0.008	0.11*	-0.005	0.06*	-0.02	0.20*	0.14*
15 Leverage	-0.04*	-0.07*	-0.14*	-0.24*	-0.12*	-0.05*	0.02	-0.29*	-0.22*
16 Equity	-0.01	-0.05*	-0.32*	0.09*	-0.08*	-0.17*	-0.01	-0.22*	-0.13*

Table 5.2 (continued): Correlation Table

Variables	10	11	12	13	14	15	16
10 Change in NWC	1						
11 NWC without Cash	0.30*	1					
12 CCC	0.08*	0.46*	1				
13 Operating CF	0.09*	0.09*	-0.02	1			
14 M/B	0.10*	0.06*	0.09*	0.23*	1		
15 Leverage	-0.21*	-0.48*	-0.19*	-0.30*	-0.03*	1	
16 Equity	-0.08*	-0.17*	-0.20*	-0.08*	-0.37*	-0.08*	1

Table 5.3: The Use of CP, CL and TC before, during and after the Financial Crisis

This table reports the levels of borrowing amounts of CP, CL and TC of the firms in our sample for three periods, before the financial crisis (2003-2007), during the financial crisis (2008-2009) and after the financial crisis (2010-2014). *CP/TA*, *CL/TA* and *TC/TA* are the outstanding CP amount, the outstanding CL amount and the accounts payable, respectively, scaled by total assets. *CL Capacity* is the maximum allowed borrowing under CL. The mean and median statistics over five, three and one year(s) before and after the financial crisis are reported in Panel A, B and C, respectively. Statistics from a *t*-test (Wilcoxon-Mann-Whitney test) for the significance of the difference in the mean (median) for each pair of periods are reported in the columns called “Test”. Panel D reports the statistics for the changes in firms' use of CP, CL and TC during the financial crisis (2007-2009). The statistical significance of the one-sample mean (median) based on a *t*-test (sign test) is reported for each financing source. Medians are in parentheses. The number of observations is reported below the mean and median. ***, **, and * Statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A. Five-Year Horizon (2003-2014)

	Pre-Crisis (A)	Crisis (B)	Post-Crisis (C)	Test (A-B)	Test (C-B)	Test (C-A)
CP/TA	.0201 (0) 406	.0202 (.0019) 260	.0182 (.0050) 915	-0.027 (-1.672*)	-0.907 (0.817)	-0.99 (2.95***)
CP/TA (>0)	.0475 (.0316) 172	.0384 (.0241) 137	.0324 (.0210) 515	1.765** (2.214**)	-1.75** (-0.25)	-4.69*** (-3.55***)
CL/TA	.0253 (.0023) 1519	.0268 (.0085) 662	.0172 (.0011) 1731	-0.68 (-4.177***)	-5.69*** (-6.42**)	-5.52*** (-2.13**)
CL/TA (>0)	.0449 (.0232) 857	.0393 (.0214) 452	.0296 (.0137) 1008	1.76** (0.76)	-4.008*** (-4.91***)	-6.69*** (-6.78***)
CL/CL Capacity	.1801 (.0434) 1464	.2116 (.0918) 644	.1390 (.017) 1691	-2.56*** (-3.82***)	-6.63*** (-6.47***)	-4.86*** (-2.80***)
CL Capacity/TA	.1189 (.0953) 1585	.1167 (.0987) 740	.1067 (.0896) 1895	0.55 (-0.67)	-2.98*** (-2.82***)	-4.26*** (-2.48**)
TC/TA	.0813 (.0577) 1892	.0721 (.0502) 793	.0718 (.0485) 2023	2.96*** (3.58***)	-0.08 (-1.06)	-4.01*** (-6.05***)

Table 5.3 (continued): The Use of CP, CL and TC before, during and after the Financial Crisis

Panel B. Three-Year Horizon (2005-2012)

	Pre-Crisis (A)	Crisis (B)	Post-Crisis (C)	Test (A-B)	Test (C-B)	Test (C-A)
CP/TA	.0227 (0) 266	.0202 (.0019) 260	.0158 (.0018) 538	0.729 (-0.692)	-1.87** (-0.59)	-2.84*** (0.11)
CP/TA (>0)	.0507 (.0351) 119	.0384 (.0241) 137	.0310 (.0209) 275	2.172** (2.758***)	-1.95** (-0.52)	-4.88*** (-4.07***)
CL/TA	.0268 (.0043) 970	.0268 (.0085) 662	.0169 (.0013) 1004	.000 (-2.578***)	-5.32*** (-5.43***)	-5.24*** (-2.73***)
CL/TA (>0)	.0445 (.0226) 585	.0393 (.0214) 452	.0282 (.0127) 603	1.54* (0.43)	-4.22*** (-4.82***)	-5.76*** (-5.46***)
CL/CL Capacity	.1890 (.0625) 939	.2116 (.0918) 644	.1416 (.0251) 972	-1.68** (-2.26**)	-5.67*** (-5.27***)	-4.37*** (-3.05***)
CL Capacity/TA	.1204 (.0968) 1002	.1167 (.0987) 740	.1051 (.0893) 1142	0.87 (-0.16)	-3.19*** (-2.97***)	-4.23*** (-2.94***)
TC/TA	.0815 (.0565) 1152	.0721 (.0502) 793	.0729 (.0497) 1223	2.79*** (3.41***)	0.24 (-0.48)	-2.82*** (-4.36***)

Panel C. One-Year Horizon (2007-2010)

	Pre-Crisis (A)	Crisis (B)	Post-Crisis (C)	Test (A-B)	Test (C-B)	Test (C-A)
CP/TA	.025 .000026 93	.0202 (.0019) 260	.0119 (0) 174	1.03 (0.37)	-2.59*** (-2.31**)	-3.25*** (-2.01**)
CP/TA (>0)	.0496 (.0351) 47	.0384 (.0241) 137	.0281 (.0178) 74	1.46* (1.77*)	-1.79** (-1.07)	-3.04*** (-2.43**)
CL/TA	.03 (.0062) 336	.0268 (.0085) 662	.0170 (.0020) 337	1.008 (-0.64)	-3.65*** (-3.67***)	-3.83*** (-2.40**)
CL/TA (>0)	.0471 (.0253) 214	.0393 (.0214) 452	.0275 (.0123) 209	1.80** (1.02)	-3.16*** (-3.74***)	-4.02*** (-3.94***)

Table 5.3 (continued): The Use of CP, CL and TC before, during and after the Financial Crisis

Panel C (continued). One-Year Horizon (2007-2010)

	Pre-Crisis (A)	Crisis (B)	Post-Crisis (C)	Test (A-B)	Test (C-B)	Test (C-A)
CL/CL Capacity	.2007 (.084)	.2116 (.0918)	.1388 (.0342)	-0.60	-4.21***	-3.42***
	327	644	325	(-0.60)	(-3.62***)	(-2.59***)
CL Capacity/TA	.1238 (.0995)	.1167 (.0987)	.1056 (.0905)	1.28	-2.22**	-2.90***
	350	740	378	(0.54)	(-2.07**)	(-2.17**)
TC/TA	.0801 (.0557)	.0721 (.0502)	.0729 (.0494)	1.81**	0.19	-1.38*
	390	793	406	(2.26**)	(-0.27)	(-2.18**)

Panel D. Changes in Firms' Use of CP, CL and TC during the Financial Crisis

	07-08 (A)	<i>t</i> -test (Sign Test)	08-09 (B)	<i>t</i> -test (Sign Test)	Test (A-B)
CP/TA	-.0020 (0)	-.53	-.0133 (-.0004)	-4.25***	2.34***
	75	(0.09*)	84	(.0002***)	(1.86*)
CP/TA (>0)	-.0023 (-.0063)	-.34	-.0108 (-.0051)	-2.24**	1.03
	42	(.22)	41	(0.07*)	(0.57)
CL/TA	.0031 (0)	1.38*	-.0093 (0)	-4.40***	4.01***
	307	(.007***)	305	(.000***)	(5.31***)
CL/TA (>0)	.0061 (.0012)	2.009**	-.0081 (-.0011)	-2.87***	3.42***
	221	(0.0009***)	207	(0.008***)	(4.46***)
CL/CL Capacity	.0406 (0)	2.52***	-.0942 (-.0008)	-5.95***	5.97***
	300	(.047**)	296	(.000***)	(5.48***)
CL Capacity/TA	.0007 (0)	.32	.00008 (0)	.04	.22
	347	(.18)	362	(.77)	(1.22)
TC/TA	-.0020 (-.0009)	-1.89**	-.0008 (-.0006)	-0.88	-.79
	390	(.018**)	393	(.052*)	(-.38)

Table 5.4: Probit Regressions for the Likelihood of CP and CL Use

This table presents the results of probit regressions with firm fixed effects predicting the likelihood of the use of CP and CL. In Models 1-3, the dependent variable is *CP* (0,1), a binary variable that equals 1 if a firm's outstanding CP amount is greater than 0, and zero if the amount equals 0. In Models 4-6, the dependent variable is *CL* (0,1), a binary variable that equals 1 if a firm's outstanding CL amount is greater than 0, and zero if the amount equals 0. *High VIX* is a binary variable that equals 1 for years in which the average daily VIX is at least one standard deviation above its mean for the years included in our analysis, and zero otherwise. *Pre-crisis*, *Crisis* and *Post-crisis* are binary variables that equal 1 if the year is before 2008, during 2008 and 2009, and after 2009, respectively, and zero otherwise. All other variables are lagged one period and winsorized at the 1% and 99% level. Detailed variable definitions and sources are given in Appendix 5.1. Standard errors are clustered at the firm level and *z*-statistics are reported in parentheses. ***, **, and * Statistical significance at the 1%, 5%, and 10% level, respectively.

Variables	(1) CP	(2) CP	(3) CP	(4) CL	(5) CL	(6) CL
Capex	2.54 (0.85)	2.44 (0.82)	2.51 (0.83)	5.33*** (2.57)	5.22** (2.49)	5.32** (2.51)
Change in Capex	-3.45 (-1.09)	-3.35 (-1.07)	-3.44 (-1.11)	-2.61 (-1.28)	-2.35 (-1.14)	-3.04 (-1.45)
IVOL	-2.58*** (-3.18)	-2.55*** (-3.13)	-2.78** (-2.41)	.21 (0.52)	.19 (0.47)	.70 (1.31)
FCF	2.04 (1.50)	1.98 (1.46)	2.03 (1.47)	.73 (0.81)	.72 (0.78)	.82 (0.90)
EVOL	-3.21 (-1.37)	-3.14 (-1.37)	-2.79 (-1.20)	.69 (0.50)	.78 (0.57)	.47 (0.33)
High VIX (Crisis)	.11 (0.94)			.15** (2.36)		
Pre-Crisis		-.14 (-0.88)			-.18** (-2.12)	
Crisis		.06 (0.50)			.07 (0.97)	
Cash	-2.55** (-2.23)	-2.73** (-2.33)	-2.74** (-2.31)	-2.36*** (-3.33)	-2.60*** (-3.50)	-2.75*** (-3.65)
Growth	.14 (0.45)	.22 (0.70)	.30 (0.80)	.19 (1.05)	.26 (1.41)	.22 (1.10)
Change in NWC	.76 (1.00)	.76 (0.99)	.84 (1.12)	1.74*** (3.65)	1.75*** (3.69)	1.86*** (3.90)
NWC without Cash	-2.56*** (-3.28)	-2.56*** (-3.26)	-2.55*** (-3.30)	-.80 (-1.57)	-.85* (-1.67)	-.89* (-1.75)
CCC	.08 (0.97)	.07 (0.85)	.06 (0.79)	-.01 (-0.18)	-.01 (-0.28)	-.01 (-0.23)
Operating CF	-2.06 (-1.01)	-1.99 (-0.98)	-2.05 (-1.00)	-1.89 (-1.45)	-1.87 (-1.42)	-1.85 (-1.40)

Table 5.4 (continued): Probit Regressions for the Likelihood of the Use of CP and CL

Variables	(1) CP	(2) CP	(3) CP	(4) CL	(5) CL	(6) CL
M/B	.02 (1.14)	.02 (1.21)	.02 (1.11)	-.05*** (-3.36)	-.05*** (-3.33)	-.05*** (-3.40)
Leverage	.19 (0.31)	.11 (0.18)	.11 (0.19)	.77* (1.88)	.70 (1.70)	.79* (1.87)
Equity	.14** (2.09)	.13** (1.91)	.13* (1.79)	-.25*** (-4.22)	-.26*** (-4.35)	-.27*** (-4.30)
Intercept	-.66 (-0.69)	-.45 (-0.46)	-.20 (-0.20)	2.23*** (3.12)	2.54*** (3.36)	2.34*** (2.99)
Year Dummies	No	No	Yes	No	No	Yes
2004			-.14 (-0.61)			-.439*** (-3.12)
2005			-.42* (-1.93)			-.19 (-1.50)
2006			-.53*** (-2.60)			-.044 (-0.36)
2007			-.02 (-0.11)			.137 (1.19)
2008			-.107 (-0.60)			.309*** (2.59)
2009			-.01 (-0.04)			-.12 (-0.79)
2010			-.099 (-0.41)			.023 (0.19)
2011			-.176 (-1.10)			.15 (1.47)
2012			-.135 (-0.87)			.053 (0.57)
2013			-.236* (-1.65)			.052 (0.74)
Pseudo- R ²	0.1382	0.1394	0.1450	0.0850	0.0876	0.0969
Observations	1055	1055	1055	2443	2443	2443
Number of Firms	222	222	222	304	304	304

Table 5.5: Firm Fixed Effects Panel Regressions of CP Borrowing Amounts

This table presents the results of OLS panel regressions of outstanding amounts of CP with firm fixed effects. The dependent variable is *CP/TA*, measured as the outstanding CP amount scaled by total assets. Model 5 reports the results for the sample of firms with positive CP borrowing. *High VIX* is a binary variable that equals 1 for years in which the average daily VIX is at least one standard deviation above its mean for the years included in our analysis, and zero otherwise. *Pre-crisis*, *Crisis* and *Post-crisis* are binary variables that equal 1 if the year is before 2008, during 2008 and 2009, and after 2009, respectively, and zero otherwise. All other variables are lagged one period and winsorized at the 1% and 99% level. Detailed variable definitions and sources are given in Appendix 5.1. Standard errors are clustered at the firm level and *t*-statistics are reported in parentheses. ***, **, and * Statistical significance at the 1%, 5%, and 10% level, respectively.

Variables	(1) CP/TA	(2) CP/TA	(3) CP/TA	(4) CP/TA	(5) CP/TA (>0)
Pre-crisis*				.004	.007
LOWEVOL				(0.92)	(1.00)
Crisis*				.009*	.012*
LOWEVOL				(1.8)	(1.66)
Post-crisis*				-.005	-.010
LOWEVOL				(-1.28)	(-1.60)
Capex	.11**	.12**	.11*	.12**	.23***
	(2.00)	(2.01)	(1.92)	(2.14)	(2.96)
Change in Capex	-.04	-.04	-.06	-.04	.010
	(-0.93)	(-0.96)	(-1.28)	(-0.91)	(0.12)
IVOL	-.05***	-.05***	-.04**	-.05***	-.06***
	(-4.13)	(-4.15)	(-2.41)	(-4.13)	(-3.09)
FCF	.07***	.07***	.07***	.08***	.11**
	(2.64)	(2.65)	(2.69)	(2.78)	(2.31)
EVOL	-.04	-.04	-.04	-.05	-.04
	(-0.71)	(-0.72)	(-0.74)	(-0.80)	(-0.44)
High VIX (Crisis)	.007**				
	(2.21)				
Pre-Crisis		.001 (0.55)		-.004	-.001
				(-0.88)	(-0.27)
Crisis		.007**		-.001	-.002
		(2.13)		(-0.38)	(-0.29)
Cash	.03	.03	.03	.03	.17***
	(0.80)	(0.86)	(0.80)	(0.83)	(2.73)
Growth	.002	.001	.0003	.001	.002
	(0.33)	(0.16)	(0.05)	(0.19)	(0.20)
Change in NWC	-.006	-.005	-.001	-.005	-.01
	(-0.42)	(-0.40)	(-0.11)	(-0.41)	(-0.61)
NWC without	-.07***	-.07***	-.07***	-.06***	-.10**
Cash	(-3.15)	(-3.16)	(-3.19)	(-3.18)	(-2.31)

Table 5.5 (continued): Firm Fixed Effects Panel Regressions of CP Borrowing Amounts

Variables	(1) CP/TA	(2) CP/TA	(3) CP/TA	(4) CP/TA	(5) CP/TA (>0)
CCC	.001 (0.67)	.001 (0.74)	.001 (0.70)	.001 (0.70)	.0009 (0.37)
Operating CF	-.14*** (-2.82)	-.14*** (-2.83)	-.14*** (-2.68)	-.14*** (-2.90)	-.23*** (-2.93)
M/B	.001*** (3.13)	.001*** (3.04)	.001*** (2.82)	.001*** (2.94)	.001** (2.28)
Leverage	-.01 (-0.91)	-.01 (-0.84)	-.01 (-0.69)	-.01 (-0.85)	-.03 (-1.60)
Equity	-.003** (-2.11)	-.003** (-2.02)	-.003* (-1.99)	-.003** (-2.18)	-.010*** (-4.17)
Intercept	.07** (2.53)	.06** (2.43)	.06** (2.48)	.07** (2.58)	.15*** (3.59)
Year Dummies	No	No	Yes	No	No
2004			-.007 (-1.55)		
2005			-.006 (-1.16)		
2006			-.0017 (-0.35)		
2007			.005 (0.92)		
2008			.007 (1.35)		
2009			-.001 (-0.19)		
2010			-.005 (-1.19)		
2011			-.005* (-1.81)		
2012			-.003 (-1.02)		
2013			-.006*** (-3.13)		
R ²	0.1262	0.1266	0.1363	0.1356	0.2329
Observations	1055	1055	1055	1055	616
Number of Firms	222	222	222	222	148

Table 5.6: Firm Fixed Effects Panel Regressions of CL Borrowing Amounts

This table presents the results of OLS panel regressions of CL borrowing amounts with firm fixed effects. The dependent variable is *CL/TA*, measured as the outstanding CL amount scaled by total assets. Model 5 reports the results for the sample of firms with positive CL borrowing. *High VIX* is a binary variable that equals 1 for years in which the average daily VIX is at least one standard deviation above its mean for the years included in our analysis, and zero otherwise. *Pre-crisis*, *Crisis* and *Post-crisis* are binary variables that equal 1 if the year is before 2008, during 2008 and 2009, and after 2009, respectively, and zero otherwise. All other variables are lagged one period and winsorized at the 1% and 99% level. Detailed variable definitions and sources are given in Appendix 5.1. Standard errors are clustered at the firm level and *t*-statistics are reported in parentheses. ***, **, and * Statistical significance at the 1%, 5%, and 10% level, respectively.

Variables	(1) CL/TA	(2) CL/TA	(3) CL/TA	(4) CL/TA	(5) CL/TA (>0)
Pre-crisis*				.002	-.001
LOWEVOL				(0.63)	(-0.20)
Crisis*				-.009**	-.013**
LOWEVOL				(-2.12)	(-2.24)
Post-crisis*				-.002	-.004
LOWEVOL				(-0.80)	(-1.09)
Capex	.17***	.17***	.17***	.17***	.20**
	(2.97)	(3.00)	(2.93)	(2.91)	(2.31)
Change in Capex	-.02	-.02	-.05	-.02	-.01
	(-0.39)	(-0.47)	(-0.85)	(-0.39)	(-0.17)
IVOL	.003	.003	.02*	.0009	-.006
	(0.25)	(0.29)	(1.74)	(0.07)	(-0.36)
FCF	.05**	.05**	.05**	.05**	.07*
	(2.11)	(2.12)	(2.15)	(2.07)	(1.84)
EVOL	-.05	-.05*	-.07**	-.07*	-.11**
	(-1.64)	(-1.66)	(-2.02)	(-1.91)	(-2.24)
High VIX (Crisis)	.004*				
	(1.82)				
Pre-Crisis		.003		.001	.008
		(1.46)		(0.42)	(1.55)
Crisis		.005**		.01***	.01***
		(2.31)		(2.85)	(2.74)
Cash	.004	.008	.003	.008	.07
	(0.12)	(0.25)	(0.09)	(0.24)	(1.48)
Growth	.004	.002	-.0005	.002	-.001
	(0.72)	(0.45)	(-0.09)	(0.46)	(-0.17)
Change in NWC	.003	.003	.008	.004	-.04
	(0.25)	(0.25)	(0.59)	(0.32)	(-1.52)
NWC without Cash	.006	.007	.004	.007	.02
	(0.46)	(0.52)	(0.34)	(0.53)	(1.35)

Table 5.6 (continued): Firm Fixed Effects Panel Regressions of CL Borrowing Amounts

Variables	(1) CL/TA	(2) CL/TA	(3) CL/TA	(4) CL/TA	(5) CL/TA (>0)
CCC	-.0005 (-0.39)	-.0004 (-0.29)	-.0001 (-0.10)	-.0005 (-0.34)	-.0006 (-0.31)
Operating CF	-.104*** (-2.90)	-.10*** (-2.90)	-.09*** (-2.60)	-.10*** (-2.93)	-.13** (-2.44)
M/B	-.0004 (-0.91)	-.0004 (-0.93)	-.0005 (-1.12)	-.0004 (-0.93)	.0004 (0.60)
Leverage	.01 (0.91)	.01 (1.00)	.01 (1.19)	.01 (0.97)	.009 (0.49)
Equity	-.009*** (-5.62)	-.009*** (-5.44)	-.009*** (-5.24)	-.009*** (-5.50)	-.01*** (-4.37)
Intercept	.099*** (4.22)	.09*** (3.80)	.08*** (3.43)	.09*** (3.88)	.11*** (3.30)
Year Dummies	No	No	Yes	No	No
2004			-.003 (-0.73)		
2005			.0005 (0.14)		
2006			.004 (1.37)		
2007			.007** (2.02)		
2008			.0116*** (3.08)		
2009			-.006 (-1.31)		
2010			-.007** (-2.09)		
2011			-.0009 (-0.38)		
2012			-.0007 (-0.27)		
2013			.0013 (0.59)		
R ²	0.0879	0.0893	0.0999	0.0925	0.1165
Observations	2443	2443	2443	2443	1501
Number of Firms	304	304	304	304	245

Table 5.7: Firm Fixed Effects Panel Regressions of TC Borrowing Amounts

This table presents the results of OLS panel regressions of TC borrowing amounts with firm fixed effects. The dependent variable is *TC/TA*, measured as the accounts payable scaled by total assets. *High VIX* is a binary variable that equals 1 for years in which the average daily VIX is at least one standard deviation above its mean for the years included in our analysis, and zero otherwise. *Pre-crisis*, *Crisis* and *Post-crisis* are binary variables that equal 1 if the year is before 2008, during 2008 and 2009, and after 2009, respectively, and zero otherwise. All other variables are lagged one period and winsorized at the 1% and 99% level. Detailed variable definitions and sources are given in Appendix 5.1. Standard errors are clustered at the firm level and *t*-statistics are reported in parentheses. ***, **, and * Statistical significance at the 1%, 5%, and 10% level, respectively.

Variables	(1) TC/TA	(2) TC/TA	(3) TC/TA	(4) TC/TA
Pre-crisis *LOWEVOL				-.001 (-0.20)
Crisis *LOWEVOL				-.003 (-0.64)
Post-crisis *LOWEVOL				-.005 (-1.17)
Capex	-.82*** (-5.86)	-.82*** (-5.84)	-.82*** (-5.83)	-.82*** (-5.87)
Change in Capex	.08 (1.10)	.08 (1.01)	.09 (1.09)	.08 (1.06)
IVOL	.008 (0.47)	.009 (0.53)	.01 (0.66)	.009 (0.46)
FCF	-.40*** (-6.62)	-.40*** (-6.60)	-.40*** (-6.59)	-.40*** (-6.61)
EVOL	-.06 (-1.54)	-.07 (-1.59)	-.07* (-1.73)	-.09** (-2.04)
High VIX (Crisis)	-.008*** (-3.28)			
Pre-Crisis		.007*** (2.97)		.005** (1.23)
Crisis		-.004* (-1.70)		-.005 (-1.43)
Cash	.02 (0.80)	.03 (1.01)	.03 (1.02)	.03 (0.95)
Growth	.004 (0.49)	.0008 (0.10)	.0001 (0.02)	.0008 (0.10)
Change in NWC	-.06*** (-3.02)	-.06*** (-3.02)	-.06*** (-3.05)	-.06*** (-2.92)
NWC without Cash	.12*** (4.28)	.12*** (4.31)	.12*** (4.27)	.12*** (4.24)
CCC	-.02*** (-5.59)	-.02*** (-5.54)	-.02*** (-5.50)	-.02*** (-5.52)
Operating CF	.52*** (7.06)	.52*** (7.06)	.52*** (7.00)	.52*** (7.06)
M/B	-.0002 (-0.20)	-.0002 (-0.24)	-.0002 (-0.25)	-.0002 (-0.21)
Leverage	.07*** (3.87)	.07*** (3.97)	.07*** (3.99)	.07*** (3.91)
Equity	.0003 (0.18)	.001 (0.44)	.001 (0.56)	.001 (0.43)
Intercept	.13*** (4.48)	.12*** (3.96)	.11*** (3.65)	.13*** (4.10)

Table 5.7 (continued): Firm Fixed Effects Panel Regressions of TC Borrowing Amounts

Variables	(1) TC/TA	(2) TC/TA	(3) TC/TA	(4) TC/TA
Year Dummies	No	No	Yes	No
2004			.0104** (2.32)	
2005			.011*** (2.72)	
2006			.007** (1.96)	
2007			.0079** (2.20)	
2008			.0008 (0.24)	
2009			-.008 (-1.38)	
2010			.002 (0.50)	
2011			.0037 (1.33)	
2012			.000029 (0.01)	
2013			.0002 (0.12)	
R2	0.3058	0.3082	0.3094	0.3089
Observations	2843	2843	2843	2843
Number of Firms	313	313	313	313

Table 5.8: Firm Fixed Effects Panel Regressions of the Choice between CP, CL and TC

This table presents the results of OLS panel regressions of the choice between CP, CL and TC with firm fixed effects. *High VIX* and year fixed effects are included in Panel A and Panel B, respectively. In Model 1, the dependent variable is $CP/(CP+CL)$, measured as the ratio of outstanding CP amount to the sum of outstanding CP and CL amount. In Model 2, the dependent variable is $TC/(TC+CP)$, measured as the ratio of accounts payable to the sum of accounts payable and outstanding CP amount. In Model 3, the dependent variable is $TC/(TC+CL)$, measured as the ratio of accounts payable to the sum of accounts payable and outstanding CL. In Model 4, the dependent variable is $TC/(TC+CL+CP)$, measured as the ratio of accounts payable to the sum of accounts payable, outstanding CL and CP amount. *High VIX* is a binary variable that equals 1 for years in which the average daily VIX is at least one standard deviation above its mean for the years included in our analysis, and zero otherwise. All other variables are lagged one period and winsorized at the 1% and 99% level. Detailed variable definitions and sources are given in Appendix 5.1. Standard errors are clustered at the firm level and *t*-statistics are reported in parentheses. ***, **, and * Statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A. The Choice between CP, CL and TC with High VIX indicator

Variables	(1) CP/(CP+CL)	(2) TC/(TC+CP)	(3) TC/(TC+CL)	(4) TC/(TC+CL+CP)
Capex	.56 (0.54)	-1.75*** (-3.51)	-1.91*** (-5.87)	-2.73*** (-5.19)
Change in Capex	-.34 (-0.44)	.44 (1.05)	.41 (1.01)	.65 (0.99)
IVOL	-.68*** (-3.01)	.47*** (4.45)	-.04 (-0.62)	.33*** (2.70)
FCF	1.21** (2.50)	-1.01*** (-4.18)	-.64*** (-4.12)	-1.25*** (-4.92)
EVOL	-1.68* (-1.93)	.75** (2.04)	.26 (1.18)	.27 (0.51)
High VIX	-.003 (-0.08)	-.02 (-1.35)	-.03** (-2.52)	-.04** (-2.01)
Cash	.26 (0.62)	-.05 (-0.27)	.20 (1.39)	.17 (0.72)
Growth	-.13 (-1.50)	-.004 (-0.10)	-.01 (-0.35)	-.04 (-0.88)
Change in NWC	-.22 (-0.76)	-.118 (-1.00)	-.11 (-1.46)	-.08 (-0.56)
NWC without Cash	-.38 (-1.46)	.54*** (4.35)	.18* (1.85)	.64*** (4.47)
CCC	.01 (0.40)	-.04*** (-3.09)	-.01* (-1.84)	-.04*** (-3.10)
Operating CF	-.88 (-1.06)	1.42*** (4.20)	1.06*** (5.88)	2.17*** (5.57)
M/B	.01** (2.04)	-.004 (-1.39)	.007*** (3.19)	-.004 (-1.12)
Leverage	-.10 (-0.51)	-.01 (-0.12)	-.03 (-0.45)	.02 (0.21)
Equity	.07*** (2.97)	.01 (1.16)	.05*** (5.74)	.04*** (3.38)
Intercept	.02 (0.08)	.71*** (4.15)	.44*** (3.42)	.37* (1.86)
R ²	0.2071	0.1917	0.1148	0.1993
Observations	760	1055	2442	951
Number of Firms	191	222	304	215

Table 5.8 (continued): Firm Fixed Effects Panel Regressions of the Choice between CP, CL and TC

Panel B. The Choice between CP, CL and TC with Year fixed effects

Variables	(1) CP/(CP+CL)	(2) TC/(TC+CP)	(3) TC/(TC+CL)	(4) TC/(TC+CL+CP)
Capex	.50 (0.48)	-1.70*** (-3.43)	-1.88*** (-5.77)	-2.65*** (-5.12)
Change in Capex	-.37 (-0.45)	.55 (1.34)	.55 (1.35)	.72 (1.11)
IVOL	-.70** (-2.17)	.40*** (2.73)	-.17* (-1.92)	.21 (1.31)
FCF	1.21** (2.49)	-1.006*** (-4.09)	-.64*** (-4.20)	-1.23*** (-4.81)
EVOL	-1.54* (-1.73)	.75** (1.97)	.33 (1.48)	.32 (0.60)
Cash	.19 (0.44)	-.01 (-0.06)	.25 (1.60)	.25 (1.05)
Growth	-.09 (-0.91)	-.008 (-0.16)	.004 (0.13)	-.03 (-0.63)
Change in NWC	-.20 (-0.72)	-.15 (-1.32)	-.14* (-1.90)	-.12 (-0.85)
NWC without Cash	-.40 (-1.52)	.55*** (4.38)	.19** (2.02)	.65*** (4.57)
CCC	.008 (0.32)	-.03*** (-2.85)	-.01* (-1.91)	-.04*** (-2.74)
Operating CF	-.87 (-1.05)	1.37*** (4.04)	1.02*** (5.62)	2.08*** (5.34)
M/B	.01** (1.98)	-.003 (-1.23)	.007*** (3.34)	-.004 (-1.08)
Leverage	-.12 (-0.62)	-.01 (-0.10)	-.05 (-0.58)	.03 (0.28)
Equity	.06*** (2.66)	.01 (1.21)	.05*** (5.44)	.04*** (3.46)
Intercept	.15 (0.47)	.66*** (3.72)	.47*** (3.37)	.32 (1.55)
Year Dummies	Yes	Yes	Yes	Yes
2004	-.073 (-0.88)	.088*** (2.67)	.054** (2.22)	.125*** (2.80)
2005	-.065 (-0.80)	.091** (2.46)	.027 (1.25)	.099** (2.41)
2006	-.108 (-1.49)	.0688* (1.96)	-.004 (-0.22)	.0359 (0.89)
2007	-.024 (-0.33)	.0114 (0.31)	-.025 (-1.11)	.030 (0.81)
2008	-.086 (-1.38)	.0022 (0.07)	-.060*** (-2.71)	-.032 (-0.93)
2009	-.025 (-0.29)	.041 (1.00)	.033 (1.25)	.028 (0.64)
2010	-.055 (-0.72)	.054 (1.53)	.036* (1.69)	.054 (1.43)
2011	-.088* (-1.95)	.046* (1.86)	-.004 (-0.25)	.0056 (0.18)
2012	-.065 (-1.37)	.025 (1.15)	.00037 (0.02)	.009 (0.35)
2013	-.030 (-0.82)	.057*** (3.18)	-.007 (-0.49)	.042* (1.83)
R ²	0.2124	0.2021	0.1259	0.2117
Observations	760	1055	2442	951
Number of Firms	191	222	304	215

General Conclusion

General conclusion

The access to external financing sources is one of the key drivers of firms' growth. However, market imperfections such as informational asymmetry, adverse selection and moral hazard problems may restrict access to those sources, especially for Small and Medium-sized Enterprises (SMEs). On the other hand, large firms may face severe financing constraints under extreme circumstances when capital markets are more difficult to access. Many firms therefore turn to alternative financing sources to finance their operations. In the context of an increased interest by policy makers, regulators and researchers about small business finance as well as about the effects of the recent Global Financial Crisis on firms' access to external credit sources, our thesis is dedicated to contributing to the vast literature on the link between financing constraints and the usage of alternative financing sources. Particularly, we focus on trade credit (TC) that has been considered as the most important alternative source of bank loan (BL) and that has a potential to serve as a substitute to commercial paper (CP) borrowing for large listed firms. We provide in this conclusion with a summary of the main results from our four essays and a discussion on our contributions to the existing literature. We also discuss the limitations of our work followed by the suggestions and propositions for the future research.

In Chapter 1, we provided a review of literature on BL constraints with a focus on SMEs and a review of literature on TC with a focus on the relationship between the two sources. We also provided a summary of previous studies on the usage of other alternative financing sources that are typically associated with SMEs. Our final objective is to identify the limitations and knowledge gaps in the literature, and propose avenues for future research.

We showed that asymmetric information and agency problems lie at the heart of the concept of financing constraints (Stiglitz and Weiss, 1981). Since those problems are more severe for SMEs, they are more likely to be financially constrained (Beck et al., 2008, 2005; Berger and Udell, 1998). On the other hand, in order to cope with asymmetry information and its consequences, banks may rely on alternative solutions including collateral requirement (Smith and Warner, 1979; Stulz and Johnson, 1985; Holmstrom and Tirole, 1997), debt maturity (Dewatripont and Tirole, 1994; Diamond, 1991; Zwiebel, 1996), specific constraint clauses and renegotiations (Berlin and Mester, 1992; Rajan and Winton, 1995; Smith and Warner, 1979), relationship lending (Berger and Udell, 1995; Cole, 1998; Cole et al., 2004; Petersen and Rajan, 1995, 1994), or finally credit rationing (Jaffee and Russell, 1976; Stiglitz and Weiss, 1981; Tirole, 2010). When firms are not able to fulfill banks' requirements, they may choose not to apply for a bank financing, which results in discouraged borrowing, another type of financing constraint (Kon and Storey, 2003). A few studies indeed show that discouraged firms represent a substantial part of all bank-constrained SMEs (Canton et al., 2013; Chakravarty and Xiang, 2013; Han et al., 2009). However, those firms are rarely taken into account in studies related to financing constraints.

In another body of literature, theories of TC provision suggest that suppliers may be better than banks in overcoming asymmetric information and moral hazard problems (Burkart and Ellingsen, 2004; Emery, 1984; Jain, 2001; Mian and Smith, 1992; Smith, 1987). These arguments imply that TC may be available to bank-constrained firms and therefore may be used as a financing of last resort, implying the substitution effect between the two sources (Meltzer, 1960; Nilsen, 2002; Petersen and Rajan, 1997, 1995, 1994). On the other hand, TC may be complementary to BL; thereby TC availability serves as a good signal to banks and thus facilitates BL, especially in the case of SMEs (Agostino and Trivieri, 2014; Biais and Gollier, 1997; Burkart and Ellingsen, 2004; Cook, 1999; Tsuruta, 2015). Hence, previous studies provide inconclusive results on the nature, substitute or complement, of the relationship between BL and TC.

A recent strand of research suggests that the development of financial markets and institutions should disproportionately benefit small firms in accessing external financing (Beck et al., 2008a, 2008b, 2005). A number of studies show that TC is used more in countries with weak legal protection and financial development (Burkart and Ellingsen, 2004; Fisman and Love, 2003; Van Horen, 2004) while some others suggest that the development of financial intermediaries facilitates the provision of TC (Deloof and La Rocca, 2015; Demirgüç-Kunt and Maksimovic, 2001). Hence, previous studies provide mixed evidence on the effect of the financial development on TC usage. Furthermore, we emphasized that there is no study investigating the effects of the institutional development on the nexus BL-TC.

We further showed that financially constrained firms, notably SMEs, may also rely on other alternative financing sources such as leasing (Cosci et al., 2015; Severin and Filareto-Deghaye, 2007), informal sources including those from their family and relatives (Allen et al., 2012a, 2012b; Bell, 1990; Ghosh et al., 2000; Petersen and Rajan, 1994) or market financing (Kashyap et al., 1993; Leary, 2009; Myers and Majluf, 1984). However, there is little research investigating directly the effects of BL constraints on the use of those sources.

In the literature on the link between capital market imperfections and debt maturity, numerous studies posit that short-term debt is better than long-term debt in resolving market frictions arising from asymmetric information and agency problems (Berlin and Mester, 1992; Dewatripont and Tirole, 1994; Diamond, 1991; Flannery, 1986; Myers, 1977; Smith and Warner, 1979; Zwiebel, 1996). We argued that this advantage might be the common feature of short-term financing sources including short-term BL, TC and CP. Moreover, since existing literature shows that TC can be used as a short-term substitute for BL, we argued that TC might be also used to compensate for a reduction in CP borrowing, which is usually associated with large listed firms. This argument is particularly promising because theories of TC provide us with many reasons to believe that TC may help mitigate asymmetric information and agency problems and thus may serve as an expensive substitute for cheaper sources including BL and CP. However, the choice between CP and TC remains unexplored in the literature.

By identifying limitations in previous studies, we suggested that further investigation on the effects of financing constraints on firm's usage of TC and other alternative sources provides a valuable avenue of research to improve our understanding of the relationship between BL and TC, the role of alternative financing, and add to our knowledge on the link between CP and TC. We addressed this research problematic by carrying out four essays presented in this dissertation.

The first essay in Chapter 2 examined the effects of BL constraints on the use of TC by Vietnamese firms across size with a comparison between large firms and SMEs. Our results suggest that bank-constrained large firms increase their use of TC to a greater extent relative to bank-constrained SMEs. We find that BL and TC are substitutes for large firms and complements for small firms when bank constraint relates to credit denial. That is, when a firm's loan application is turned down, large firms use more TC whereas SMEs use less TC. These findings also imply TC works as a signalling mechanism to facilitate the access to BL of SMEs (Biais and Gollier, 1997; Burkart and Ellingsen, 2004). Our results further show that large firms use more TC when they are discouraged from applying for a BL because of burdensome application procedures and strict collateral requirements. In contrast, SMEs use more TC when they are discouraged from applying for a BL because of high interest rates and when their loan application is still pending.

This study makes an interesting contribution to the finance literature because we distinguish, for the first time, three types of bank-constrained firms, i.e. credit denied firms, discouraged firms and those with pending applications; and four types of discouraged firms, i.e. those that did not apply for a BL because of burdensome procedures for loans, strict collateral requirements, high interest rates and expected denial. This distinction allows us to provide new insights into the nature of the relationship between BL and TC. Further, we show that size has a significant impact on the nature, substitute or complement, of the relationship between BL and TC. Hence, our study not only enriches the knowledge on the use of TC and the link with BL, but also extends the existing literature on the effects of financing constraints on TC usage by investigating a broad range of bank constraint types and considering the effect of size, what previous studies did not take into account (Beck et al., 2008; Danielson and Scott, 2004; Lin and Chou, 2015; Mateut et al., 2006; Petersen and Rajan, 1997). In addition, we provide the first study that investigates the link between financing constraints and the use of TC by Vietnamese firms, adding to the small literature on this link in developing countries.

The second essay in Chapter 3 was dedicated to providing international evidence on the effects of BL constraints on the use of TC. Our estimates of financial constraints distinguish two main types of constrained firms: constrained firms that applied for a BL (denied firms and those with pending applications), and those that did not apply for a BL (discouraged firms). We explore whether or not these effects differ by firm size, age and country-level characteristics including income level, financial development and legal protection. By addressing these questions, our contributions are to provide additional insights into the effects of BL constraints on TC usage, to add to the scarce international evidence on these effects

and to fill the knowledge gap in the role of institutional development to the relationship between BL and TC.

We find that TC and BL tend to be substitutes for larger, older firms and those in developed countries with stronger institutional development; and complements for smaller, younger firms and those in developing countries with weaker institutional development. Our results highlight these findings when constraints relate to actual denial and when institutional development relates to the development of financial intermediaries. Hence, our results suggest that TC may have an informational content to formal lenders for small and young firms and those in developing countries with weaker institutional development, and that the development of financial intermediaries facilitates the use of TC (Demirgüç-Kunt and Maksimovic, 2001).

By contrast, discouraged firms because of burdensome procedures for bank loans tend to rely more on TC use even when they are smaller, younger firms or operate in countries with weaker institutional development. Our results further suggest a stronger substitution effect for younger discouraged firms.

The third essay in Chapter 4 investigated the effects of BL constraints on the use of six alternative financing sources by SMEs worldwide, i.e. TC, leasing, credit cards, informal finance, sources from family and friends, and equity. In this study, we include firms that have a BL but reported access to finance as an obstacle (partly constrained firms) as a type of bank-constrained firms. This essay contributes to the small literature investigating directly the effects of BL constraints on the use of alternative financing sources, and, for the first time, analyzes these effects by distinguishing a broad range of bank constraint types and by distinguishing two financing purposes, i.e. working capital requirement and new investments. In general, our results suggest that the effects of BL constraints on the use of the alternative financing vary across credit forms, constraint types, and financing purposes. Specifically, our results generally suggest that bank-constrained SMEs tend to rely more on sources from family and friends and those from money lenders. We also find that they use alternative financing to finance working capital requirement to a greater extent as compared to new investments, and that discouraged firms because of burdensome loan procedures use more alternative financing compared to other types of discouraged firms.

More specifically, we find that partly constrained SMEs have a higher level of TC and leasing than actual denied counterparts do. This finding is consistent with studies on TC who suggests an informational role of TC to banks (Biais and Gollier, 1997), an easier access to TC for more creditworthy firms (Burkart and Ellingsen, 2004; Nilsen, 2002) and a limited role of TC in compensating for a low use of bank finance of small businesses (Beck et al., 2008b).

Our results further suggest a complementary effect between BL and leasing for firms with pending applications and a substitution effect between BL and equity for those firms. Besides, partly constrained firms appear to be able to borrow from credit cards channel while

denied firms do not. In addition, in line with previous studies showing the restricted access to capital markets of small businesses, our results reveal that the effect of bank constraints on the use of equity is limited. Particularly, our study extends the paper of Beck et al. (2008b) by providing a close look and a direct investigation on the link between BL constraints and the use of alternative sources. While Beck et al. (2008b) suggest that TC, leasing and equity do not compensate for the limited access to bank finance of small firms, our results, by using direct measures of BL constraints, indicate that those sources do allow some categories of bank-constrained SMEs to ease their financial difficulties.

The fourth essay in Chapter 5 investigated the use of CP, bank credit lines (CL) and TC by non-financial S&P 500 firms before, after and during the Global Financial Crisis (2008-2009) with an attempt to explore the relationship between those credit sources. Our main objective is to test whether TC and CL are substitutes to CP. Based on the study of Kahl et al. (2015), this essay provides an interesting contribution to the existing literature by linking inter-firm credit to a money market instrument as short-term alternatives for large well-established firms, and also adds to the small literature in CP. In general, we find evidence on the substitutability of CL and TC to CP.

More specifically, we find that firms with higher rollover risk tend to borrow more from bank CL and TC relative to CP, supporting the substitutability of CL and TC to CP with a stronger effect for CL. Our results further suggest that TC may be used as a substitute to CP by firms with more severe asymmetric information problems. However, we find that during the financial crisis, while firms borrow more from CL, they use less TC. Our results, on the other hand, provide little evidence on the substitutability of TC for bank CL.

Consistent with the transaction cost hypothesis (Kahl et al., 2015), we find that CP, a very short-term debt, is used to finance investment projects. Our results further suggest that CL and TC borrowing are better than CP in overcoming asymmetric information problems. On the other hand, we show that CP and CL are likely to help mitigate moral hazard problems with a stronger effect for CP. By contrast, in times of crisis, TC is used less by firms with more severe moral hazard problems, which is not in line with TC theories suggesting that TC is associated with suppliers' monitoring advantage (Burkart and Ellingsen, 2004).

Taken together, our four essays suggest that TC tends to be most valuable to large firms during normal conditions of financial system when they may increase borrowings from their suppliers to overcome constraints in bank finance access, implying a substitution effect. However, compared to bank credit, TC appears to play a limited role in easing financing constraints of large well-established firms during financial crises. On the other hand, TC may alleviate credit rationing by resolving asymmetric information between banks and SMEs, especially in developing countries with weaker financial development, implying a complementary effect. In addition, TC may compensate for a low use of BL of SMEs for some classes of firms, especially for discouraged firms because of burdensome loan procedures. Hence, by distinguishing different types of BL constraints and investigating the effect of size and institutional development, our thesis provides an interesting contribution to

the debate on the nature of the relationship, substitute or complement, between BL and TC. Besides, we show that since TC does little in relaxing SMEs' financing constraints, they are more likely to rely on informal sources. On the other hand, we show that CL appear to be an important substitute of CP, whereas TC may compensate to a certain extent for a lower use of CP of large listed firms with higher rollover risk and more severe asymmetric information problems.

Our study also provides several interesting managerial and policy implications. Since our findings provide evidence on the informational role of TC in enhancing BL availability to SMEs, our managerial implication is that those firms should use TC to signal their credit quality to increase banks' willingness to lend. Moreover, we find that TC does little in easing financing constraints of SMEs whereas other alternative financing sources such as informal credit or sources from family and friends are often expensive and limited, especially when constraints relate to investment need. Since SMEs play an important role in the growth of the economy, our policy implication is that governments, especially in developing countries, should provide them with other financing forms such as government grants. Besides, our results suggest that the development of financial intermediaries is complementary to TC use, implying that TC plays an informational role and allows easing BL constraints in developing countries. Therefore, the improvement of TC channel and the development of institutions should be central consideration in the policymaking process.

However, we are aware of some limitations of our study. In the first three essays, the survey data did not allow us to run panel data analysis as well as to use the lagged variables of BL constraints. This may be necessary, since there is a potential causal relationship between BL and TC. In addition, future research could be more specifically explore the effects of firm's credit quality on the nexus BL-TC by using proxies other size such as firm risk or credit rating.

Another limitation in our essays is that we could not distinguish "constrained good firms" from "constrained bad firms". That is, credit denial may be either due to asymmetric information, which leads to "true" credit rationing, or due to the low credit quality of the firm and the high risk of the investment project. Since such a distinction may help better explain the access to alternative financing sources and the differences in using those sources, further investigation should be done to explore the differences between these two groups.

Besides, the major limitation of the fourth essay is that we did not construct a control sample of firms that are able to access the CP market but choose not to do so to compare with CP issuers. Such a control sample would provide additional insights into the relationship between CP, CL and TC and check the robustness of the results. We therefore hope that in a future research, we will be able to address this limitation.

Furthermore, one could investigate the effects of BL constraints on TC use during the financial crises to explore whether the impact of firm size and institutional development on the relationship between BL and TC changes in such difficult times. In addition, one can

expect that TC is most valuable to firms with intermediate level of wealth whereas very large firms do not have to rely on TC and SMEs have limited access to TC. Therefore, ideally, one could use a unique sample covering very large well-established firms (e.g., S&P 500 firms), firms with intermediate level of wealth (e.g., large firms from World Bank Enterprise Surveys), and SMEs to explore the differences in using TC between those size groups.

General References

General References

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Abstract

This thesis consists of four essays investigating the effects of financing constraints on firms' use of trade credit (TC) and other alternative financing sources. In the first essay, we investigate the effects of bank loan (BL) constraints on the use of TC by Vietnamese firms across size. We find that bank-constrained large firms rely on TC more than bank-constrained Small and Medium-sized Enterprises (SMEs). Particularly, we find that denied large firms use more TC whereas denied SMEs use less of it. In the second essay, we study the effects of BL constraints on firm's use of TC across size, age and institutional development by using an international sample. Our results suggest that TC and BL tend to be substitutes for larger, older firms and those in developed countries with stronger institutional development; and complements for smaller, younger firms and those in developing countries with weaker institutional development, especially when constraints relate to credit denial. In our third essay, we investigate the effects of BL constraints on the use of six alternative financing sources by SMEs worldwide, i.e. TC, leasing, credit cards, informal finance, sources from family and friends and equity. Our results generally suggest that bank-constrained SMEs tend to rely more on sources from family and friends and those from money lenders. We also find that they use alternative financing to finance working capital requirement to a greater extent as compared to new investments. In the last essay, by using a sample of nonfinancial S&P 500 firms, we examine the interplay between the use of commercial paper (CP), bank credit lines (CL) and TC for the period 2003-2014. Our results suggest that firms with higher rollover risk borrow more from CL and TC relative to CP with a stronger effect for CL. We also find that higher level of asymmetric information is associated with more usage of CL and TC relative to CP while more severe moral hazard problems are associated with more usage of CP relative to CL and TC. Besides, our results indicate that firms tend to use less TC and more CL during the financial crisis.

Keywords: bank loan constraints, discouraged firms, trade credit, alternative financing sources, bank credit lines, commercial paper, Small and Medium-sized Enterprises (SMEs)

Résumé

Cette thèse se compose de quatre essais portant sur les effets des contraintes de financement sur l'utilisation du crédit commercial (TC) et d'autres sources alternatives de financement des entreprises. Dans le premier essai, nous étudions les effets des contraintes sur l'emprunt bancaire (BL) sur l'utilisation du TC par les entreprises vietnamiennes. Nous étudions plus particulièrement l'effet de la taille sur le choix entre les deux types de financement. Nous constatons que les grandes entreprises lorsqu'elles sont rationnées sur les BL comptent plus sur le TC que les petites et moyennes entreprises (PME). En particulier, nous constatons que les grandes entreprises dont la demande de crédit a été refusée utilisent plus de TC tandis que les PME dans la même situation en utilisent moins. Dans le deuxième essai, nous étudions les effets des contraintes sur les BL sur l'utilisation du TC en fonction de la taille et de l'âge des entreprises ainsi que du développement institutionnel des différents pays. Nos résultats suggèrent que le TC et le BL ont tendance à être des substituts pour les entreprises les plus grandes, les plus âgées et lesquelles situées dans les pays développés (développement institutionnel plus fort). En revanche, le TC et le BL sont complémentaires pour les entreprises les plus jeunes, les plus petites et lesquelles situées dans les pays en développement (développement institutionnel faible). Ce résultat est particulièrement net dans le cas où la demande de crédit est refusée. Dans notre troisième essai, nous étudions les effets des contraintes sur les BL sur l'utilisation de six sources alternatives de financement par les PME dans le monde entier. Les formes de financement étudiées sont: le TC, le crédit-bail, les cartes de crédit, la finance informelle, les fonds provenant de la famille et des amis et les capitaux propres. Nos résultats suggèrent généralement que les PME rationnées par les banques ont tendance à compter davantage sur les fonds de la famille et des amis et sur les prêts des usuriers. Nous trouvons aussi qu'elles utilisent les modes de financement alternatifs plutôt pour financer le fonds de roulement que pour financer de nouveaux investissements. Dans le dernier essai, à partir d'un échantillon d'entreprises non financières du S&P 500, nous examinons l'interaction entre l'utilisation du papier commercial (CP), des lignes de crédit bancaire (CL) et du TC sur la période 2003 à 2014. Nos résultats suggèrent que les entreprises avec le risque de refinancement le plus élevé empruntent plus sous la forme de CL et de TC que sous la forme de CP. Cet effet est plus fort pour les CL. Nous constatons également que plus le niveau d'asymétrie d'information est fort, plus les entreprises utilisent les CL et le TC par rapport à CP. En revanche, plus les problèmes d'aléa moral sont graves, plus les entreprises favorisent les CP par rapport aux CL et TC. En outre, nos résultats indiquent que les entreprises ont tendance à utiliser moins de TC et plus CL pendant la crise financière.

Mots clés: contraintes sur l'emprunt bancaire, entreprises découragées, crédit commercial, sources alternatives de financement, lignes de crédit bancaire, papier commercial, Petites et Moyennes Entreprises (PME)

