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Rizwan Mushtaq

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Rizwan MUSHTAQ

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**ESSAYS ON ACCESS TO FINANCE, FINANCIAL
LITERACY AND DEVELOPMENT**

Sous la direction de Madame Catherine BRUNEAU

Professeur à l'Université Paris 1 Panthéon-Sorbonne

Membres du Jury

Mme. Catherine Bruneau	Professeur à l'Université Paris 1 - Directrice de thèse
M. Thierry Baudassé	Professeur à l'Université d'Orléans - Rapporteur
M. Jérôme Héricourt	Professeur à l'Université de Lille et CEPII - Rapporteur
M. Jean-Bernard Chatelain	Professeur à l'Université Paris 1 et PSE -Président de jury

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Avertissement

Mis à part l'introduction et la conclusion de cette thèse, les différents chapitres sont issus d'articles de recherche rédigés en anglais et dont la structure est autonome. Par conséquent, des termes "papier" ou "article" y font référence, et certaines informations, notamment la littérature, sont répétées d'un chapitre à l'autre.

Notice

This thesis is produced by compiling self-contained research articles. However, terms “paper”, “study” or “article” are frequently used in the chapters. Moreover, some explanations like corresponding literature are repeatedly used in different places of the thesis.

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List of Abbreviations

ADB	Asian Development Bank
CA	Correspondence Analysis
CFI	Center for Financial Inclusion
CGAP	Consultative Group to Assist the Poor
CPEC	China-Pakistan Economic Corridor
FAS	Financial Access Survey
FSD	Financial Sector Development
GFDD	Global Financial Development Database
ICT	Information and Communication Technologies
IMF	International Monetary Fund
ITU	International Telecommunication Union
MCA	Multiple Correspondence Analysis
MDGs	Millennium Development Goals
MFIs	Microfinance Institutions
MIX	Microfinance Information Exchange
MSME	Micro, Small and Medium Enterprises
NBFI	Non-Bank Financial Institution
NFIS	National Financial Inclusion Strategy

NFLP	Nationwide Financial Literacy Program
NRSP	National Rural Support Program
PMN	Pakistan Microfinance Network
PPAF	Pakistan Poverty Alleviation Fund
PSX	Pakistan Stock Exchange Limited
SAARC	South Asian Association for Regional Cooperation
SAFE	South Asian Federation of Exchanges
SBP	State Bank of Pakistan
UFA	Universal Financial Access
WBES	World Bank Enterprise Survey
WDI	World Development Indicators

0.1. Introduction générale

La profondeur financière diminue l'inégalité de revenu et encourage la croissance économique. C'est un indicateur qui représente le développement du secteur financier dans une économie, le plus souvent, mesuré comme la ratio entre le crédit domestique octroyé (crédit intérieur/PIB) et la capitalisation boursière. En revanche, le crédit domestique est conçu comme un indicateur d'alerte précoce concernant la crise financière qui affecte les plus démunis au sein de la société et également toute l'économie dans son ensemble. Le développement financier et l'inclusion financière sont des concepts distincts mais connectés entre eux [Demirgüç-Kunt & Klapper \(2013\)](#). Le premier est approché par des indicateurs de niveau macro tandis que le dernier utilise de la propriété du compte sous sa forme de base et sous une forme plus avancée, l'accès à des services financiers formels tels que l'épargne, le crédit et l'assurance.

L'accès à un compte bancaire augmente la probabilité d'utiliser d'autres services financiers. L'inclusion financière a récemment suscité une énorme attention des chercheurs et des décideurs, car elle est identifiée comme un outil important pour atteindre 7 objectifs parmi les 17 sur le développement durable.¹ Cependant, le manque de données suffisantes entrave la capacité d'évaluer ses effets économiquement significatifs. L'accès et l'utilisation des services financiers pourraient faire sortir les personnes non bancarisées de la pauvreté et encourager l'esprit d'entreprise et la croissance économique. L'inclusion financière offre l'occasion de déposer son épargne dans un endroit sûr qui peut être retiré dans les situations d'urgence. Un accès accru peut apporter de nouveaux dépôts, développer une habitude d'épargne et accumuler des gains d'intérêts au sein des ménages précédemment non bancarisés ou sous-financés. Tout cela contribue finalement au développement du secteur financier global et conduit donc à la croissance économique.

Le niveau de base de l'inclusion financière traite de la propriété du compte dans les institutions financières, les bureaux de poste ou le compte d'argent mobile. Les gouvernements du monde entier découvrent d'autres façons d'atteindre les communautés exclues financièrement, comme la technologie numérique est l'un des outils les plus

1. L'article à consulter sur: <http://www.worldbank.org/en/topic/financialinclusion/overview>.

puissants pour fournir des financements responsables et durables. Selon la Banque mondiale, globalement, 2 milliards (38 %) sont encore non bancarisés et sans compte bancaire et 200 à 250 millions de PME imméritées principalement dans les pays en développement.² Ces groupes exclus économiquement comprennent largement les pauvres ruraux, moins instruits avec des ressources insuffisantes pour épargner. Par conséquent, ils doivent s'appuyer sur des prêteurs d'argent et des amis pour emprunter, tandis qu'ils ont tendance à économiser à la maison, à acheter du bétail, de la bijouterie ou à participer à des boulots (comités de scrutin, cercles d'épargne informels et sans intérêt). Leur mécanisme d'emprunt informel leur coûte des taux d'intérêt plus élevés accompagné des conditions de remboursements stricts. De même, les méthodes traditionnelles d'épargne sont plus exposées aux risques et produisent des rendements inférieurs à ceux des épargnes déposées dans les banques.

La figure 1.1 nous donnent une vision sur la tendance générale des pratiques des ménages pakistanais en ce qui concerne les prêts, les épargnes et les flux de trésorerie.³ Les moyens informels pour emprunter et épargner sont très populaire notamment dans les pays développés puisque l'accès à cette méthode ne demande pas ou peu de paperasse. Généralement cela se fait par contact car ce-dernier garantit une relation de confiance; par exemple un propriétaire, une personnalité connue ou un client fidèle peut rassurer un nouveau client qui souhaite souscrire ou offrir un prêt. La figure 1.1 expose une vision générale des flux de trésorerie des ménages, les ménages de milieu modeste qui arrivent à mettre de l'argent de côté pour des besoins futurs pourraient s'intégrer au système formel des marchés financiers au lieu de garder leur habitude traditionnelle d'épargner. En ce qui concerne ceux qui ne peuvent point épargner, ils peuvent toujours se diriger vers le marché financier formel afin de financer leur affaire en ayant par exemple recours à un prêt au lieu d'avoir à faire a des gens de leur entourage pour en obtenir un.

Les personnes pauvres continuent à subir une exclusion financière en raison du manque de garanties exigées par les banques conventionnelles. Par contre, ces groupes

2. Ces estimations sont basées sur les données Findex de la Banque mondiale 2014.

3. Ce diagramme a été développé en gardant à l'esprit la gestion financière des ménages à revenus faibles et moyens. Il peut contenir des plusieurs indicateurs fondés sur le revenu, la taille du ménage et le niveau de participation des ménages aux marchés financiers. NSS représentent les plans d'épargne nationaux.

marginalisés ont quelque chose à encourager car les institutions de microfinance (IMF) sont des institutions financières spécialisées qui accordent un faible crédit aux pauvres sans garantie. Le secteur de la microfinance a également attiré l'attention considérable des décideurs en matière de prestation de services financiers aux pauvres. La microfinance a gagné une réputation en aidant les ruraux pauvres, et les petits entrepreneurs, en particulier les femmes. Selon les statistiques du marché MIX, il y avait 101 millions d'emprunteurs actifs de microfinance avec un portefeuille de prêt brut de 89 milliards de dollars et des actifs de 160 milliards de dollars.⁴

En outre, l'inégalité homme-femme dans l'inclusion financière est énorme à travers les pays en développement, soit 9 points de pourcentage par rapport aux 7 points de pourcentage mondiaux. Les statistiques récentes montrent que 58% des femmes et 65% des hommes dans le monde ont un compte bancaire.² Des éléments de preuve considérables suggèrent que l'accès financier renforce la position des femmes et améliore son rôle dans les questions financières des ménages. Les fournisseurs de microcrédit accordent en particulier le crédit aux femmes entrepreneurs, à noter que plus de 80% des clients de la microfinance sont des femmes. Le ciblage des emprunteurs peut potentiellement augmenter la probabilité d'une meilleure gestion financière dans le ménage, l'estime de soi et la confiance des femmes, l'éducation de leurs enfants, la sécurité alimentaire et une meilleure santé.⁵ En plus, les femmes dans le secteur financier pourrait également promouvoir l'esprit d'entreprise et contribuer à la réduction de la pauvreté. En revanche, les clients de la microfinance doivent payer des taux d'intérêt plus élevés et une structure de prêts à échéance abrupte qui exerce une pression psychologique sur les emprunteurs. En outre, le montant du prêt consommé pour les objectifs improductifs rend plus difficile pour les emprunteurs de rembourser leur dette.

Récemment, l'avènement des nouvelles technologies a rendu les marchés financiers assez complexe. Cependant la technologie moderne aide les fournisseurs financiers à atteindre aux villageois non bancarisés à distance (habituellement appelée la technologie financière, Fintech ou services financiers numériques). Cela permet aux institutions finan-

4. MIX Market 2014, à consulter sur: <http://www.themix.org/mixmarket>.

5. Women's Empowerment International (WE), Women and Microfinance, <http://www.womenempowerment.org/learn/109-women-and-microfinance>.

cières d'économiser les coûts, d'assurer des contacts rapides avec les clients, d'accélérer les processus de vérification et de faciliter la construction des base de données numériques.⁶ En outre, les nouvelles technologies offrent des effets bénéfiques pour les personnes aux revenus modestes qui sont souvent sous-bancarisées à travers la propagation des téléphones portables et l'Internet qui permettent d'effectuer les transactions financières en ligne sans rendez-vous physique à l'institution financière. Fintech pourrait fournir des services financiers aux segments non bancarisés comme les zones rurales et les femmes d'une manière plus avancée et efficace.⁶

En plus, l'utilisation des technologies modernes fournit aux micro-entrepreneurs ruraux de l'information rapide sur les marchés qui peut augmenter leurs profits. Par ailleurs, les entrepreneuses rurales qui n'ont pas de possibilité de voyager au quotidien pourraient profiter au maximum de la Fintech qui peut aider leurs petites entreprises en développement. Les institutions financières ainsi que le partenariat des technologies modernes (Fintech) peuvent étendre leur couverture financière (inclusion financière numérique) qui renforcerait la croissance et la rentabilité des petites entreprises (MPME) et les petits propriétaires. Par conséquent, le revenu d'affaires et l'agriculture accrue pourrait promouvoir le bien-être des ménages, l'éducation des mineurs, un meilleur accès aux services de santé et le développement de la culture entrepreneuriale. Cela motive les personnes sans emploi à emprunter sur les marchés financiers pour démarrer une nouvelle petite entreprise. À long terme, les emprunteurs productifs remboursent leur dette et demandent des prêts supérieurs aux montants initiaux. Ce processus aboutit à une réduction du chômage, le développement du secteur des PME qui contribue à la croissance économique et la réduction de la pauvreté.

Les services financiers numériques sont envisagés comme un outil important pour élargir l'accès financier. Les téléphones portables occupent la place centrale dans la promotion des services financiers numériques. Environ 50 % des adultes possèdent des téléphones portables dans les pays en développement.² Une diffusion de portables plus large pourrait aider à débloquer le potentiel de l'argent mobile pour les personnes aux revenus modestes dans les zones rurales. Il ne nécessite pas de paperasse ou d'une succursale bancaire physique pour ouvrir un compte bancaire mobile. Au contraire, il

6. Griffoli, T. "Banking on Change", Finance & Development September 2017.

suffit une pièce d'identité une connexion cellulaire vérifiée, et cela peut être effectué dans un des magasins de détail. Un porte-monnaie électronique mobile individuel est créé avec un identifiant unique qui peut être utilisé pour épargner, retirer ou transférer de l'argent [Kpodar & Andrianaivo \(2011\)](#).

En outre, chaque transaction laisse une trace numérique qui pourrait aider à construire des bases de données pour concevoir des produits financiers les mieux adaptés aux besoins des consommateurs finaux. Malgré les effets favorables de l'inclusion financière numérique, il porte également les vulnérabilités. Il y a un risque de vol de téléphone portable qui contient des informations sur le porte-monnaie électronique. Des fraudes de la part des agents de vente au détail ne peuvent pas être ignorées non plus, comme la majorité de la clientèle est composée de femmes de ménage ou moins lettré qui peuvent facilement être trompés par filous. Cependant les personnes instruites sont moins susceptibles d'être victime d'une fraude. Par conséquent, les responsables politiques devraient mettre l'accent sur une double stratégie pour augmenter l'inclusion financière durable. La première partie porte sur le côté de l'offre de services financiers en assurant les crédits accessibles au coût faible alors que la seconde concerne la formation financière des consommateurs. Les individus avec la formation financière sont plus susceptibles de participer efficacement sur les marchés financiers. Au contraire, ceux qui sont pas suffisamment formés en finance restent en distance des marchés financiers volontairement ou à cause de l'absence d'accès. Leur participation est également caractérisée comme étant limitée à l'inclusion financière de base. Ainsi, la formation financière est un élément indispensable dans le processus d'intégration des populations non bancarisées dans le secteur bancaire réglementé.

En outre des aspects favorables, la dépendance technologique croissante porte également des ramifications négatives. Par exemple, la technologie de la robotique et l'informatique où les machines prennent au cours des activités humaines ont laissé plusieurs actifs sans emplois. De même, les technologies financières exigent moins de professionnels, la mise en place de services bancaires en ligne et les guichets automatiques ont réduit le nombre du personnel bancaire. De plus, les technologies numériques disposent d'une violation de la vie privée, le risque cybernétique, de plus en plus de

menaces pour les libertés civiles, les transactions financières frauduleuses et le scam et la distraction numérique. Ce sont de graves préoccupations et les vulnérabilités des technologies modernes (Fintech). Cybercrimes sont à la hausse dans le monde entier, les pirates et les cybercriminels peuvent accéder à des informations confidentielles et y compris voler les coordonnées bancaires. De même, la distraction numérique affecte la performance individuelle au travail et réduit la productivité. En outre, la recherche montre que les technologies numériques provoque des troubles du sommeil et moins d'interactions sociales.

Un autre aspect inquiétant de Fintech c'est le cadre réglementaire pas très bien adapté. Fintech, en tant que l'industrie en pleine croissance, exige une réglementation et un mécanisme de surveillance. La protection des consommateurs de services financiers reste difficile avec le développement rapide des technologies. Afin de protéger le consommateur final des lacunes et des risques potentiels, l'élaboration et la mise en œuvre des règles pour cette industrie sont de plus en plus à l'ordre du jour des régulateurs. A cet effet un bacs à sable réglementaire est introduite dans certains pays, à savoir, Royaume-Uni, Émirats Arabes Unis, Singapour, Hong Kong, Thaïlande, Malaisie et l'Australie.⁷ La probabilité de défaut pourrait être également augmentée avec l'entrée des entreprises «Techfin» novices dans le secteur financier, par opposition aux institutions financières spécialisées. Toutefois, le partenariat entre une institution financière et une compagnie «Fintech» pourrait être beaucoup plus efficace.

Les cybercriminels usent aussi de nombreux stratagèmes pour soutirer de l'argent des comptes bancaires de nouveaux utilisateurs ou des personnes les plus vulnérables. Les individus les plus inclus ou intelligents échappent à ces pratiques dans une certaine mesure alors que les individus ayant de faibles connaissances informatiques et moins utilisateurs d'internet sont relativement plus vulnérables aux fraudes en ligne. Par conséquent, l'éducation financière peut réduire le risque potentiel des risques liés aux fraudes en ligne. En outre, l'utilisation de téléphones portables par les individus exclus sur le plan intellectuel et par une partie des femmes est limitée aux appels. Une part importante des utilisateurs ruraux ne sont même pas en mesure de composer un numéro

7. La Regulatory Sandbox offre un cadre réglementaire pour les FinTech. L'article à consulter sur: <http://www.karandaaz.com.pk/blog/regulatory-sandbox-need-hour-pakistan/>

de téléphone.⁸

Cette thèse appuie l'importance de l'éducation financière dans la gestion des finances personnelles puisque les personnes les plus « connectées » seraient moins vulnérables aux attaques frauduleuses et aux défauts de paiement. L'éducation financière peut améliorer l'inclusion financière et sortir des individus et des ménages de la pauvreté. La capacité d'utiliser et de comprendre les marchés et les produits financiers, aussi appelée la culture financière, est tout aussi importante pour l'inclusion financière. Les personnes éduquées sur le point de vue financier sont plus à même capable de performer sur les marchés financiers tandis que les autres peuvent s'abstenir volontairement ou sont plus en proie aux défauts. Les services financiers numériques, la banque en ligne et le trading soulignent l'intérêt de la culture financière. Ainsi, la culture financière semble indispensable à la stabilité économique et financière dans son ensemble. La culture financière, couplée à la compréhension des services financiers de pointe, pourrait donc améliorer l'inclusion financière. De ce fait, il est primordial d'investiguer ces interactions afin de pouvoir dresser de solides conclusions. Ce papier souligne différents aspects de l'inclusion financière dans les pays en voie de développement en général et au Pakistan en particulier. Ce sont l'importance croissante de l'inclusion financière et des services financiers numériques dans la vie des populations qui ont conduit à ce travail de recherche.

La culture financière inclut les connaissances, les compétences et les aptitudes liées à la gestion des finances personnelles (l'OCDE). Un niveau de culture financière avancé pourrait conduire à des décisions financières plus optimales et au bien-être et confort financiers des ménages. La culture financière est aussi impérative à la stabilité des marchés financiers. De médiocres décisions financières de la part des consommateurs peuvent mener à une quantité importante de défauts, voire à une crise financière. Malgré son énorme importance, les données sur la culture financière sont plutôt décevantes. Les niveaux de culture financière sont bas même dans les pays dotés d'un système financier développé. En outre, l'écart entre les sexes est aussi considérable à travers le monde avec des hommes qui tendent à avoir plus de connaissances financières que les femmes. Selon

8. Pour plus de détails, consultez «CGAP Carnets Des Petits Exploitants 2016», <http://www.cgap.org/publications/financial-diaries-smallholder-families>.

une récente étude de Standard & Poor's (S&P), seulement 37% des adultes à travers le monde sont instruits sur le plan financier. Une décomposition plus poussée montre que près de 35% des hommes et 30% des femmes ont des connaissances financières.⁹ Outre cette étude, un grand nombre de données empiriques rapporte des niveaux encore plus bas de culture financière dans le monde.

Le développement financier contribue positivement à la croissance et réduit la pauvreté et les inégalités (voir, par exemple [Demetriades & Hussein \(1996\)](#), [Demirgüç-Kunt & Levine \(2009\)](#), [Beck *et al.* \(2007\)](#)). Cependant, l'accroissement du crédit conduit à l'instabilité financière, consulter, par exemple [Kelly *et al.* \(2011\)](#), [Schularick & Taylor \(2012\)](#). Et le niveau d'équipement en téléphones portables et internet contribue à la croissance à travers plusieurs canaux. Ces nouvelles technologies aident à la réduction de la pauvreté et des inégalités et favorisent l'accès à la finance. Le rôle de l'inclusion financière dans le bien-être des ménages, la croissance des petites et moyennes entreprises et la réduction de la pauvreté est très reconnu, (voir, également [Kpodar & Andrianaivo \(2011\)](#), [Comin & Nanda \(2014\)](#)). De plus, l'avènement des Fintech favorise l'inclusion des segments de population financièrement isolés.

Les technologies numériques sont considérées comme un outil puissant pour offrir des services financiers de manière viable. Néanmoins, on suppose que la Fintech est un domaine plus vulnérable aux cybercrimes. La non existence ou l'absence d'un cadre réglementaire adéquat et de mécanismes de protection des consommateurs nuisent au développement de ce secteur. De plus, la plus grande partie des inégalités financières est identifiée dans les économies en voie de développement où les ruraux et les femmes constituent principalement les groupes les plus exclus. Et ces groupes sont principalement composés de personnes qui choisissent de s'exclure volontairement du système bancaire et financier car n'ayant pas de ressources suffisantes et très peu de documentation. La quantité de comptes bancaires fantômes, c'est à dire sur lesquels il n'y a pas eu de transactions pendant un an ou plus est alarmante dans ces pays à bas revenus. Sans culture financière, l'inclusion financière est un concept non atteignable. Les effets bénéfiques de l'inclusion financière dépendent du niveau de connaissance des individus concernés. Des individus dotés des connaissances adéquates peuvent gérer de manière

9. Ces estimations sont basées sur les données S&P Global FinLit Survey 2014.

optimale leurs finances à l'aide des services financiers numériques.

0.1.1. Accès à la finance et la pauvreté: le cas du Pakistan

Le Pakistan est le foyer de plus de 207 millions personnes, 32 millions de ménages et 6^e plus grand pays dans le monde en ce qui concerne la population.¹⁰ L'inclusion financière au Pakistan est très faible par rapport à d'autres pays. En 2014, La Banque mondiale rapporte que seulement 13% de la population ont accès à un compte bancaire officiel et 6% utilisent des comptes de l'argent mobile. Le Pakistan constitue l'une des plus grandes populations non bancaires au monde; avec seulement 1 adulte sur 10 a accès à des services financiers formels.¹¹ En plus de l'inclusion financière, la situation économique du Pakistan souligne une croissance positive après une décennie de volatilité importante. La mise à jour des indicateurs de développement du Pakistan par la Banque mondiale en 2016 révèle que le Pakistan a réussi à enregistrer une croissance de 4,7% du PIB qui est le plus élevé en huit ans. En outre, l'incidence de la pauvreté a diminué à un rythme encourageant depuis 2001, mais les taux de croissance et de réduction de la pauvreté sont encore inefficaces pour améliorer le bien-être durable. Figure 1.2 montre l'incidence de la pauvreté aux niveaux national et provincial au Pakistan. l'incidence de la pauvreté de la pauvreté au niveau national a connu une tendance baissière au cours de cette période. Au niveau provincial, l'incidence de la pauvreté a également tendance baissière depuis 2005. La tendance de la pauvreté pour les Baloutchistan montre une récession pendant 2005-2010 tandis qu'entre 2010-2013 il a légèrement augmenté. De plus, ce chiffre indique également une baisse de la pauvreté pour le Pendjab le panier de pain du Pakistan suivi par KPK et Sindh. Le Baloutchistan semble avoir des effectifs de pauvreté plus élevés au Pakistan, car il reste une province très fragile durant les années 2000. Pour des raisons de sécurité, cette province est restée largement exclue financièrement. Cependant, l'amélioration de la sécurité depuis 2013, le développement du port de Gwadar et le couloir économique Chine-Pakistan (CPEC) génèrent des possibilités d'emploi et le développement des infrastructures locales. En outre, la figure

10. Ces estimations sont basées sur les données PBS-Pakistan census-2017, et celles de l'Organisation des Nations Unies (ONU) 2017.

11. Financial Inclusion Insights: <http://finclusion.org/country/asia/pakistan.html>.

A.2b présente la pauvreté multidimensionnelle du district au Pakistan

0.1.2. Marchés financiers et l'accès à la finance en Pakistan

Le secteur bancaire classique apparaît au 18^e siècle en Inde pendant le règne britannique. Partout dans le pays, des English Agency Houses ont commencé à voir le jour et plus tard ont assisté à l'arrivée des banques publiques et gouvernementales. Lors de l'indépendance, L'Inde ne comptait pas moins de 3 496 agences bancaires dont 487 situées au Pakistan. De plus, la plupart des sièges sociaux des banques cotées se situaient en Inde.¹² Durant cette période, La banque de réserve de l'Inde (Reserve Bank of India-RBI) faisait office de banque centrale autant pour L'Inde que pour le Pakistan. Le 30 décembre 1948, la commission du gouvernement britannique distribua tout le capital de la banque de réserve de L'Inde (30% pour le Pakistan soit 750 millions d'or et 70% pour l'Inde). La State Bank of Pakistan fut alors créée en juillet 1948 soit un an après l'indépendance et ouvra 51 agences dans l'est et l'ouest du Pakistan. Le secteur financier pakistanais a connu plusieurs réformes. Le secteur bancaire du pays a connu trois phases : « l'avant nationalisation », « la nationalisation » et « la privatisation ». Après cette dernière phase, le secteur bancaire est devenu plus efficace en proposant des prêts en faveur de la productivité et en améliorant son service d'épargne. Les banques au Pakistan offraient de plus en plus des produits et services de qualité et innovant à leurs clients. Plus récemment, grâce aux avancés technologiques dans le domaine bancaire, les banques ont pu améliorer leur efficacité vis-à-vis de leur clientèle. Les réformes bancaires du Pakistan qui ont débuté dans les années 1990 ont permis de transformer ce secteur en un secteur efficace, solide et stable.

Malgré l'infrastructure insuffisante, le secteur bancaire pakistanais a connu un développement rapide durant les décennies précédentes. Le secteur financier s'est vu attribué plusieurs réformes considérables depuis 1947, les différents gouvernements démocratiques qui se sont succédés ont testé soit des réformes de nationalisation soit de privatisation. Le choix de la nationalisation au Pakistan a été effectué par Zulfikar Ali Bhutto afin de déclencher la croissance économique ; ce-dernier a été en effet élu par le

12. "Routledge Handbook of Contemporary Pakistan", Ch-15, p.248.

peuple comme Premier Ministre du Pakistan.¹³ Le secteur financier du Pakistan a été nationalisé pendant la seconde phase du « Nationalization and Economic Reforms Order (NERO) » le 1er janvier 1974. Ce processus d'étatisation provoqua des effets désastreux sur le plan économique du Pakistan jusqu'à ce que le processus de privatisation fût engendré en 1991. La dénationalisation dans le pays a été la mesure prise par le Premier Ministre, élu par le peuple, Mian Nawaz Sharif. Il a effectivement lancé le programme de privatisation le 22 janvier 1991 ayant pour but de promouvoir le principe du libre-échange économique, de l'entrepreneuriat dans le secteur privé et de rendre les investissements directs à l'étranger plus attractifs. La majeure partie des réformes économiques et financières de l'histoire du Pakistan ont eu lieu durant cette période néanmoins leurs contrecoups durent toujours.¹⁴

D'autre part, en matière innovation dans la prestation des services financiers, le Pakistan se classe premier par rapport à l'Asie du Sud et d'autres pays en développement. En plus de l'entrée mentionnée ci-dessus des entreprises de télécommunications dans le secteur financier, le Pakistan a été témoin d'un partenariat unique en son genre. Pakistan State Oil (PSO) avec 3500 points de vente à travers le pays a combiné ces efforts avec « Telenore Pakistan » une entreprise de téléphonie mobile de premier plan, pour étendre les services financiers.¹⁵ Un autre acteur important « e-sahulat » sous la supervision de base de données nationale et autorité d'enregistrement (NADRA) avec ses 12000 franchises nationales émerge en tant que fournisseur financier. Elle s'est associée à plusieurs institutions financières et entreprises de télécommunications ayant pour objectif de stimuler l'inclusion financière dans le pays. Ces initiatives sont cependant à des stades précoces, l'impact réel sur les pauvres et l'inclusion financière globale devra être évalué dans les années à venir. L'évolution rapide des services bancaires mobiles et du paysage changeant des fournisseurs de services financiers obligent les régulateurs à adapter constamment les régulations en vue de protéger les consommateurs.

Le Pakistan se caractérise par un système financier complexe, à l'image de son

13. Riazuddin, Riaz. "Pakistan: Financial Sector Assessment (1990-2000)", State Bank of Pakistan.

14. L'histoire de la Banque d'État du Pakistan, L'article à consulter sur: <http://sbp.org.pk/about/history/index.asp>

15. Pour plus de détails, voir, <http://psopk.com/en/media-center/press-releases/news-details?newsId=335>

organisation économique. Les emprunts informels obtenus de tontines familiales ou amicales, de prêteurs sur gages ou auprès d'intermédiaires locaux limitent la croissance de l'inclusion financière. Le faible niveau d'éducation financière, et l'écart démographique urbain/rural entravent également l'inclusion financière au Pakistan. Évitant de recourir à des services financiers formalisés, les individus les moins éduqués préfèrent en effet faire appel à des sources de financement informelles. Le Pakistan est un grand pays où 200 millions de personnes vivent dans un espace de 796 096 km^2 , dont 70% en zones rurales. L'accès aux services financiers est concentré principalement dans les milieux urbains, alors que les villages éloignés demeurent exclus de ces accès. En déployant l'accès à la finance, les technologies mobiles pourraient cependant faciliter la tâche des acteurs, tant pour les institutions financières et les consommateurs que pour le gouvernement. L'adoption de la Stratégie Nationale d'Inclusion Financière (SNIF) par le Gouvernement du Pakistan en Mai 2015, qui vise à rapprocher du secteur bancaire la population la moins bancarisée du monde et a pour ambition de réaliser les objectifs de l'accès universel aux services à l'horizon 2020, souligne l'importance du sujet.¹⁶

L'importance croissante de l'accès à la finance, de l'éducation financière et des FinTech ont motivé le point de départ de cette recherche. Cependant, les personnes avec une meilleure éducation et une meilleure maîtrise des services financiers pourraient tirer de plus grands bénéfices du développement du secteur financier. Cette thèse conclut également que l'adoption des nouvelles technologies telles que les téléphones mobiles et Internet augmente la probabilité de participation au marché financier pour les individus, ainsi que pour les petites et moyennes entreprises. La technologie Internet améliore alors la productivité des petites et moyennes entreprises et des institutions financières. Mais cette transformation apporte aussi des risques potentiels, lesquels peuvent cependant être réduits par une supervision forte, des règles strictes et des régulations bien délimitées. Sur le plan de la demande, l'éducation financière peut aider à contrebalancer les risques et à accroître les bénéfices de l'adoption des nouvelles technologies dans les services financiers. Construire une capacité financière de masse n'est pas tâche aisée, cependant des efforts sont en cours au Pakistan, mais aussi dans d'autres pays. Les projets de renforcement des capacités financières varient d'un pays à l'autre, et d'une communauté

16. Bureau Fédéral du Statistiques Pakistan, PBS.

à une autre. Au Pakistan, il est nécessaire de développer la compréhension des produits et concepts financiers élémentaires, tout en faisant respecter les normes adéquates par les partenaires privés ou publics qui les fournissent. Bien que les nouveaux entrants comme les Fin-Tech aient le potentiel d'étendre l'accès à la finance, ils pourraient affecter de manière négative les consommateurs et le marché financier tout entier, en l'absence de règles et de régulations appropriées. Par ailleurs, l'extension du crédit aux petits entrepreneurs, plus particulièrement aux femmes entrepreneurs ainsi que dans le secteur agricole, peut également stimuler la croissance économique dans son ensemble et réduire la pauvreté dans le pays.

0.1.3. Organisation de la thèse

Cette thèse porte sur plusieurs aspects de l'inclusion financière. Il vise à étudier le rôle de l'inclusion financière dans la réduction de la pauvreté et la façon dont les TIC et la culture financière tirent parti de l'inclusion financière et du bien-être des ménages. L'organisation de cette thèse est la suivante; Le troisième chapitre explore le rôle des nouvelles technologies dans la promotion de l'inclusion financière et de la réduction de la pauvreté. Il présente également des preuves sur les financements numériques et les nouvelles technologies basées sur des données cross-section. Le quatrième chapitre de la thèse révèle le côté de la demande de l'inclusion financière au Pakistan. Cela indique l'importance de la culture financière pour une participation effective aux marchés financiers. Enfin, le cinquième chapitre dévoile l'association entre les nouvelles technologies et le niveau d'accès au financement au Pakistan.

Le chapitre 3 évalue le rôle des technologies de l'information et de la communication (TIC) dans la réduction de la pauvreté en favorisant l'inclusion financière, en utilisant un ensemble de données de panel de soixante et un pays entre 2001 et 2012. Il se concentre principalement sur deux dimensions différentes de l'inclusion financière, c'est-à-dire l'inclusion par les banques commerciales et par les institutions de microfinance (IMF). Alors que les institutions financières formelles s'occupent de clients riches et moins riches, les IMF prétendent être les banquiers des pauvres. Un grand nombre de personnes pauvres ne sont toujours pas de compte bancaire dans des pays à faible revenu;

Cependant, la recherche dans le domaine du financement du développement suggère que les financements accessibles et en temps opportun peuvent contribuer à réduire la pauvreté. L'importance des IMF dans la fourniture de crédit et d'autres services financiers aux ménages économiquement exclus est globalement reconnue. Il est donc inévitable d'étudier le rôle des TIC dans la promotion de l'inclusion financière (IFM), en particulier dans les pays en développement. Dans la première étape de l'analyse des données, nous constatons que les effets de réduction de la pauvreté de l'inclusion financière sont mesurés de l'une ou l'autre manière. En outre, les résultats de l'étude indiquent une association positive de la diffusion des TIC avec l'inclusion financière et une relation négative avec la pauvreté et l'inégalité. On a observé que les dimensions des TIC utilisées comme instruments d'inclusion financière accélèrent la croissance économique et réduisent la pauvreté et les inégalités. Par conséquent, les politiques visant à promouvoir les infrastructures d'information et de communication pourraient stimuler l'inclusion financière en favorisant le financement numérique. En outre, une meilleure collaboration entre les TIC et le secteur financier sera susceptible d'améliorer le financement numérique qui pourrait contribuer à combler le fossé de l'infrastructure financière.

Le chapitre 4 évalue le niveau de la culture financière et son effet sur l'inclusion financière au Pakistan. Il présente également l'impact des technologies de l'information et de la communication (TIC) sur l'inclusion financière. Ce chapitre analyse les données d'enquête pour ($n = 409$) ménages à revenu faible et moyen provenant de 4 grandes villes du Pakistan. Nous avons utilisé un modèle probit et l'analyse des correspondances. Les résultats de Probit montrent qu'une alphabétisation financière plus élevée entraîne une probabilité accrue d'avoir un compte bancaire formel. Les caractéristiques individuelles et familiales sont également des prédicteurs forts de la culture financière et de l'inclusion au Pakistan. Les résultats du modèle probit ordonné révèlent l'impact de l'inclusion financière et de l'alphabétisation sur le revenu du ménage, où nous trouvons des coefficients insignifiants de la culture financière. Cependant, l'inclusion financière et l'accès et l'utilisation des TIC fournissent des effets importants sur le revenu du ménage. En outre, nous montrons que les TIC et les médias sociaux influent fortement sur la

participation du marché financier de l'individu. Les ménages dont l'accès et l'utilisation des TIC sont plus susceptibles d'être bien placés par rapport à leurs homologues qui ne l'utilisent pas. Notre étude montre également que la culture financière augmente la probabilité d'épargne, mais elle semble inactive en ce qui concerne la planification de la retraite et la budgétisation des ménages au Pakistan. L'analyse des correspondances confirme les résultats de l'analyse probit. Il indique également des inégalités dans l'accès et l'utilisation des services financiers, des TIC et de l'éducation au Pakistan. En résumé, l'amélioration de la culture financière aux côtés des TIC peut favoriser une participation effective aux marchés financiers et le bien-être financier des ménages.

Le chapitre 5 présente une perspective variable de l'association entre les TIC et l'accès au financement par les PME dans une économie émergente. Dans ce chapitre, nous nous concentrons également sur l'accès financier universel d'ici 2020 et la stratégie nationale d'inclusion financière du Pakistan (NFIS) pour atteindre les objectifs d'inclusion financière d'ici 2020. Ce chapitre présente principalement les résultats en appliquant l'approche de l'analyse exploratoire des données (AED). Nous avons utilisé les données de l'Enquête sur les entreprises de la Banque mondiale (WBES) de 1247 (PME) ainsi que divers rapports de la State Bank of Pakistan (SBP). L'accès au financement est mesuré par deux indicateurs tels que le compte bancaire de l'entreprise et la marge de crédit d'une institution financière. Les PME au Pakistan connaissent moins d'accès financier par rapport aux autres pays semblables qui décline également depuis 2007. Alors que les petites et les grandes entreprises diffèrent considérablement en termes d'accès au financement, alors qu'elles présentent un avantage comparatif par rapport à l'ancien. À l'inverse, les PME au Pakistan présentent des tendances encourageantes en ce qui concerne l'accès et l'utilisation des technologies liées aux TIC telles que le courrier électronique, le site Web, le réseau cellulaire, etc. De plus, les résultats du modèle probit révèlent que l'âge et la taille des entreprises sont des prédicteurs significatifs de l'inclusion financière de l'entreprise au Pakistan. Les entreprises micro et plus jeunes sont exclues financièrement par rapport aux entreprises moyennes et plus grandes. En outre, certains indicateurs liés aux TIC augmentent également la probabilité de l'accès de l'entreprise au financement au Pakistan. Cela implique que les entreprises ayant un

accès accru et l'utilisation de nouvelles technologies sont plus susceptibles de bénéficier des marchés financiers. De même, les résultats fournis par l'analyse des correspondances multiples (ACM) indiquent également une association entre l'adoption des TIC et l'accès de l'entreprise au financement pour les entreprises de l'échantillon. En conclusion, les politiques visant à créer un secteur financier inclusif et transparent et le développement des infrastructures TIC pourraient conduire à la prospérité partagée d'une économie en favorisant le secteur des PME.

Chapter 1

General Introduction

1.1. General Introduction

Financial depth can reduce income inequality and foster economic growth through various mechanisms. It is a broad indicator that represents financial sector development in an economy, generally measured as the ratio of domestic credit to private sector or stock market capitalization to GDP. Financial depth and financial inclusion are distinct yet related concepts and are important dimensions of financial development, see, for example [Demirgüç-Kunt & Klapper \(2013\)](#). The former is approximated by macro level indicators while the latter deals with account ownership in its basic form and in more advanced form, access to formal financial services such as savings, credit and insurance. A bank account serves as a gateway to access credit, savings, payment services, insurance and other financial services.

Financial inclusion has very recently attracted enormous attention from researchers and policy makers, as it is identified as the important tool to achieve 7 out of 17 Sustainable Development Goals.¹ However, lack of sufficient data inhibits the ability to assess its economically meaningful effects. Access to and use of financial services could pull unbanked people out of poverty, encourage entrepreneurship and pick up economic growth. Financial inclusion provides an opportunity to save at a secure place which can be withdrawn in emergencies. Greater access can bring new deposits, develop a

1. World Bank Global Financial Development Report and Financial Inclusion Overview: <http://www.worldbank.org/en/topic/financialinclusion/overview>.

savings habit and accumulate interest earnings to previously unbanked or underbanked households. These deposits and savings eventually contribute to the development of overall financial sector and hence lead to economic growth.

The basic level of financial inclusion deals with the account ownership at financial institutions, post office or mobile money account. Access to a bank account increases the likelihood of using other financial services. The governments around the world are exploring alternative ways to reach out to financially excluded communities. For instance, digital technology is envisaged as one of the most powerful tools to provide responsible and sustainable finance. According to the World Bank, globally 2 billion (38%) people are still unbanked i.e., without access to a formal bank account and 200-250 million undeserved SMEs mainly in developing countries.² These financially excluded groups largely comprise of the rural poor, who are less educated with insufficient resources to save and women. Consequently, they have to rely on local money lenders and family & friends for borrowing, meanwhile they tend to save at home, buy livestock, jewelry or participate in stokvels (ballot committees, informal, interest-free savings circles). Their informal borrowing mechanism costs them higher interest rates, strict repayments and reciprocity. Similarly, traditional methods of savings are more exposed to risks and yield lower returns than savings at banks. Figure 1.1 provides insights about the distribution of household financial management.³ The top of figure demonstrates household borrowings and savings while at the bottom, household cash flow distribution is depicted. Informal means of borrowings and savings are highly popular particularly in developing countries. As the access to informal finance requires little or zero collateral and entails no complex paper work. It generally functions on trust and reference system, a landlord, known personality or a current client can guarantee the new customer who wish to engage in informal lending or borrowings. Figure 1.1 also exhibits a general concept of household cash flow; poor households who manage to put money aside for future shocks could be entered into the formal financial markets instead of their traditional way of savings.

2. These estimates are based on World Bank Findex data 2014.

3. This diagram has been developed keeping in view the household financial management of lower and middle income households. This may contain varied factors based on income groups, household size, level of financial market participation among others. NSS stands for National Savings Scheme. Note: L^AT_EX codes written by cfr at TEX.SE. modified by the author to fit the elements of household financial statement.

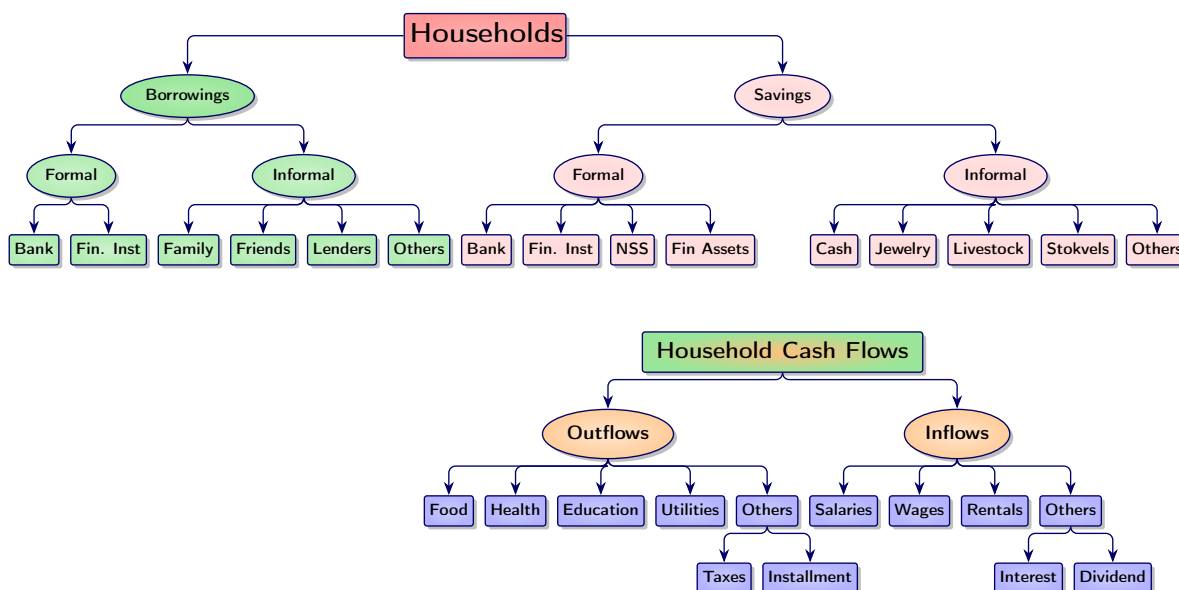


Figure 1.1 – Household Finance

Source: Author's conception.

While the others without saving capacity, looking for funds to inject in the small business may get access to the formal financial market rather relying on informal lenders.

Poor people continue to experience financial exclusion due to lack of collateral required by conventional banks. But these marginalized groups have something to cheer about as Microfinance Institutions (MFIs) are specialized financial institutions that provide small credit to the poor without collateral. Microfinance sector has attracted considerable attention of the policy makers in provision of financial services to the poor. It has gained a reputation in serving rural poor and small entrepreneurs particularly women. According to the statistics of MIX market, there were 101 million active microfinance borrowers with \$ 89 billion gross loan portfolio and \$160 billion assets of the sector.⁴ However, a massive gender gap still exists in financial inclusion particularly in the developing world which is 9 percentage points compared with the global 7 percentage points. The recent statistics show that 58% of women and 65% of men worldwide have a bank account.² While a considerable amount of evidence suggests that financial access empowers woman and improves her role in household financial matters. Microcredit providers particularly extend credit to female entrepreneurs; more than 80%

4. MIX Market 2014, <http://www.themix.org/mixmarket>.

of microfinance clients are women with lower default rates. Targeting female borrowers can potentially increase the likelihood of better financial management in the household, women's self-esteem and confidence, her children's education, food security and better health.⁵ Including women into the financial sector could also promote entrepreneurship and poverty reduction. It is worth mentioning that microfinance clients have to pay higher interest rates and steep installment loan structure that puts psychological pressure on them. Additionally, the loan amount consumed for unproductive objectives makes it harder for borrowers to pay back debt. Resultantly, it increases the probability of non performing loans and bad debts on the one hand. While on the other, it exacerbates the financial condition of the poor borrower.

Recently, the advent of new technologies is changing the landscape of financial markets. On the one hand, it has made financial markets fairly complex. While on the other, it helps financial providers to reach out to the far remote unbanked villagers. The adoption of technology by financial sector or digital only financial providers startups are usually termed as FinTech, digital-only or neobanks. New technologies could leverage financial inclusion particularly in remote villagers and women. Moreover, new technologies could reduce the role of intermediaries and provide quick relevant information about the counterparties.⁶ Accordingly, new technologies offer beneficial effects for the underbanked poor, as the spread of mobile phones and the Internet permits mobile money transactions and online banking without visiting a physical financial institution outlet. Fintech could leverage financial services to the unbanked segments particularly in rural areas and women in a more advanced and efficient way. The use of modern technologies also provides quick market information to rural micro entrepreneurs and smallholder farmers that can increase their profits. Furthermore, rural women entrepreneurs who cannot travel on daily basis might get maximum benefit from the FinTech that can help developing their small businesses. Financial institutions along with the partnership of modern technologies (FinTech) can expand financial outreach (digital financial inclusion) that can boost growth and profitability of small entrepreneurs

5. Women's Empowerment International (WE), Women and Microfinance, <http://www.womenempowerment.org/learn/109-women-and-microfinance>.

6. More information on Fintech disrupts available in, Griffoli, T. "Banking on Change", Finance & Development September 2017.

(MSMEs) and smallholder farmers. Consequently, the increased business and agriculture income could promote household welfare, children's education, access to better health facilities and develop entrepreneurial culture. That motivates unemployed individuals to borrow from financial markets to start new small business. In the long run the productive borrowers repay their debt and demand for higher loans than the initial amount. This process results in a reduction in unemployment, improved agriculture sector and entrepreneurship development which contribute to the overall economic growth and poverty reduction.

Digital financial services (DFS) are envisaged as significant tool in expanding financial access. Mobile phones hold the central position in advancement of digital financial services. Around 50% of adults own a mobile phone in developing countries.² Greater mobile phone diffusion could help unlock the potential of mobile money for rural poor. It does not require paper work or a physical bank branch to open a mobile money account. Instead it could be done through a verified cellular connection and identity card at widespread retail network. An individual mobile e-wallet is created with a unique id that can be used to save, withdraw or transfer money [Kpodar & Andrianaivo \(2011\)](#). Furthermore, each transaction leaves digital trail that could help build databases to design financial products best suited for the needs of ultimate consumers.

Besides auspicious effects, the growing technology dependence also bears negative ramifications. For instance, robotics technology and computers have left several employees out of jobs, while machines are taking over the human activities.⁷ Similarly, financial technologies necessitate fewer professionals and the introduction of online banking and ATMs have reduced the number of banking staff. In addition, digital technologies feature breach of privacy, cyber risk, growing threats to civil liberties, fraudulent financial transactions, scams and digital distraction. These are serious concerns and vulnerabilities in modern (financial) technologies. Cybercrimes are on the rise worldwide, hackers and cyberthieves can access and steal confidential information including bank details. Likewise, digital distraction affects individual's performance at work and reduces productivity. Further, research demonstrates that digital technologies cause sleep disorders and less social interactions. A worrisome aspect of "Fintech" is

7. see, <http://www.businessinsider.fr/us/when-robots-will-take-peoples-jobs-2017-6/>

inadequate regulatory framework. The growing “Fintech” industry also requires sound regulations and surveillance mechanism. Financial consumer protection framework remains challenging with the rapid development of technologies.⁸ In order to protect the ultimate consumer about potential loopholes and risks, there is increasing focus of the regulators and policy makers in drafting and implementing guidelines for this industry. It is challenging for regulators to design regulations without stifling innovation. For that purpose regulatory sandbox is introduced by countries namely, UK, UAE, Singapore, Hong Kong, Thailand, Malaysia and Australia.⁹ The probability of defaults could also be increased with the entrance of tech companies into financial sector that are novice “TechFins” as opposed to specialized financial institutions. However, the partnership of financial institution and technology company “Fintech” could do the task in much better fashion.

Despite favorable effects of digital financial inclusion, it also carries vulnerabilities. There is risk of mobile phone theft that contains information of e-wallet. Frauds by retail agents also cannot be disregarded, as the majority of the clientele is comprised of household women or less literate who can easily be deceived by swindlers. However educated individuals are less likely to get defrauded. Therefore, policy makers should emphasize a twofold strategy to leverage sustainable financial inclusion. The first involves the supply side of financial services by providing low cost and accessible credit while the second is building financial capability among consumers. Financially savvy individuals are more likely to participate effectively in financial markets. Contrarily, the financially ignorant remain distanced from financial markets voluntarily or due to lack of access. Their participation is usually limited to the basic financial inclusion. Thus, financial literacy is an indispensable element in the process of bringing the unbanked into the mainstream regulated banking. Cyberthieves also make money by fraudulent online schemes that drain bank accounts of many new users or less literate groups. However, smart and knowledgeable individuals escape these scams up to certain extent. While, people with less computer and Internet know how (less online experience) are more prone

8. More detail on financial technology and risks see, Chris Wellisz, “The Dark Side of Technology” Finance & Development September 2016.

9. Regulatory sandbox is a recent regulatory framework that provides guidelines for FinTechs. Article accessed at:<http://www.karandaaz.com.pk/blog/regulatory-sandbox-need-hour-pakistan/>

to online financial scams. Therefore, education attainment can reduce the potential risks from online frauds. In addition, the use of mobile phone by illiterate poor and women is limited to receive calls only. Most of the rural users are even unable to dial a number to make call.¹⁰ This argument prolongs the importance of financial literacy in personal financial management. As financial savvy individuals would be less likely to trap in online financial frauds and defaults. Financial literacy can enhance financial inclusion and bring households or individuals out of poverty. The ability to use and awareness about financial markets and products termed as financial literacy (OECD definition) is equally important for financial inclusion. Financial literate individuals are more likely to perform better in financial markets, while the others might abstain voluntarily or more likely prone to financial defaults. Digital financial services, online banking and trading reestablish the significance of financial literacy.

Financial literacy includes knowledge, skills and attitudes related to personal financial management (OECD). Higher financial literacy might lead toward optimal financial decisions, improved financial wellbeing and household welfare. Financial literacy is also imperative for financial market stability, as substandard consumer financial decisions can pave the way for financial turmoil and defaults. Thus, financial literacy coupled with the understanding of state of the art digital financial services could enhance effective financial inclusion. Despite enormous importance, worldwide financial literacy estimates are disappointing. Financial literacy scores are low even in countries with well-developed financial markets. In addition, gender gap in financial literacy is also huge around the world. Where, men tend to be more financial savvy than women. According to a recent survey of S&P, only 37% of adults around the world are financial literate. Further disaggregation shows that nearly 35% of males and 30% of females worldwide are found to be financially knowledgeable.¹¹ Besides these survey results, a large body of empirical research report lower levels of financial literacy in the world.¹²

Research suggests that financial development contributes to aggregate growth and

10. See Smallholders Financial Diaries 2016, which explains the uses of mobile phone by smallholder farmers. Can be accessed at: <http://www.cgap.org/publications/financial-diaries-smallholder-families>.

11. These statistics are fetched from the S&P Global FinLit Survey 2014.

12. More detail discussion about financial literacy is given in chapter 4.

reduces poverty and inequality, see, for example [Demetriades & Hussein \(1996\)](#), [Demirgüç-Kunt & Levine \(2009\)](#), [Beck *et al.* \(2007\)](#). However, evidence also indicates that increased credit expansion causes financial instability, see, for instance [Kelly *et al.* \(2011\)](#), [Jakubík & Slačák \(2013\)](#). Recent strand of studies focuses on the role of new technologies in poverty reduction and overall economic growth, see also [Kpodar & Andrianaivo \(2011\)](#), [Comin & Nanda \(2014\)](#). Financial inclusion has been identified as an important transmission channel that contributes to household welfare and help poverty reduction. Where, mobile phone diffusion and Internet penetration have been acknowledged to accelerate economic growth through several channels. These new technologies help leverage financial access and in turn, financial inclusion promotes household welfare and entrepreneurship development. However, the supporting evidence is very limited and at early stages in this branch of literature. Moreover, Fintech revolution claims to expand financial inclusion to the unbanked segments of the markets. Digital technology is also considered as a powerful tool to provide responsible and sustainable finance on the one hand. While on the other, fintech is believed to be more vulnerable to the cybercrimes. Moreover, nonexistence and inadequate regulatory framework and consumer protection mechanism also inhabit the capacity of providers to reach out. Similarly, research related to the impact of financial technologies on financial inclusion and on poor is also at an infant stage.

Despite favorable insights about the digitization of financial markets and digital financial inclusion, greater financial inequality still persists in lower income economies. As the rural poor and women are among the main financially excluded groups. The majority of these segments is comprised of those who have voluntarily distanced themselves from the financial system, do not have sufficient funds to deposit, non availability of financial institutions or without necessary documents. Moreover, the rate of dormant accounts is alarming in developing countries, where account holders have made no transactions.¹³ In this case the objective of financial inclusion falls short of its purpose. Effective financial inclusion is impervious without financial literacy. The beneficial effects of increased

13. Nearly 40% of the bank accounts declared as dormant in India and 20% in developing countries. Can be accessed at: <https://www.weforum.org/agenda/2015/05/the-main-facts-and-figures-about-financial-inclusion-around-the-world/>

financial inclusion depend upon the ability of consumers. Financial savvy individuals can manage finances adequately and can use digital financial services effectively. In addition, access to financial services by the rural poor and women could help poverty reduction. The growing importance of financial inclusion, financial literacy and digital financial services in the lives of masses has led to undertake this research. Therefore, it is exigent to investigate these interactions to draw meaningful conclusions. This research highlights several aspects related to financial inclusion and the ability of new technologies to leverage financial services in developing and low income economies in general and in particular for Pakistan.

1.1.1. Access to Finance and Poverty: The case of Pakistan

1.1.1.1. A brief overview of the Poverty status in Pakistan

Pakistan is home to over 207 million people, 32 million households. It is 6th largest country in the world with respect to population and 25th largest economy in terms of PPP.¹⁴ Presently, the economic situation of Pakistan highlights positive growth after a decade of significant volatility. The World Bank's Pakistan Development Update 2016 reveals that country has managed to record 4.7% growth in GDP which is highest in eight years. Moreover, poverty headcount is declining at encouraging pace since 2001, but the growth and poverty reduction rates are yet ineffective to unlock sustained wellbeing. Figure 1.2 exhibits poverty headcount ratio at national and provincial levels in Pakistan. The declining national poverty trends can be noticed over this period. Province-wise poverty is also decreasing since 2005, poverty trend for Baluchistan shows a slump during 2005-2010 while between 2010-2013 it slightly increased. This figure also indicates lower poverty for Punjab, the bread basket of Pakistan followed by KPK and Sindh. Baluchistan seems to have higher poverty headcount in Pakistan, as it remains highly fragile province during 2000s. In addition figure A.2b presents district wise multidimensional poverty in Pakistan, it also shows higher poverty rates in Baluchistan province. Similarly, figure A.2a demonstrates microfinance penetration in

14. The population figures are taken from PBS-Pakistan census 2017, and economy related from United Nations estimates 2017 and World Data Atlas.

the country. Again, greater number of MFI borrowers can be observed in the Punjab province and lower in the Baluchistan, large part of that province is without microfinance outreach.¹⁵ Due to security concerns this province largely remained financially excluded. However, improved security situation since 2013, development of Gwadar port and China Pakistan Economic Corridor (CPEC) are generating employment opportunities and local infrastructure development.

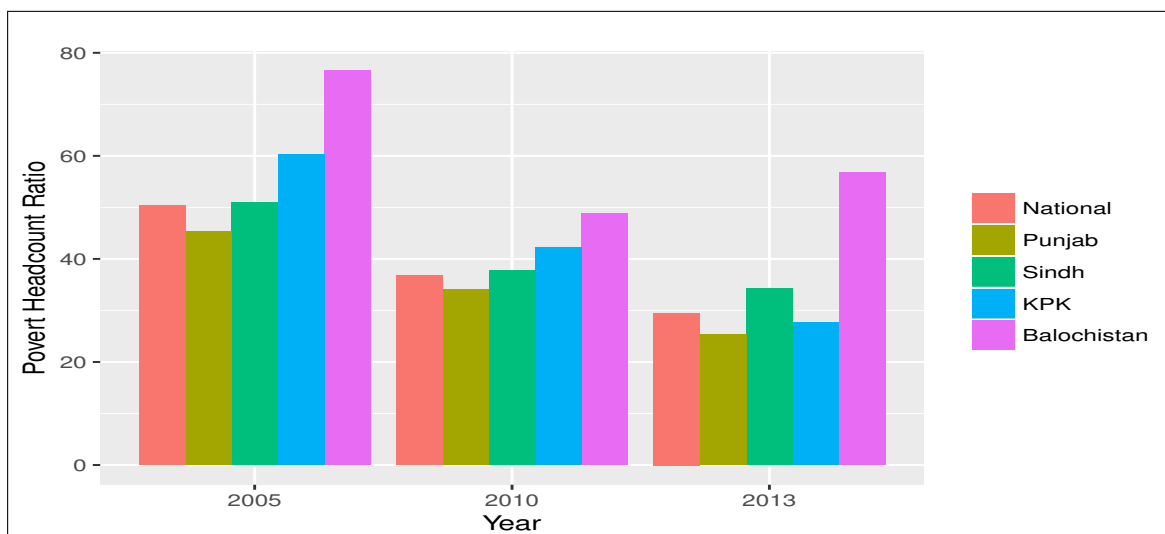


Figure 1.2 – Poverty Headcount Based on FY14 Poverty Line

Source: Pakistan Development Update, Author's calculations.

With the cooperation of several international organizations, the Government of Pakistan took various initiatives by setting up different poverty reduction institutions at national level, notably Khushhali Bank (KB), Pakistan Poverty Alleviation Fund (PPAF) and provincial level (RSPs) among others. Some notable social safety net projects are also operating in Pakistan such as Benazir Income Support Program (BISP) and Pakistan Bait-ul-Mal that provide financial assistance to the destitute. These institutions particularly target poor and destitute in order to enable them flee from poverty.

15. It is also worth mentioning that Punjab is the largest province with respect to population. According to the recent population census-2017, it is home to over 110 million people followed by Sindh (47.8 million), KPK (30.5 million) and Baluchistan 12 million. For more detail description about Pakistan census see, <http://www.pbscensus.gov.pk/>.

1.1.1.2. Financial Markets & Access to Finance in Pakistan

Formal banking sector in India emerges in 18th century during British Raj. At the time of partition (August 14, 1947), there were over 3,496 British and Indian commercial bank branches in India, out of which only 487 (13.3 %) were situated in Pakistan.¹⁶ In addition, most of the head offices of banks were located in India. Pakistan had no central bank for over a year after its independence. During this period the Reserve Bank of India (RBI) served as the central bank of both India and Pakistan. British government's commission distributed the assets of RBI on 30th December 1948 (30% for Pakistan, 750 M gold and 70% for India) while remains unsettled to this date. According to the SBP, India still owes Pakistan around Rs. 5.6 billion. The State Bank of Pakistan (SBP) was established on July, 1948 a year later from independence. Afterwards, it has opened 51 branches in east (currently Bangladesh) and West Pakistan.¹⁷ Despite poor infrastructure, banking sector in Pakistan has witnessed rapid development in subsequent decades and continues to grow. The banking sector in Pakistan has undergone several significant reforms since 1947, different democratic governments have experimented nationalization and privatization reforms.

The history of banking sector in Pakistan could be divided into three phases “Before nationalization”, “Nationalization” and “Privatization”. In 1970s all banks were nationalized by the Pakistan Peoples Party (PPP) government, later on during 1990s Pakistan Muslim League Nawaz (PMLN) government privatized formerly nationalized banks. In order to enhance economic growth, nationalization in Pakistan was a policy measure of the Prime Minister of Pakistan, Zulfikar Ali Bhutto.¹⁸ The financial sector of Pakistan was nationalized in the second stage of “Nationalization and Economic Reforms Order (NERO)” on 1st January 1974. The process of nationalization left disastrous effects on aggregate economy of Pakistan until the initiation of privatization process in 1991 (see figure 1.3). This figure illustrates a timeline of eminent events in the history of Pakistan along with the financial reform phases. After the nationalization phase by

16. “Routledge Handbook of Contemporary Pakistan”, Ch-15, p.248.

17. History of the State Bank of Pakistan can be access at: <http://sbp.org.pk/about/history/index.asp>

18. Riazuddin, Riaz. “Pakistan: Financial Sector Assessment (1990-2000)”, State Bank of Pakistan.

PPP government, de-nationalization in Pakistan, has been a policy measure of Prime Minister Nawaz Sharif. He launched privatization program on 22nd January 1991 with a vision to promote free market economic principles, to encourage ownership of private sector and to attract (FDI).

Major economic and financial reforms in the economic history of Pakistan occurred in these two regimes; however their aftershocks lasted for years. Figure 1.3 also demonstrates the length of a government’s tenure, name of the ruler along with his political party, type of rule and financial reforms in the history of Pakistan. The aim of the government to privatize the financial sector was to develop financial sector more competitive, profitable, see for example (Khan, 2008). Banks in Pakistan commenced offering quality and innovative products and services to their customers after they were privatized. More recently, up gradation of technology in banking made them more effective and efficient for their clients. These reforms in banking have transformed this sector into an efficient, strong and resilient. The country has witnessed booming banking sector during 2000s with the entry of foreign banks, introduction of Islamic banking, establishment of microfinance banks and initiation of mobile or branchless banking.

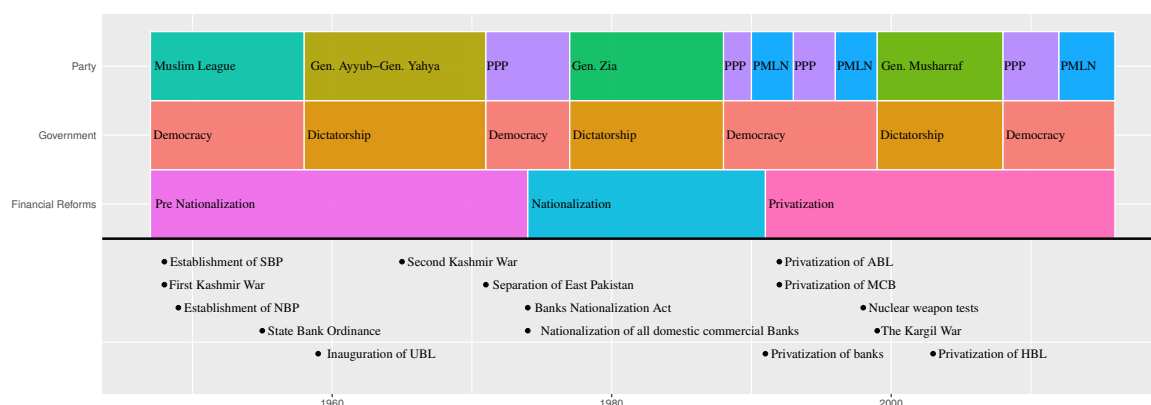


Figure 1.3 – Timeline of financial reforms and eminent events in Pakistan since 1947

Source: Author’s compilations.

The financial sector of Pakistan is hugely dominated by the banking sector. As the banking sector covers about 95% of financial market.¹⁹ At present, Pakistani banks are

19. Ishrat Husain: “Banking sector reforms in Pakistan”. Can be accessed at:<http://www.bis.org/review/r050203e.pdf>

equipped with state of the art facilities and stand together with the other developed banking systems of the world. For instance, they are now providing every service as in any developed country like ATM (debit and credit cards), e-banking, foreign currency accounts, insurance and pension schemes among others. A number of banks are under private control and because of stiff competition in the presence of foreign and government banks, all the competing players attempt to provide better services to the clients. In recent years, Pakistani banking sector has seen extraordinary unprecedented growth and proved as the best performing sector at national and regional levels. Branch-less banking is also flourishing at brisk pace, assets of the banking sector have been increased to over US \$97 billion with 17 percent rise in deposits. Table 1.1 presents the main results of access to finance surveys conducted in 2008 and 2015 in Pakistan. It also depicts the supply side statistics on access to finance in Pakistan.

Table 1.1 – Financial Inclusion at a glance

Demand Side Statistics			Supply Side Statistics	
Percentage of Adult population:	2015	2008	Number of Banks	54
A. Banked	16%	11%	Number of Branches	13,134
B. Other formal	7%	1%	ATMs	12,000
Formally Served (A+B)	23%	12%	POS terminals	44,000
C. Informally Served	24%	32%	BB Agents	310,000
Financially Served (A+B+C)	47%	44%	Total No. of Accounts	43,000,000
Financially Excluded	53%	56%	Total No. of Borrowers	7,000,000

Source: Access to Finance Survey, 2015

Source: SBP as of 31-May-16

As noted earlier, the financial sector of Pakistan is largely dominated by the banks. The number of commercial bank branches is 12,983 across the country. Whereas, these branches are hugely concentrated in urban areas and populated towns. There are 10 foreign banks operating in Pakistan, only located in big cities. In addition, a specialized bank to facilitate SME sector operating only in 13 big cities, while ZTBL (agriculture development bank) has sufficient outlets in the country. Islamic banking is also increasing in Pakistan with 5 full-fledged Islamic banks and Islamic banking branches of commercial banks comprise 1250 outlets.²⁰

The spectacular revolution that has been occurring in the telecommunication sector

20. The statistics in these figures are taken from SBP.

is changing the way banks interact with their customers. For example “Mobilink Microfinance Bank”, “Telenore easypaisa” and “UPaisa” are initiatives by the telecommunication companies. These institutions are offering wide range of financial products primarily through mobile phone. In addition, increased financial and technology (Fintech) partnership can help promoting financial inclusion particularly among far remote rural unbanked and women. Financial inclusion through postal service has also been acknowledged, over a billion rural people worldwide using postal services for savings and deposits.²¹ Pakistan has a vast network of post offices in the country however, very recently it announced provision of limited financial services such as savings, postal life insurance (PLI) and Electronic Money Order (EMO). Post offices can advance financial inclusion rapidly compared to other tools, due to greater trust of people in state backed financial institutions in Pakistan. These services are only being offered at GPOs (The General Post Offices) that are located in districts. There is a need to expand these services at tehsil and union council levels, so that the rural unbanked, poor, uneducated and women can access financial services confidently.²²

Pakistan is leading the South Asia and other developing, when it comes to the adoption of innovative ways to deliver financial services. In addition to the above mentioned entry of telecommunication companies into financial sector, Pakistan has witnessed a unique partnership of its kind. Pakistan State Oil (PSO) with 3500 outlets across the country (deals in petroleum products distribution) partners with “Telenore Pakistan” (a leading cellular and mobile banking company) to expand financial services.²³ Another significant player “e-Sahulat” under the aegis of NADRA (National Database and Registration Authority) with its 12,000 nationwide franchises, emerges as a financial provider. It partnered with several financial institutions and telecommunication companies with an objective to boost financial inclusion in the country. These initiatives are however at early stages and the real impact on the poor and overall financial inclusion could be possible to evaluate in the coming years.

21. Financial Inclusion and the Role of the Post Office. Accessed at : <http://blogs.worldbank.org/developmenttalk/financial-inclusion-and-role-post-office>

22. Each district usually composed of three sub-districts (Tehsils) and several Union councils. The Union Council is the lowest administrative unit in Pakistan.

23. For further detail, see, <http://psopk.com/en/media-center/press-releases/news-details?newsId=335>

The rapid developments in the mobile banking and changing landscape of financial providers force regulators to design rules and regulations to protect consumers. For this reason, the State Bank of Pakistan (SBP) along with Pakistan Telecommunication Authority (PTA) introduces mobile banking and branchless banking regulations. These regulations aimed at setting guidelines for diverse business models and consumer related issues.²⁴ Figure 1.4 provides insights about the diverse Fin-Tech partnerships taking place in Pakistan to advance financial inclusion in the country.²⁵ These latest ventures share common objective to provide financial services at the doorstep of consumer by eliminating conventional barriers to financial inclusion. It is worth noting that the dynamic partnerships come with potential risks, for instance lax regulatory environment, poor rule of law and higher contract enforcement cost could help rise in fraudulent activities. Moreover, consumer privacy and personal data would also be at stake, because of less educated retailers and widespread access points. They could furnish consumer information to the crooks for financial gains. Furthermore, the rural uneducated and women would be more prone to these kinds of scams due to the unfamiliarity with mobile banking. Thus, the initial phase of the Fin-Tech industry might leave many less educated poor out of money or defaults. However as the industry grows and people become acquainted with these new inventions and tight regulations, this could help broadening sustainable and effective financial inclusion particularly in developing countries.

According to the World Bank, there are more than 2 billion people worldwide without access to formal financial services. Whereas, more than 73% of unbanked population lives in 25 focus countries. Pakistan makes up one of the world's largest unbanked populations (5%) and is one of the important 25 priority countries; with only 1 in 10 adults having access to formal financial services.²⁶ Financial inclusion in Pakistan is very low compared with the other countries. World Bank 2014 reports that only 13% people have access to formal bank account and only 6% use mobile money accounts.

24. "Regulations for Mobile Banking Interoperability 2016", can be accessed at: <http://www.sbp.org.pk/bprd/2016/C3-Annx-A.pdf>

25. Information about the number of outlets and clients is taken from the respective websites of the companies.

26. Financial Inclusion Insights: <http://finclusion.org/country/asia/pakistan.html>.

- Telenore Pakistan	Telenor Easypaisa has over 70,000 merchants
- Mobilink	68,000+ retailers with 95,204 clients
- U-Phone	U-Bank with more than 23,000 UPaisa retailers
- Pakistan Post Office	Pak-Postal Savings Bank, 13,000 outlets
- NADRA e-Sahulat	More than 12,000 nationwide retail points
- Pakistan State Oil	Along with Telenore with its 3,500 outlets
- Karandaaz along with NBP	Developing a strategy for digitizing payments
- Pakcoin-First Crypto Currency	A hospital and 10 retailers accept Pakcoin
- CreditFix Pakistan	To provide financial identity to unbanked

Figure 1.4 – Financial Access in Pakistan: FinTech and Mobile Banking

Source: Govt. of Pakistan; SBP; Author's compilations.

Analogous to economic structure, Pakistan is characterized by an intricate financial system. Moreover, informal borrowing from friends and family, local money lenders and artis, or middlemen impedes the growth of formal financial inclusion (see figure 1.1). Lower levels of financial literacy and greater rural urban divide also hinder financial outreach in Pakistan. As the financial ignorant would not demand for financial services, instead they prefer to rely on informal source of financing.

Pakistan is a big country with an estimated area of 796,096 km^2 , large population lives in the rural areas (over 67% rural proportion).²⁷ Financial access is mainly concentrated in the urban zones while far remote villages still remain financially excluded and without mobile network and Internet access. The potential of mobile technologies in expanding financial access could make the task much easier for all the stakeholders including financial institutions, government and consumers. In addition, the adoption of National Financial Inclusion Strategy (NFIS) by the Government of Pakistan in May 2015 to bring unbanked population into formal banking sector to achieve financial inclusion goals by 2020 highlights the severity of the matter.²⁸

The growing importance of access to finance, financial literacy and FinTech has

27. Pakistan Bureau of Statistics, PBS.

28. NFIS is a part of World Bank UFA 2020, see <http://www.worldbank.org/en/topic/financialinclusion/brief/achieving-universal-financial-access-by-2020>

motivated to undertake this research. This thesis concludes that financial access could help poverty reduction and household welfare for low and middle income people. However, those with higher education and financial savvy might reap greater benefits from the developed financial sector than the others. Besides, it also finds that the adoption of new technologies such as mobile phone and Internet increases the likelihood of financial market participation for individuals as well as for SMEs. Empirical research demonstrates that the Internet related technologies also enhance the productivity of SMEs and financial institutions. But this transformation also brings some potential risks that might be reduced through strong supervisory control and tight rules and regulations. On the demand side, financial literacy can help offset the risks and accumulate benefits of the adoption of new technologies in financial markets. Building financial capability among masses is challenging task. The financial capability projects vary from country to country and community to community. In Pakistan there is a need to create awareness about basic financial products and concepts. Moreover, efforts must be devoted to reduce the gender gap in access to finance. In addition, public private partnership in provision of financial services must fully adhere to the relevant standards and guidelines. While the new entrants such as Fin-Tech disrupts have the potential to expand financial access but without adequate regulatory framework they might affect negatively the consumers and overall financial market. Last but not least, the expansion of credit to the small entrepreneurs especially women and agriculture sector could also stimulate overall economic growth and reduce poverty in the country.

1.1.2. Outline of the Thesis

This thesis focuses on several important dimensions of financial inclusion at macro and micro levels. It aims at investigating the role of financial inclusion in poverty reduction and how ICTs and financial literacy leverage financial inclusion and household wellbeing. The organization of this thesis is as follows; first two chapter presents general introduction in English and French respectively followed by literature review, third chapter explores the role of new technologies in promoting financial inclusion and poverty reduction. It also presents evidence on digital finance and new technologies based on cross

country data. Fourth chapter of the thesis reveals demand side of the financial inclusion in Pakistan. It indicates the importance of financial literacy for effective financial market participation and household welfare. Fifth chapter unveils the association between the adoption of new technologies and SMEs' access to finance in Pakistan.

Chapter 3 assesses the role of Information and Communication Technologies (ICT) in poverty & inequality reduction by fostering financial inclusion, using panel dataset of sixty-two countries between 2001 and 2012. It mainly focuses on two different dimensions of financial inclusion e.g., inclusion by commercial banks and by microfinance institutions (MFIs). As the formal financial institutions deal with wealthy and well-off clients, whereas the MFIs claim to be the bankers of poor. A large number of poor people are still un-banked in low income countries; however, research in development finance suggests that accessible and timely finance has the potential to bring poor out of poverty. The importance of MFIs in providing credit and other financial services at the doorstep of financially excluded households is globally acknowledged. Thus, it is inevitable to investigate the role of ICT in promotion of (MFIs)/financial inclusion particularly in developing countries. In the first step of data analysis, we find poverty reducing effects of financial inclusion measured either way. Furthermore, results of the study indicate a positive association of ICT diffusion with financial inclusion and a negative relationship with poverty & inequality. It was also observed that the ICT dimensions when used as instruments for financial inclusion accelerate economic growth and reduce poverty & inequality. Therefore, policies to promote information and communication infrastructure could stimulate financial inclusion by promoting digital finance. Moreover, better collaboration between ICT and financial sector will likely to advance digital financial inclusion that could help to bridge the financial infrastructure gap.

Chapter 4 evaluates the level of financial literacy and its effect on financial inclusion in Pakistan. It also presents the impact of Information and Communication Technologies (ICT) on financial inclusion. This paper analyzes survey data for 409 low and middle income households from 4 major cities of Pakistan. After data collection and cleaning process we utilized probit, ordered probit and correspondence analysis. Probit results show that higher financial literacy leads to an increased probability of having a formal

bank account. Individual and household characteristics are also found to be strong predictors of financial literacy and inclusion in Pakistan. Findings of ordered probit unveil the impact of financial inclusion and literacy on household income, where we find insignificant coefficients of financial literacy. However, financial inclusion and access to and use of ICTs provide significant effects on household income. In addition, we show that ICT and social media highly influence the individual's financial market participation. Households with greater access to and use of ICTs are highly likely to be affluent compared to their counterparts who don't use. Our study also shows that financial literacy increases the likelihood of savings, but it does not show any significant impact on retirement planning and household budgeting. Moreover, correspondence analysis supports the findings of probit analysis. It also indicates inequalities in access to and use of financial services, ICTs and education attainment. In sum, improving financial literacy alongside ICT can promote effective financial market participation and household financial well-being.

Chapter 5 presents a vary perspective of the association between ICT and access to finance by SMEs in an emerging economy. In this chapter we also focus on Universal Financial Access (UFA 2020 goal) and Pakistan's National Financial Inclusion Strategy (NFIS). This chapter mainly presents results by applying Exploratory Data Analysis Approach (EDA). We utilized World Bank Enterprise Survey (WBES) data of 1247 (SMEs) along with various reports of the State Bank of Pakistan (SBP). Access to finance is approximated from two indicators such as firm's bank account and line of credit from a financial institution. SMEs in Pakistan experience lower financial access compared with the other peer countries which is also declining since 2007. Whereas, small and larger firms differ significantly in terms of access to finance, where latter have a comparative advantage over former. Conversely, SMEs in Pakistan exhibit encouraging trends when it comes to the access to and use of ICT related technologies such as e-mail, website, cellular phone etc. Moreover, results of the probit model reveal that the age and size of the firms are significant predictors of firm's financial inclusion in Pakistan. Micro and younger firms are found to be financially excluded compared with medium and larger firms. Furthermore, selected ICT related indicators also increase

the likelihood of firm's access to finance in Pakistan. This implies that firms with greater access to and use of new technologies are more likely to benefit from financial markets. Likewise, results of Multiple Correspondence analysis (MCA) also indicate the association between ICT adoption and firm's access to finance for sampled firms. In conclusion, this study suggests that policies aimed at building inclusive and transparent financial sector and ICT infrastructure development could lead to shared prosperity of an economy by flourishing SME sector.

Chapter 2

Access to Finance & Poverty: A Review of Literature

LITERATURE REVIEW

2.1. Introduction

The role of finance is always hailed as a significant contributor to economic growth and a vital element of economic system. Finance-growth relationship has been a big question for economists and policy makers for a long time. [Bagehot \(1873\)](#) and [Schumpeter \(1911\)](#) have proposed the idea of beneficial effects of well-developed financial markets for an economy. Afterwards, based on empirical evidence several economists opined finance-lead growth (for instance, see ([Goldsmith, 1969](#), [King & Levine, 1993a](#), [Beck *et al.*, 2000](#), [Levine, 2005](#))). Similarly, an amount of evidence suggests that development of financial system reduces income inequality by expanding outreach, because availability and timely access to finance become possible for the poor households who were neglected previously. They might have the opportunity to borrow from developed financial markets, as argued by ([Galor & Zeira, 1993](#), [Clarke *et al.*, 2006](#), [Honohan, 2004](#)). The disproportionate effects of financial sector development on productive and unproductive individuals, small and large firms and heterogeneous sectors and developed and developing economies have also been a burning subject among researchers (see for instance, ([Rajan & Zingales, 1998](#), [Beck *et al.*, 2007, 2008](#), [Calderón & Liu, 2003](#))). In addition to these favorable arguments, some economists also believe that only richer and powerful people can get maximum benefit from a developed financial system. By virtue of the fact that formal financial system entails collateral from borrowers, poor people lack collateral and consequently they remain unbanked or underbanked [Clarke *et al.* \(2006\)](#). In this phenomena, inclusion of poor in financial markets might be arduous even when these markets are well developed. This situation eventually ends up in yielding inequality. This debate takes the next level, with intermingled evidence based on the indicator selection, supply leading or demand following hypothesis, type of the data e.g., time series or cross sectional, econometrics technique, sample selection among others.

Another argument sheds light on the importance of institutions to reap the benefits of financial sector development. For example, ([Levine *et al.*, 2000](#)) show that strong legal and contract enforcement infrastructure can stimulate financial development that eventually helps to promote economic growth. ([Huang, 2010](#)) show positive impact of the improvement in the quality of institutions on financial development in the

short run for low income countries. Analogously, (Andrianova *et al.*, 2011) reveal that the level of financial development depends on the quality of governance and institutional improvement particularly for lower income countries. (Rajan & Zingales, 2003) emphasized on strengthening the institution and legal structure. In the same fashion (Rossi, 1999) states that sound institutions along with strong supervision ensure healthy financial sector that eventually reduces financial fragility and improves economic performance. (Mishkin, 2009) also portrays that the strength of institutions, governance, legal structure and reforms are necessary conditions for an underdeveloped economy to outpace growth contraction factors. Based on the case and cross-country evidence about financial development and income inequality, Claessens & Perotti (2007) conclude that the quality of institutions plays a significant role in broadening effective access to finance. They also provide that sustained and broad financial development can be possible through reforms that can also help inequality of access particularly in unequal countries. Gimet & Lagoarde-Segot (2011) analyzed data of 49 countries for the period of 1994-2002 and witness causality from financial development to income inequality. Moreover, they suggest that the characteristics of the financial sector largely determine the relationship more than its size.

Besides the importance of institutional quality for sustained and broad financial development, another stream of literature focuses on the threshold effects and the negative implications of credit expansion (a broad indicator that is widely being used a proxy for financial development). For instance, (Cecchetti *et al.*, 2012) suggest that financial development is beneficial up to a threshold level then it becomes a source of dawdle for economic growth particularly in emerging economies. (Jeanneney & Kpodar, 2011) argued that credit abundance by the banks does not offer much benefit to poor but transaction facilitation and saving opportunities. In addition, they find that financial development paves the way for financial instability which is detrimental for the poor. Similarly, (Schularick & Taylor, 2012) dubbed credit expansion as the sole best predictor of financial instability rather external imbalances. Likewise, (Kelly *et al.*, 2011) confirm that credit expansion is a leading predictor of financial instability. In a like manner, (Jakubík & Slačák, 2013) infer that the credit growth has a significant influence on

financial stability. (Borio *et al.*, 2011) observe that credit expansion affects negatively to growth of retail deposits, consequently financial intermediaries shifts to wholesale funding.

Despite these arguments, a large body of literature predominantly indicates favorable impact of financial sector development for poverty alleviation, inequality reduction and economic growth. Furthermore, a developed financial sector ensures the availability of affordable financial services. It facilitates poverty and inequality reduction and encourages SME development by broadening access to finance.¹ The access to and use of financial services generally termed as financial inclusion. It is an important component of financial development. According to the World Bank financial inclusion is the access to the useful and affordable financial products and services (such as transactions, payments, savings credit and insurance) that full the needs of individuals and businesses.² Affordable and accessible finance is considered one of the important tools to fight poverty in developing economies. (Beck & Brown, 2011) and (Levine, 2005) suggest that the access to finance reduces poverty, they illustrate that bank account users households are highly likely to be wealthy and well educated. In a related study, (Bruhn & Love, 2014) argue that access to finance has the potential to reduce poverty, increase employment and income in low income regions.

Access to finance has recently attracted a considerable attention from the policy makers and researchers. As it is considered an important driver of shared prosperity, poverty reduction, SME development and economic growth. Financial inclusion usually refers to the ownership of a formal bank account or a mobile banking account. Some also suggest that financial inclusion is a combination of two elements such as i) the availability of financial services (supply side) and ii) the knowledge of financial products and services (demand side). This thesis focuses on the empirical examination of the impact of financial inclusion on poverty and inequality and household welfare. It also investigates the role of new technologies in the expansion of financial services and how financial literacy increases the probability of financial inclusion. Therefore, the rest of the study is devoted to financial inclusion and related components. This study draws

1. <http://www.worldbank.org/en/publication/gfdr/background/financial-development>
2. <http://www.worldbank.org/en/topic/financialinclusion/overview>

links from the traditional finance-growth nexus to understand the importance of financial inclusion for individuals, businesses and for the overall economy.

2.2. Theoretical Perspective

Competitive equilibrium maximizes social efficiency and is characterized by Pareto efficiency. This mechanism also termed as Walrasian equilibrium where scarce resources are efficiently allocated. The efficiency of competitive equilibrium implies that markets are perfectly competitive, resources are efficiently allocated and there are no externalities such as pollution or asymmetric information. On the other hand, inefficiency of competitive equilibrium demonstrates that some markets are missing. A market could be named as “missing” due to various factors like mistrust, imperfect information and transaction cost. This phenomena has been described by the winner of Nobel Prize in Economics Kenneth J. Arrow, where he highlights that the transaction cost explains the condition of missing markets as it makes harder for some markets to organize effectively. In order to overcome the situation of missing market, Arrow suggests intervention of the State/Government, role of certain social norms or other formal actors’ involvement. The missing market in case of financial inclusion is the absence of market for the provision of financial product and services for the poorest.

There are multiple types of transaction costs associated to the missing markets of financial inclusion. For example the transaction costs for financial exclusion can be broken down into two categories, first, demand side constraints (consumer) and second, supply side (financial markets). The consumer constraints can further be categorized as; i) proximity to a bank involves financial cost and time particularly for rural poor ii) psychological cost for a majority of poor, as they voluntarily distanced themselves from financial markets due to lack of knowledge and awareness. In addition, the supply side costs are; i) risks involved in dealing and or lending to the poor usually without collateral, moreover furnishing of check book or credit card could also increase the probability of defaults ii) provision of financial services like insurance to the poor can also be problematic for financial institutions due to asymmetric information.

Based on these theoretical grounds this dissertation focuses on the missing market of financial inclusion and how and what factors can reduce or eliminate the aforementioned costs. We argue that the new technologies (henceforth ICT) such as mobile phone and Internet provide two way assistance to annihilate these transaction costs. ICT can promote financial inclusion by expanding outreach of the financial institutions to the far remote regions such as mobile banking. Financially excluded person might have access to a bank account (mobile banking account) without visiting a physical bank branch. Availability and easy access to financial services help reduce the cost of traveling to the city where bank is located. ICT also favor to fill missing market from supply side as it reduce the cost of operations for banks and provide efficient way to contact the existing and evaluate potential clients. As [Kpodar & Andrianaivo \(2011\)](#) indicate that the business of financial intermediaries can be advanced due to reduction in the transaction costs by ICT particularly mobile penetration, while on the other hand it facilitates branchless banking. They further suggests two way effects of mobile penetration i.e., provision of financial services to the financially excluded communities and ii) expansion of financial services and business by reducing transaction costs of running a physical bank branch. Similarly, [Datta & Agarwal \(2004\)](#) and [Waverman *et al.* \(2005\)](#) also argue that better communication and technologies reduce transaction costs. Furthermore, [Alter \(2015\)](#) highlights that mobile banking reduces transaction costs and helps broadening access to finance at lower rates. In the same vein, [Sassi & Goaid \(2013\)](#) and [Claessens *et al.* \(2002\)](#) also show that ICT diffusion is beneficial to expand financial services in a way that it helps reducing market frictions such as information and transaction costs. In addition to that, [Beck & Feyen \(2013\)](#) argue that size of the firm determines firms' access to finance based on transaction costs and information asymmetries. The smaller firms confront higher credit constraints as compared to the larger firms. They further indicate that SME are financially constrained due to lack of desired collateral and poor governance structures. [Dabla-Norris *et al.* \(2015\)](#) identify credit participation cost as one of the barriers to access credit. They also demonstrate that decrease in financial participation cost increases firms access to credit. [Dabla-Norris *et al.* \(2015\)](#) also discussed that individuals have access to credit however the size of

credit varies due to financial frictions such as limited commitment and asymmetric information.

Besides, financial literacy increases the probability of an individual's financial markets participation. In contrast, financial illiteracy assumed to be an important factor for self-exclusion, in line with the second transaction cost discussed above. Several economists reveal that financial illiteracy drives financial exclusion and lowers the demand for financial services. [Beck & De La Torre \(2007\)](#) presented that financial exclusion can be voluntary due to non-economic factors such as lack of financial knowledge, ethnicity and religion or cultural barriers. They further suggest that financial illiteracy can reduce the demand for financial products and services. [Barajas *et al.* \(2013\)](#) described factors that inhabit the provision of financial services (supply side) and limit participation from demand side. In addition to the broad state and institutional factors they also include socio-economic indicators such as conflict, financial illiteracy and informality. Based on survey data from India and Indonesia [Cole *et al.* \(2009\)](#) reveal that financial literacy is an important determinant of demand for financial services particularly among less educated individuals.³ Furthermore, the work of [Grohmann *et al.* \(2014\)](#) and [Kim \(2016\)](#) also shows financial illiteracy as an obstacle to financial inclusion.

This dissertation is also related to the social capital theory. The empirical research shows that social households are more likely to participate in financial markets, [Hong *et al.* \(2004\)](#). In developing world there are various informal schemes and lending programs that encourage social interactions and networks. These networks can help reduce individual stress, provide information, guidance and build pressure on a potential defaulter to repay loan. Most recent research deals with the socialization over the Internet related technologies and social capital. [Fukuyama \(1995\)](#) and [Calabrese & Borchert \(1996\)](#) provided the basis for information technologies and social capital linkages. Where, [Fukuyama \(1995\)](#) argue that the existing physical (face to face) networks help build electronic networks. Similarly, [Calabrese & Borchert \(1996\)](#) indicate the favorable influence of information technology for the development of social capital.⁴ In contrast,

3. Also see [Klapper *et al.* \(2013\)](#) for the linkages between financial literacy and financial inclusion in Russia.

4. The latest empirical research about social media, Internet and conventional social media or somewhat mixed (see for instance, [Hooghe & Oser \(2015\)](#), [Dhavan V Shah \(2001\)](#))

Putnam (2000) is of a view that new technologies do not facilitate social capital. Putnam further went on to describe that technology and mass media particularly television is responsible for isolation of Americans, as their face to face interaction has been reduced.

This research is also related to the Behavioral Decision Theory (BDT) by Edwards (1954) and Prospect Theory of Kahneman & Tversky (1979). Behavior decision theory put forth by an American psychologist Edwards (1954) which describes individual's decision making in a systematic approach. While, Kahneman & Tversky (1979) propose prospect theory that describes the process of decision making in risky uncertain situations. Prospect theory referred that gains and losses are valued differently and the individuals usually make decisions on the basis of perceived gains rather than perceived losses. Prospect theory is also known as the loss aversion theory. It describes that decisions are normally based on judgments of the humans and judgments are the assessment of external state of the world. In this study, we take financial literacy as an element of human cognitive ability and assumed that individual with higher level of financial literacy score possess greater cognitive ability. In this case the decision which is the main variable of concern is access to financial market or more specifically to own a formal bank account.

This study further grounds in Resource-Based View (RBV) resource based theory when it enters SME level settings. This theory describes the importance of firms resources and how firm exploits those available resources to gain competitive advantage Barney (1991). In this dissertation I consider SMEs' access to and use of ICT as their resources and hypothesized that more the SMEs use ICT the greater the probability of their access to finance.

The motivation of this study also comes from a more broader argument about the role of financial deepening and economic growth Levine (1997, 2005), finance and inequality (Greenwood & Jovanovic, 1990, Beck *et al.*, 2007) microfinance and poverty and inequality (Inoue & Hamori, 2012, Imai & Azam, 2012), financial literacy, ICT and financial market participation (Van Rooij *et al.*, 2011a, Bogan, 2008) SMEs' access to finance (Beck *et al.*, 2008, Beck & Demirguc-Kunt, 2006). In addition to these, another branch of literature suggests the beneficial effects of financial development for technological innovations

(Comin & Nanda, 2014, Levine, 2005). Financial sector encourages innovation and facilitates experimentation as suggested by Comin & Nanda (2014).

A considerable body of theoretical and empirical evidence suggests the beneficial impacts of financial development on poverty and inequality reduction, advancement of innovation and economic growth. There are also some concerns about this argument of favorable effects of financial sector development discussed above. However, the recent interest of the policy makers around the world shifted towards to promote delivery of financial services to the financially excluded groups particularly in developing countries. This dissertation exclusively focuses on financial inclusion instead of financial development and considers alternate indicators then suggested by conventional finance-growth literature. Approximately, there are more than 2 billion people without access to a bank account (WB), whereas, access to finance is identified as one of the important tools to fight poverty. Several notable institutions such as World Bank, IMF and CGAP unanimously conceive the ability and potential of the provision of financial services to the unbaked population for poverty and inequality reduction. These institutions are working with the governments of the poor countries to reduce the number of unbanked. For that reason, they have also established Universal financial access goals by 2020 (UFA 2020) in 25 priority countries where the larger population lack access to formal financial services. The central objective of UFA-2020 is to bring the unbanked individuals, SMEs and small farmers into formal banking sector. Moreover, developing financial capability among the masses is also a policy objective of this program due to lower financial literacy levels around the world. Therefore, it is indispensable to investigate the current progress, effects and factors influencing financial inclusion at national, SME and individual levels. Based on the theoretical considerations (transaction costs) discussed above that is ICT and financial literacy lower the transaction costs and pave the way for effective financial inclusion. This dissertation thereby empirically examines the effects of ICT and financial literacy on access to finance at aggregate, individual and firm settings.

In the following tables, literature on extremely pertinent studies is summarized.⁵

5. In the following tables I attempt to present highly cited studies for each of the topic based on Google scholar citations with at least 50 citations, however the number of citations may be lower for the latest published papers.

However, for a comprehensive discussion on the relevant literature for respective studies see section 3.2 of chapter 3, section 4.2 of chapter 4 and section 5.2 of chapter 5.

Table 2.1 – Literature on ICT, Poverty & Inequality and Financial Inclusion

Main topic	Research Questions	Result	Author
ICT, growth, poverty	What is the role of ICT in economic growth	Investment in ICT promotes economic growth while ICT does not Investment in ICT and ICT promote economic growth through capital accumulation ICT reduces production cost and increase output	Pohjola (2001) Colecchia & Schreyer (2002) Vu (2011, 2013)
	What is the role of ICT in poverty reduction?	ICT reduces poverty reduction and are powerful tool to access education, health and financial services	Kenny (2002), Cecchini & Scott (2003), Shamim (2007), Warren (2007), Bhavnani <i>et al.</i> (2008), Sassi & Goaid (2013), Pradhan <i>et al.</i> (2015)
ICT, financial inclusion	What is the role of ICT in promotion of financial inclusion	They suggest favorable effects of ICT for economic growth through financial inclusion	Kpodar & Andrianaivo (2011)
	Does ICT/mobile banking affect poor ?	ICT penetration, mobile technology promote financial inclusion particularly in rural areas Mobile banking helps to improve economic conditions of the poor Mobile money technology affects entrepreneurship and economic growth positively	Kendall <i>et al.</i> (2010), Sarma & Pais (2011), Mishra & Bisht (2013) Mbiti & Weil (2011) Beck <i>et al.</i> (2015)
	Does Microcredit reduce poverty and promote economic growth	They suggest favorable effects of access to credit of the poor for economic growth and poverty reduction	Roy (2003), Khandker (2005)
Access to Microfinance and poverty	Microcredit, poverty reduction at aggregate level	These authors report negative relationship of microcredit access with poverty reduction and household welfare indicators They did not find significant effects of microcredit and find no difference between borrowers and non-borrowers in most indicators	Imai <i>et al.</i> (2010), Imai & Azam (2012), Inoue & Hamori (2012) Duflo <i>et al.</i> (2013)
	Microfinance & Inequality	They find that microfinance lowers inequality and promote economic growth They show very little impact of microcredit in inequity reduction	Kai & Hamori (2009) Hermes (2014)
	Microfinance & Dwelling	Report a slight improvement in the dwelling conditions	McIntosh <i>et al.</i> (2011)

(continued)

Literature on ICT, Poverty & Inequality and Financial Inclusion

Main topic	Research Questions	Result	Author
Access to finance and poverty	Does access to finance lower poverty and promote household welfare	Rich and wealthy households are more likely to have a bank account in countries with higher foreign bank presence	Beck & Brown (2011)
		Access to finance has a potential to reduce poverty and increase employment in low income regions	Bruhn & Love (2014)
		Socio-economic conditions can be improved through advancing financial inclusion	Alter (2015)
	Financial Access and Inequality	They show negative correlation between financial access (bank account) and inequality	Honohan (2008) , Park & Mercado Jr (2015)

Table 2.2 – Literature on ICT, Financial Literacy & Financial Inclusion

Authors	Approaches Sample	Methods	Conclusions
Bogan (2008)	Quantitative	Health and Retirement Survey, Questionnaire, Univariate Probit Model	They find positive impact of access to and use of Computer/Internet on stock market participation.
Servon & Kaestner (2008)	Qualitative and Quantitative 243	Telephone Surveys and Interviews	Financial literacy, information and communication technology training is crucial for Low-moderate income people to properly use e-banking otherwise it will remain beneficial for the financially literate and high income customers only.

(continued)

Literature on ICT, Financial Literacy & Financial Inclusion

Authors	Approaches Sample	Methods	Conclusions
Klapper <i>et al.</i> (2013)	Quantitative 1600	Panel Data, Face-to-Face Interviews	Financial literacy is significantly related to financial markets participation it also discourages informal borrowing. Financial literacy helps individual to bear macroeconomic and income shocks.
Van Rooij <i>et al.</i> (2011a)	Quantitative 2000 Two modules 2005-1508, 2006-1373	Internet, Household Survey (DHS), Designed Questionnaire	Lack of Financial Literacy prevents households to invest in stocks. While unsophisticated investors cannot make wise choices to invest in financial markets. Further, they know less about how to invest and how to make good decisions for retirement.
Behrman <i>et al.</i> (2010)	Quantitative 13054	Social Protection Survey	Financial literacy and schooling attainment have the positive effects on household wealth accumulation. It could have much larger benefits for individuals, firms, economy and government if they invest more in financial literacy.
Cámara & Tuesta (2015)	Quantitative 26456	ENAHO-2001 Survey (Quarterly & Annually), Probit Model	Identify main reasons of financial exclusion in Peru such as lack of education, income, living in rural areas and women. There are almost 50% individuals who are not availing financial services due to low income and cost of services.
Thomas & Spataro (2015)	Quantitative, SHARE, wave 4-32337 SHARELIFE, wave 3-17533 (re-interviewed)	Questionnaire (Financial & Numerical) OLS and Binary Probit Model	Financial literacy and Human capital are positively associated with stock market participation. Quality of education (teacher-student ratio) and financial attractiveness are also major predictors of stock market participation in Europe market.
Cole <i>et al.</i> (2009)	Quantitative India and Indonesia, 14million observation, 5% sample from census data	Survey (Questionnaire) OLS regression, linear regression model	They further find that financial literacy programs remain unsuccessful to increase financial inclusion, however moderate effect has been noticed among uneducated and financially illiterate households.
Javed (2008)	Quantitative 10,305	AtoF Household survey, Questionnaire, Multinomial Logistic Regression	Study based on Gallup survey in Pakistan found that education is the main contributor to financial literacy, improved income and education can lead to greater financial literacy and inclusion in Pakistan.

Table 2.3 – Literature on SMEs ICT adoption& Access to Finance

Authors	Approaches Sample	Methods	Conclusions
Beck <i>et al.</i> (2005)	Quantitative, 45 countries	OLS, IV regres- sion	They concluded that SMEs contribute to economic growth, however this result becomes invalid when they account for endogeneity.
Beck & Demirguc-Kunt (2006)	Descriptive	Literature Review	They concluded access to finance a growth constraint for SMEs.
Beck <i>et al.</i> (2008)	Quantitative, 44 countries, 36 industries	OLS, IV specifications	They show that financial development helps grow smaller firm industries as compared to the larger industries
Beck & Pería (2009)	Quantitative, Survey, 45 countries, 91 banks	Descriptive, t-test	They reveal that SMEs in developing countries face greater constraints than in developed countries, as banks extend lower investment loan at higher rates
Presbitero & Rabellotti (2016)	Quantitative, WBES data	LPM & binary selection model	They find variations in SMEs access to finance based on size, information transparency and region in LAC
Benfratello <i>et al.</i> (2008)	Quantitative 5415-4497- 4680 SMEs, Italy	Pooled Logit Models	They show that financial sector development increase the probability of innovation process in small and high-tech firms
Han (2008)	Quantitative 2500 SMEs UK	Ordered logistic model	They find that online banking, behavior and banking relations help reduce perceived financial problems for the entrepreneurs
Ayyagari <i>et al.</i> (2011)	Quantitative WBES- 19000 firms, 47 developing countries	OLS, country fixed effects	They find that young large firms are more innovative, moreover, they find positive association between firm innovation and access to external finance
Lee <i>et al.</i> (2015)	Quantitative 10,000 SMEs UK	Probit Model	They find that, since the financial crisis innovative firms are more likely to confront financial constraints compared to the other
Dalla Pellegrina <i>et al.</i> (2017)	Quantitative 6000 SMEs Italy	OLS, Heckman selection estimation	They conclude that ICT adoption by small firms in Italy increases the likelihood of firm's access to credit.

2.3. Literature Relevance

The objectives of this study include i) to establish theoretical grounds for this dissertation and ii) to provide a review of existing literature for each of the following chapters. A substantial body of evidence supports the argument of positive impact of financial development on economic growth and poverty reduction. In contrast, research also demonstrates variations in the tendency of the impact based on country's level of development, institutional quality, governance structure and the financial markets composition. This dissertation draws links from the conventional finance-growth nexus hypothesis and focuses on a relatively new indicator i.e., financial inclusion. Financial inclusion is thought to have the ability to improve household welfare by encouraging savings, interest earnings and efficient transactions among others. However, there are various barriers that inhibit broadening financial inclusion. Based on the theoretical model developed in section 2.2, this dissertation mainly deals with the two factors such as i) ICT and ii) psychological cost due to financial illiteracy that lower transaction costs involved in financial inclusion.

Related literature about chapter 3 provides grounds to investigate the impact of ICT on poverty and inequality by exploiting financial inclusion channel. There is evidence of the impact of ICT on overall growth and financial development. However, investigation of the impact of ICT and financial inclusion on poverty and inequality through the channel of financial inclusion makes this study significant from the others. In addition, this study simultaneously considers financial inclusion by commercial banks and MFIs.

Research related to 4 demonstrates positive impact of ICT use and financial literacy on stock market participation. In contrast, this study focuses on to examine whether ICT use and financial literacy increase the probability of financial inclusion, household welfare and retirement planning in Pakistan (one of the 25 priority countries characterized by higher financial exclusion identified by the World Bank).

Finally, chapter 5 contributes to the literature on SMEs' ICT adoption and access to finance. Present literature provides mixed results about the innovation and firm's access to finance. Moreover, empirical literature with respect to Pakistan on this topic barely exists to the best of our knowledge.

Chapter 3

Microfinance, Financial Inclusion and ICT: Implications for Poverty and Inequality: Evidence from Emerging and Low-Income Countries

MICROFINANCE, FINANCIAL INCLUSION AND ICT

3.1. Introduction

The intellectual debate over the contribution of financial sector in overall economic growth continued extensively; particularly for economists and policymakers' investigating this underlying relationship endures preeminent for many years but still indecisive with antagonistic opinions. Schumpeter (1911) argued that the banker and entrepreneur can swiftly augment the economic growth and industrial development. Well-functioned financial sector has various benefits and contributions towards overall growth of an economy. As financial intermediation plays its role by transferring and allocation of scarce resources Levine (2005), Beck *et al.* (2000). Moreover, developed financial system is perceived as the most important component of market in transition economies due to its role in allocation of scarce resources Greenwood & Jovanovic (1990), Ben Naceur & Zhang (2016). On the other hand, adversaries have the opinion that financial institutions are neither sufficient nor necessary for economic growth.¹

Another stream of research outlined the scenario which lies between these two polar extremes and showed bidirectional relationship. In addition to finance-growth and poverty nexus, this study considers the role of information and communication technologies (henceforth ICT) diffusion that is thought to promote financial inclusion and poverty reduction.² It is generally believed that (ICT) penetration through mobile telephony rollout has greater benefits. Mobile rollout is considered the most important factor in ICT diffusion, it improves the availability of financial products (supply side) and boosts demand for these products (demand side). Further, the increased ICT penetration helps promote the overall economic growth as well by advancing financial inclusion which stimulates financial sector development. Moreover, ICT penetration facilitates information flows and the analysis of credit worthiness in efficient way by maintaining the comprehensive database of clients. As a result, economies witness the escalation in private investment and eventually rise in economic growth (see, for instance Kpodar & Andrianaivo (2011)). They further argued that the ICT have a positive significant

1. This statement's context is that the financial institutions have played a significant role in capitalistic economies but it is neither sufficient nor necessary, see Pyka and Andersen "Long Term Economic Development". p.434.

2. ICT stands for Information and Communication Technologies. We used ICT in plural form throughout this thesis.

impact on rural development; enable better connectivity to stay in touch with dear ones that reduces psychological disorders; provide rapid market information to farmers that improves their bargaining power and eliminates the middleman. Furthermore, increased ICT penetration promotes various non-agricultural economic activities in rural areas like ecolodges and women owned micro enterprises. They also highlighted that increased information and knowledge enable micro entrepreneurs to apprehend and manage business in improved fashion. Micro and small enterprises will get faster and cheaper market information than print media. Additionally, service delivery and mobile banking would be efficient as a result of less cost, improved infrastructure and information. Similarly, [Comin & Hobijn \(2009\)](#) consider technology diffusion as a key channel through which productivity growth is achieved.

Furthermore, [Datta & Agarwal \(2004\)](#) described direct impact of ICT through rise in employment opportunities and demand, while they explain indirect economic benefits through social returns. The debate of direct and indirect benefits of ICT goes on and turns to Latin America and Africa (see, for instance, [Lewin & Sweet \(2005\)](#)). ICT diffusion plays a positive role in the advancement of community through numerous channels. It contributes to education sector by increasing Internet access, facilitates virtual education through electronic and print media. The association between ICT and health is also very important; it aids dissemination of rapid medical information and permits online operation facility in rural areas.

In addition, some researchers conceive that economic growth leads ICT penetration which eventually enables (in particular) under-served groups of the society to access financial markets. In turn, this increased access for the lower end of society would help to reduce financial infrastructure gap in low and middle income countries (see, for instance [Kpodar & Andrianaivo \(2011\)](#)). On the other hand, studies indeed described finance led technology development (see, also, [Comin & Nanda \(2014\)](#)). They anticipated that the financial markets contribute significantly in the process of technological advancement. The authors further demonstrated that the financial sector development contributes and facilitates the essential process of experimentation for the initial commercialization of technologies. A large number of financial market operations are managed from computer

and Internet related technologies; trading of securities in capital markets and future forward contracts among others.

Banking transactions have become more efficient and secure; e-banking has changed the entire banking system. With the increasing spread of mobile phone and Internet related technologies, digital banking is progressing at rapid pace. When it comes to the adoption and implementation of new technologies, the Microfinance Institutions (MFIs) also not fall short. These institutions typically deal with less educated, (rural) poor and unbanked individuals, their ICT based solutions are largely customer oriented. [Berger & Nakata \(2013\)](#) revealed that MFIs are switching from labor-intensive and costly social networks to ICT-based solutions. Microfinance sector has tremendous contribution in the success of Millennium Development Goals (MDGs). Recently, policy makers have turned their attention to explore the role of ICTs in sustainable development and urban goals. Research on ICT and financial services is promising which thereby provides incentive to explore into more rigorous analysis.

The other side of story sheds light on negative effects of improved ICT penetration on poor household. They might spend greater portion of their earnings on mobiles, sim cards and recharge of pre-paid connections. It increases the share of household or personal budget on mobile and Internet based technologies that could have been utilized for other household basic needs, such as food, health and education. Eventually, the limited budget of household gets disturbed and the economic situation of poor would worsen. Empirical studies point out that the household spending on mobile phone related technologies is rising more than proportionally in developing countries compared to advanced world. The share of income devoted to mobile services could have been used for food, health, education or on other productive purposes or needs. For example, [Heeks \(1999\)](#) indicated negative impacts of opportunity costs from the utilization of financial resources in ICTs rather than in health and education. Besides, [Thomé et al. \(2011\)](#) suggested that the increasing use of mobile phone and Internet related technologies leads towards anxiety, depression and sleep disorders. The use of social media at workplace is also a burning issue, as it reduces the productivity. Even mismanagement of time by the general public in using mobile and Internet is a growing concern. Furthermore,

less educated Internet users are exposed to online scams, frauds, malware and viruses. Sometimes they trap themselves in serious situations unintentionally.

In addition to the negative effects of ICTs at household level, some authors also show its impact at aggregate level as well. [Grace *et al.* \(2004\)](#) suggest that a threshold effect of ICT could lead countries to a poverty trap. As the required threshold level is achieved ICT development would no longer generate favorable outcomes for low income countries. On the one hand, rapid diffusion of ICTs in an economy increases employment opportunities. While on the other, it also becomes the reason of labor downsizing because of the introduction of less labor intensive technologies. [Mark \(1987\)](#) argued that the advent of new technology can create unemployment for the operative, laborer and lower skilled workers but it would increase high professional and technical jobs. Machines are taking over human jobs, revolution in robotic technology could also leave many workers without work. Further, the introduction of technology in financial markets has made financial products and services more complex. The ever increasing sophistication in the financial markets has made it mandatory to understand the basic economic and financial concepts [Prete \(2013\)](#). The technology entrants in financial provision industry could result in defaults and the transformation for incumbents will also increase the cost.

Although research is laden with the positive impact of financial development in developed economies nevertheless recorded with lower tendency. In developing world the impact of financial development is paradoxical where the estimated tendency is higher as well. Therefore, it is indispensable to delve into analyze this relationship for developing economies to accomplish this conundrum sharply. In addition, the financial inclusion channel caters lower attention in the present literature. While the role of ICTs and financial inclusion on poverty and inequality is also rare due to data limitations. This study devotes an effort to combine a unique dataset to explore the underlying interactions. The aim of this study is to examine simultaneously two different dimensions of financial inclusion i.e., inclusion by commercial banks and by microfinance institutions (MFIs). As the formal financial institutions deal with wealthy and well off clients, whereas the MFIs claim to be the bankers of poor. Many poor people particularly from African and Asian countries are still un-banked (see general introduction of the thesis

for more detail); however, research in development finance suggests that accessible and timely finance has the potential to bring poor out of poverty. The importance of MFIs in providing credit and other services at the doorstep of financially excluded households is globally acknowledged. This study explores the impact of financial inclusion by MFIs and by commercial banks on poverty and inequality. Most notably, it examines how ICTs boost financial inclusion and help poverty reduction. This study is an attempt to spell out the possible effects of ICT diffusion to enhance different types of financial inclusion and poverty alleviation. And finally, in this study we attempt to determine whether the ICT provide favorable environment in the expansion of digital financial services.

3.2. Literature Review

The literature related to this study is organized in the following manner. The first section describes a comprehensive review of research conducted to examine the impact of financial development on poverty (more detailed version of conventional finance-growth and poverty literature is presented in chapter 2). In addition, this section presents the role of microfinance institution in poverty reduction at aggregate level. Second section discusses the stream of research devoted to explore the impact of financial access and household welfare (at household level). Section three analyzes studies about the linkages among ICT, financial access and poverty. Finally, section four gives an overview of research related to the role of new technology in promotion of digital financial services.

3.2.1. Finance, Microfinance and poverty: broader perspective

Microfinance has now gained a reputation to pull households out of poverty by reaching out to unbanked end of the community. Microfinance Institutions (MFIs) frequently conduct impact assessment surveys of their credit schemes. These reports are often loaded with positive impact of small amounts of loans on poor. Usually, MFIs organize longitudinal or follow up surveys in order to study socio-economic conditions of their clients. Some studies also present comparative analysis of clients (active borrowers

of MFIs) with non-clients (Potential borrowers, not yet borrowed). These institutional research reports are not free from bias in impact assessment. Moreover, research aimed at the impact of MFIs on aggregate poverty & inequality is relatively scarce due to the lack of continuous time series data of latter indicators. On the other hand, inadequate and short time series data about MFIs performance and outreach might be the potential reasons that hinder researchers to investigate this compelling facet. Some notable exceptions are discussed here.

Several influential studies demonstrated that developed financial markets contribute to poverty reduction and lowering inequality (see chapter 2). The argument that access to finance reduces poverty becomes more strong with the support of these studies. For example, [Beck & Brown \(2011\)](#) find that access to finance reduces poverty, they further illustrate that the households with a bank account or using plastic money instruments are more likely to be rich, wealthy and highly educated in countries with higher foreign bank presence compared to those who don't. Similarly, [Bruhn & Love \(2014\)](#) analyze possible impact of access to finance on poverty using labor market channel. This study also argues that access to finance has potential to reduce poverty, increase employment and income in low income regions. In a recent IMF working paper, [Alter \(2015\)](#) present that socio-economic growth can be achieved by enhancing financial inclusion. [Huang \(2010\)](#) and [Andrianova *et al.* \(2011\)](#) emphasize on the importance of quality of governance and institutions for financial sector particularly for lower income countries. In a series of research papers about financial Inclusion, the World bank has focused on different key aspects and schemes aimed at improving financial inclusion. [Anson *et al.* \(2013\)](#) suggest that the post offices can help increase financial inclusion by offering account opening services to the financially excluded folks.

A striking theoretical model developed by [Ahlin & Jiang \(2008\)](#), argued that micro-credit typically reduces long-run inequality and poverty however it might alter long-run GDP. Meanwhile, one of the fundamental empirical studies by [Imai *et al.* \(2012\)](#), measured impact on poverty at aggregate level using cross-country and panel data. They relied on two period cross sections (2003 & 2007) of 61 countries. To estimate this relationship they use gross loan portfolio per capita (GLPPC) adjusted for write-offs and

inflation as a proxy for MFIs activities in a given economy.³ They present negative and statistically significant impact of MFIs activities on poverty. More specifically, a country *ceteris paribus* with larger microfinance network likely to experience lower poverty. Similarly, the impact of MFIs on income inequality was studied by Kai & Hamori (2009), where they indicated equalizing effects of MFIs for inequality. In addition, they concluded that MFIs substantially reduce inequality and contribute to overall economic growth. Inoue & Hamori (2013) indicate the process of distribution of money to poor communities as *financial permeation*. They expand their empirical analysis to 90 countries from 1998-2008 and found that financial permeation significantly reduces poverty. In contrast, it is argued that, microfinance alone cannot reduce poverty. Despite greater penetration of microfinance in Bangladesh and Bolivia and Indonesia compared with other developing nations, poverty is still a gigantic issue for these countries.⁴ In addition to these studies more recent survey of literature related to financial development, inequalities and leverage provided by Bazillier & Hericourt (2017). They highlight reverse causality and the significant role of inequalities in the dynamics of financial development and financial crises.

Further, Islam (2009) argues that microfinance alone cannot reduce poverty and economic insecurity. He compared direct and indirect financial impact of microfinance and suggests that it has a strong indirect broader effect on poverty and economic insecurity.

These days microfinance sector is more connected to the formal financial markets. This sector also adopt the best practices from their traditional counterparts. Snow & Buss (2001) provide that microcredit could be used as a mechanism to extend the reach of formal economy. They emphasized that the large and strong commercial banks may lend to microcredit borrowers who desire to “Graduate” and demand for the bigger amount of credit than microloans. Main thesis we infer from this particular study is that the formal financial sector of the economy also matters for the MFIs and

3. Lack of time series data about poverty and microfinance constrained authors to make cross sections for 2007 and panel data by combining two or one observation per country for 2003 and 2007. Gross Loan Portfolio of microfinance institutions to total population in a country serves as the microfinance penetration proxy.

4. Aneel Karnani, “Microfinance Misses Its Mark”, Stanford Social Innovation Review Summer 2007.

its borrower. Likewise, [Terberger \(2003\)](#) considers microfinance as an instrument for developing financial markets rather a development tool to alleviate poverty. In this view one can deduce that MF does have the potential to affect macroeconomic growth via different channels such as sectoral development, employment opportunities, pulling out the poor from vulnerabilities and promoting micro enterprises. Following studies explored direct link of microfinance with aggregate growth along with the indirect effect by illustrating contribution of microfinance sector in traditional financial system. The study of [Maksudova \(2010\)](#) makes an attempt to address the lacuna of research on the interaction of microfinance sector with broader real economy and commercial banks. Data ranging from 1996-2009 of 1433 MFIs from 102 countries have been utilized by taking time averages. Their findings report that the intermediation of microfinance sector could potentially contribute to financial sector and real economy.

Relying on market failure hypothesis, [Vanroose & D'Espallier \(2013\)](#) depict that MFIs outreach is higher in countries where access to finance is very low as well as it serves financially excluded in well developed financial systems. On the basis of these studies, it might be possible to say that for the development of microfinance sector overall financial system of a country is essential element. MFIs do have an impact on standard of living, commercial banking and economy through different mechanisms. However, their success also depends on formal financial sector, macroeconomic and business environment among many others. One of the groundbreaking empirical studies about the success of MFIs on country specific macroeconomic factors published by [Ahlin *et al.* \(2011\)](#). Their analysis emphasized the role of stable economy for MFIs of the country in which they operate. [Guiso *et al.* \(2004a\)](#) observed that in a developed financial system individuals are more likely to commence new businesses that creates a competitive environment and increased growth of firms. They also highlighted that local financial development could advance regional economic performance.

3.2.2. Microfinance and Poverty: household survey approach

We have reviewed the microfinance impact assessment literature and find that the evidence of microfinance impact at aggregate level (macroeconomic) is relatively scarce

and at early stage. In this study, we explored whether MFIs reduce poverty and inequality at aggregate level. It also measures the impact of financial inclusion through commercial banks and MFIs simultaneously. Microfinance is considered one the most effective and significant tools to fight poverty especially in developing countries. It has gained a repute to have an effect on social and economic conditions of the borrower. Microfinance initially came up with the small amount of credit to poor people who were previously neglected by the formal financial sector. Later, various MFIs entered in the field including NGOs, societies, and some full fledge microfinance banks. Its new mechanism to serve the poor community without or little collateral got promising response from all around the globe. These institutions also claim to enhance women empowerment in rural and relatively less literate communities. Nowadays, MFIs are providing value added services to their clients by organizing different types of trainings, health and education facilities and energy provision along with banking services including savings, deposits, loans and mobile banking.

It is perceived that access to finance has the potential to reduce poverty while MFIs exclusively target the poor. They charge higher interest rates from its poor clients; small amount of loans are given after initial screening of the potential borrower. The amount of next loan is higher than the previous depending on the track record of borrower and the cash flows of microenterprise. Opponents of the microfinance believed that small amount of loans do not have the positive impacts on poverty, instead of pulling them out of poverty they push them into the state of helplessness by arguing the case of Bangladesh, Bolivia and Indonesia. Despite comparatively larger microfinance market share, these countries still witness higher poverty levels.⁴ Empirical research based on the impact assessment demonstrates that MFIs have a positive impact on standard of living of the borrower alongside indirect effect through the development of financial sector and economy. There is very little empirical and theoretical evidence about the impact of microfinance at aggregate level. In contrast, a sufficient amount of research is existent on the impact assessment of microcredit at household and individual levels. For instance, existing literature suggests that household welfare could be increased through affordable and accessible finance (see, for instance, [Imai & Azam \(2012\)](#), [Imai *et al.*](#)

(2010), [Duflo et al. \(2013\)](#))

In an early study about microfinance, [Roy \(2003\)](#) stated that it has been proved that the provision of credit to poor is a powerful tool in development. The author further described that the quality of life of poor can be improved by bringing them into banking system. [Imai & Azam \(2012\)](#) measure the impact of microfinance on household income, consumption and women body mass index. Their findings conclude that the purpose of loan is a significant predictor in the success of microloans, overall they show positive impact on income and food consumptions. Moreover they argue that small loans increase household consumption on food items which facilitates in reduction of poverty headcount ratio. In addition, [McIntosh et al. \(2011\)](#) notice modest improvements in dwellings of MF borrowers. Using state level data of 28 Indian states covering seven times period, [Inoue & Hamori \(2012\)](#) find negative impact of financial deepening on poverty. Financial deepening could be a consequent of economic development, a growing economy potentially raises the demand for financial services. [Imai et al. \(2010\)](#) concentrate on household access to microfinance and its potential to reduce poverty. By utilizing national household data from India they applied treatment effect model, findings confirm positive and significant effects of productive microfinance loans on multidimensional welfare indicators.

Examining the impact of MFIs on aggregate economy, poverty & inequality is relatively a new field. Studies which investigated this underlying relationship could be distinguished on the basis of methodology adapted, sample size, indicator selection and time duration. In earliest literature, researchers have investigated the impact of microcredit on poor using direct surveys of clients and impact assessment by MFIs. Moreover, various researchers compared the clients with non-clients. As microfinance industry grows with the attraction of more clients, it caters the attention of academicians and international organizations. Critics argue that, does microfinance alone have a potential to reduce poverty in an economy? Does microfinance become a main element of country's financial sector? Whether microfinance industry has become mature enough that can affect overall growth of an economy with small amount of loans with a tiny share in the market? Despite favorable household level evidence of microfinance, these

questions still largely remain unanswered.

3.2.3. ICT, Financial Inclusion and Poverty

Over the last 10 years, a growing literature in the area of ICT and growth indicates the significance of the role of ICT in social and economic uplifting. Similarly, evidence suggests that the better access to finance can reduce poverty and improve household welfare. [Kendall *et al.* \(2010\)](#) state that developed countries are characterized by higher access to finance than developing economies and microfinance plays a considerable role to expand financial inclusion. Similarly, ICTs can help in reaching out the poor in a number of ways, by e-banking, mobile-banking and mobile ATMs, it also helps access to timely and cheap information and better connectivity with micro loan officers. [Mishra & Bisht \(2013\)](#) observe that mobile technology is an excellent tool to accelerate financial inclusion particularly in far remote areas. Similar findings learned by [Kpodar & Andrianaivo \(2011\)](#) for a sample of African countries, they confirm positive contribution of ICT in economic growth through financial inclusion channel. In like a manner, [Warren \(2007\)](#) concludes that the underprivileged and rural populations are the foremost beneficiary of technological development. [Bhavnani *et al.* \(2008\)](#) suggest higher social and economic benefits of mobile telephony in rural areas and project poverty reducing effects of mobile phone. [Sarma & Pais \(2011\)](#) report positive association between level of human development and financial inclusion. They also exhibit positive role of information and communication technologies and related infrastructure to boost financial inclusion. [May & Diga \(2015\)](#) review the literature of ICT and progress towards measurement of its impact. They concluded that much of the focus of researchers remain on macro level ICT linkages before 2002 while less attention paid to its role in poverty reduction at micro level.

Furthermore, [Comin & Nanda \(2014\)](#) point out that greater banking originated financial depth facilitates faster technology diffusion particularly for higher capital intensive technologies. Moreover, they present that developed financial markets facilitate and foster technology diffusion. In a similar manner, [Mbiti & Weil \(2011\)](#) suggest that mobile banking improves the economic conditions of the poor in Kenya. In addition,

following authors also report beneficial implications of ICTs for poor and financial development, evidence from rural India [Cecchini & Scott \(2003\)](#), using panel data [Shamim \(2007\)](#) and from MENA and Asian countries [Sassi & Goaid \(2013\)](#) and [Pradhan *et al.* \(2015\)](#) respectively. Empirical evidence that demonstrates the impact of ICT on poor is limited to African countries, (see, for instance [Kpodar & Andrianaivo \(2011\)](#)) there is a dire need to explore that important link in other regions of the world. It is also imperative to place emphasize on to study the role of ICTs in expanding financial inclusion (including Microfinance) and digital financial inclusion. [Cecchini & Scott \(2003\)](#) reveal that ICT could play a positive role to improve access to information, education, health, government and financial services particularly for poor. [Shamim \(2007\)](#) finds positive association between ICT penetration and financial development. She describes that the increased mobile phone penetration and Internet potentially enhance financial depth which eventually boost overall economic growth.

3.2.4. ICT and Digital Finance: The way forward

“Mobile-Money helps people to save and borrow and empowers them in a big way.” - *Bill Gates in 2015 Gates Annual Letter.*

By digital finance we mean delivering financial services through latest information and communication technologies (ICT) such as mobile money, these services include access to credit, saving facility, insurance and financial education. Digital finance is not only about financing, it can be a powerful tool and an engine of job creation, access to money transfer, rural development, micro credit and insurance for un-banked. It also permits people to feel more secure and empowered; its benefits can be extended to improve other sectors such as agriculture, transportation, water, health, education, and clean energy.⁵

The growing number of poor is using mobile money to make transactions and contributing to many multipliers effects of the value that can be used to finance businesses. Moreover, digital money also plays an important role in small business development by

5. Rizzo summarized the speeches of professionals in the domain of digital finance titled as “Digital Finance: Empowering the Poor via New Technologies”. Accessed: 2016-06-04. <http://www.worldbank.org/en/news/feature/2014/04/10/digital-finance-empowering-poor-new-technologies>.

improving access to finance, fast and secure electronic transactions and their financial history (Kamal Quadir, CEO of bKash, Bangladesh). On the other hand, better collaboration between ICT and financial sector will likely to improve digital finance that can help bridge the financial infrastructure gap. Moreover, public-private partnership can also play a substantial role to meliorate ICT diffusion and digital finance, because it can reduce cost, distance and regulatory complexities. One of the examples of partnerships for financial inclusion and digital finance is the joint initiative of (IFC) and the MasterCard Foundation, which aims to promote financial inclusion via mobile money or digital finance in Sub-Saharan Africa.⁶

In developing countries, most of the people are unbanked or underbanked. Whereas, initiatives are being taken to increment outreach and to make sure that everybody has equal opportunity to borrow from financial institutions. To reduce the financial inclusion it is imperative to build an effective and efficient microfinance infrastructure that would truly operate for the poor. Secondly, promotion of digital banking should also be the priority agenda for the policy makers. Thirdly, developing and designing a regulatory framework and consumer protection mechanism for the changing landscape of financial markets. Fourthly, improving the financial capability among the population and awareness about the digital banking are also equally important tasks.

In a photo contest, (Rizzo and Stock, 2014) illustrated financial inclusion through the pictures of annual CGAP photo contest. Photos from Kenya, Nigeria and Ghana exhibit that people are using mobile phones to save, borrow, earn interest and purchasing clean water, small farmers are receiving fertilizer subsidies directly into mobile wallets and availing micro insurance schemes. They further underscore the importance of financial inclusion and stated that without this a country's financial stability is at risk that can also halt economic growth.⁷ According to another report of CGAP, Kenya is acknowledged to be a world leader in mobile money, over two thirds of the adult

6. More detail can be found at: http://www.ifc.org/wps/wcm/connect/news_ext_content/ifc_external_corporate_site/news+and+events/ifc+and+the+mastercard+foundation+launch+partnership+to+improve+financial+services+for+millions+in+africa

7. "The annual CGAP photo contest aims to illustrate remarkable ways that access to financial services can help the poor manage their complex financial lives and grow their businesses, these photos mainly show that how people use financial services and digital finance in their lives", can be accessed at: <http://www.cgap.org/photos-videos/2014-cgap-photo-contest>

population benefiting from M-PESA. Mbiti & Weil (2011) also suggested that the M-PESA promotes financial inclusion and digital transactions which improve individual economic outcomes. Similarly, Beck *et al.* (2015) showed positive association between mobile money and access to trade credit, they further suggested beneficial effects of mobile money technology for entrepreneurs and economic growth. Claessens *et al.* (2002) and Christiansen (2002) argue that better ICT diffusion bolsters digital finance and that the developed ICT infrastructure is positively associated with e-financial services.

3.2.5. Summary of the literature and gaps

As noted from the literature several researchers examined the effects of financial sector development on real economy. Though, studies with respect to developing economies are sparse. Whereas, researchers argued that the financial development in developing countries has greater impact on economic growth compared with developed economies. Finance-growth nexus gets renewed attention with the incorporation of new econometrics approaches, financial reforms, new policies and continuously striding financial market systems. This study considers the recent inventions such as mobile phone and cellular Internet, personal computer and broadband to uncover the direct and indirect impact of these technologies on households at aggregate level. Secondly, it exploits the financial inclusion channel to explore whether the advent of these technologies helps expansion of financial services in the lower and middle income countries.

More recent strand of literature on financial inclusion concentrates on the use of mobile phone for financial transactions and to promote financial inclusion. As the researchers suggest that information and communication infrastructure could stimulate financial inclusion by promoting digital finance. Kpodar & Andrianaivo (2011) identify following paths depicted in figure 3.1, that show how ICT development can accelerate economic growth. They however didn't consider the implications of ICT for poverty & inequality. In addition, they focused only on formal financial inclusion (commercial banks) and their sample was limited to African countries.

We based our analysis on the hypothesis that ICT development improves financial markets, increases access to finance, reduces credit constraints and eventually helps

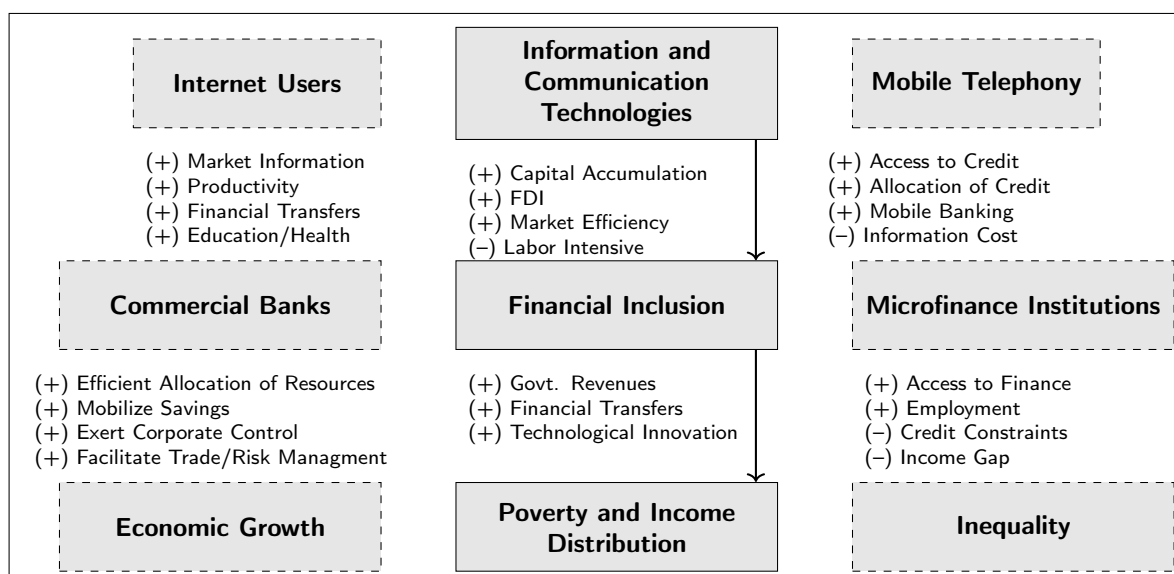


Figure 3.1 – Theoretical Framework

poverty alleviation. Figure 3.1 shows three blocks that explain this mechanism, we adhere to two constituents of ICT i.e., Telephone (mobile or fixed) and Internet.⁸ Central and bottom blocks represent financial markets and poverty respectively. The central block shows the financial inclusion which is composed of conventional financial institutions (e.g., commercial banks) and microfinance sector (including MF banks, NGOs, etc.). Finally, in the bottom the main dependent variable of this study i.e., poverty & inequality are shown. In short, we may describe this figure as ICT-Finance-Poverty respectively, that exhibits the role of new technologies in promotion of financial inclusion (through different channels listed between blocks) and eventually the impact of financial inclusion for poverty, inequality and overall economic growth.

3.3. Data and Methods

This study is conducted with an objective to examine what role ICTs can play in poverty reduction through financial markets. In addition to that we investigate the equalizing and poverty reducing effects of microfinance at aggregate level. Time frame of this study was based on the data during 2001-2012. However, lack of continuous time

8. Note: L^AT_EX codes written by Charles-Axel Dein as Porter model, can be found at: [Texample](#), we modified those codes to serve our purpose.

series data on Poverty & inequality forced us to take three year averages from 2001-2012. Resultantly, the dataset we are able to obtain for the analysis could be divided into four non-overlapping cross sections i.e., 2001-2003, 2004-2006, 2007-2009, 2010-2012. Our method is in line with the recommendations of [Levine \(2005\)](#), [Kpodar & Andrianaivo \(2011\)](#), [Imai *et al.* \(2012\)](#), [Alter \(2015\)](#). They further suggested that this method renders robust results, avoids potential endogeneity and ensures sufficient number of observations to run a panel data analysis. In addition, this method smooths out any short term fluctuations in the data series. It is also worth noting that our panel largely consists of developing and emerging economies and these economies usually exhibit shorter business cycles (see, for example, [Rand & Tarp \(2002\)](#)). We only retain those countries having at least two observations of poverty during the period under study. As a result we are left with 62 countries for our analysis. Table 3.11 presents the list of countries along with regions and income levels.

3.3.1. Data description and sources

Data are collected through various sources. The first set of variables consists of the indicators related to Microfinance Institution (MFIs) which is collected from Microfinance Information Exchange (MIX), whereas the second set of variables contains macroeconomic and poverty indicators from the World Bank (WDI), third set involves variables related to Information and Communication Technologies (ICT) which is taken from the International Telecommunication Union (ITU) database 2015.

3.3.1.1. Poverty & Inequality

We use most recent indicator of poverty which measures poverty headcount ratio at \$ 2 a day as main response variable. This variable is broadly used as a proxy of aggregate poverty in an economy, that refers to the percentage of population living below \$ 2 a day. The other outcome variables of poverty in this study are Gini coefficient, which measures the income inequality and poverty gap and its squared, that reflects the depth of poverty and its incidence, see [Imai *et al.* \(2012\)](#).

3.3.1.2. Microfinance Inclusion/Intensity

We measure microfinance financial inclusion as the ratio of gross loan portfolio to GDP, and number of borrowers divided by total population in a country. Higher loan portfolio and the number of borrower represent greater expansion of MFIs activities and improved financial inclusion. These indicators expected to have negative impact on both poverty headcount and Inequality. Rise in the scale of MFIs activities may ease credit constraints for unbanked and eventually decreases poverty (see, for instance, [Imai *et al.* \(2012\)](#), [Inoue & Hamori \(2013\)](#)).

3.3.1.3. Mainstream Financial Inclusion

Next we move forward to measure formal financial inclusion. It is challenging to approximate financial inclusion because of a few number of financial inclusion variables and non-availability of standard measure. We held two indicators of financial inclusion, e.g., commercial bank deposits and borrowers per head. In addition, access to financial institutions is also taken from the newly developed index by [Svirydzenka \(2016\)](#), we also use alternative indicators for financial inclusion such as loans per head and Credit/GDP ratio.⁹ We added population density in financial inclusion regression following [Kpodar & Andrianaivo \(2011\)](#) and expect positive coefficient; banks' overhead cost and the number of bank branches per km^2 were also added to account for efficiency of financial intermediaries and geographical coverage of bank branches respectively.

3.3.1.4. ICT Indicators

Information and communication technologies (ICT) diffusion is measured through, Mobile cellular subscriptions, Internet users, Fixed telephone lines (all per head), price of 3-minute local mobile call and ICT imports. Better ICT infrastructure supposed to favor financial markets, economic growth and hence poverty reduction (see, e.g., [Kpodar & Andrianaivo \(2011\)](#), [Alter \(2015\)](#)). ICT favor financial inclusion while increased access to finance helps poverty reduction.

9. We included most commonly used indicator of financial deepening as a broader measure of financial inclusion, considering the fact its higher correlation with all other financial inclusion proxies [Svirydzenka \(2016\)](#), [Kpodar & Andrianaivo \(2011\)](#).

3.3.1.5. Control Variables

The number of potential control variables is huge but we stick to these indicators following empirical literature. We include trade openness as one of the control variables which is measured as $(\text{imports} + \text{exports}) / \text{GDP}$. Consistent with the neoclassical theory we expect negative association of openness with poverty and inequality and positive with economic growth. Following finance-growth nexus literature, this study has taken real GDP per capita (RGDP) and the ratio of $(\text{Credit} / \text{GDP})$ to approximate economic growth and financial development in a given economy. These two indicators play positive role in poverty reduction and household welfare. We expect higher level of per capita income is related to lower poverty headcount ratio and greater financial development (see, e.g., [Levine \(2005\)](#), [Beck et al. \(2007\)](#)). In addition we use final government consumption as percentage of GDP to account for size of the government, a negative coefficient on poverty and inequality is expected as it captures the benefits of public spending. Share of arable land is also used as control variable; negative sign of the coefficient is expected because a large share of arable land is supposed to be favorable in fight against poverty & inequality.¹⁰

In addition, to capture the quality of legal environment we introduced political rights as well as index of civil liberties [King & Levine \(1993b\)](#). Both indices are retrieved from freedom in the world database see, for instance [Jeanneney & Kpodar \(2011\)](#). The freedom house variables move between 1 (most free) and 7 (least free).¹¹ Similarly, to approximate quality of institutions in a country this study incorporates cost of contract enforcement from doing business. As the higher enforcement cost dampens economic activities and supposed to have a negative impact on financial inclusion and positive link with poverty.

10. See for example, [Lansana et al. \(2015\)](#), “Impact of Microfinance on Poverty and Inequality: A Panel Heterogeneous Causality Analysis”. Unpublished paper.

11. We reversed these variables to make it more descriptive, after reversal 1 becomes least free and 7 most free. For more detail see, <https://freedomhouse.org/report/freedom-world-2016/table-scores>

3.3.2. Model

In order to examine the hypothesized relationship, we followed a standard model of Beck *et al.* (2007), Imai *et al.* (2012) and Kai & Hamori (2009). Where we introduced ICT penetration and build on the standard model to measure the effects of microfinance and mainstream formal financial inclusion on poor, following baseline regression is estimated for panel data.

$$Pov_{i,t} = \gamma_0 + \gamma_1 mfi_{i,t} + \gamma_2 fi_{i,t} + \gamma_3 ict_{i,t} + \gamma_4 macr_{i,t} + \gamma_5 inst_{i,t} + \epsilon_{i,t} \quad (3.1)$$

where “*MFI*” denotes financial inclusion by Microfinance institutions, “*Fi*” represents financial inclusion by commercial banks whereas, “*ICT*” is the level of Information and communication technologies, in addition to these the control variables are “*MACR*”, macroeconomic indicators such as GDP per capita and “*INST*” denotes institutional and freedom indicators. In the first step of data analysis we performed pooled OLS with cluster-robust standard errors. For a given individual country the error $\epsilon_{i,t}$ is likely to be correlated over time, with the application of cluster-robust standard errors we get unbiased and consistent coefficients Demirguc-Kunt *et al.* (2014). Whereas default standard errors assume that the residuals follow (i.i.d) pattern. These standard errors are adjusted for individual clusters and are slightly larger than the simple estimation, also see, Presbitero & Rabelotti (2016), Bruhn & Love (2014). Next we used fixed and random effects model to quantify the impact of financial inclusion and ICT on poverty & inequality. This is done by extending the standard model formulated above to control for cross country differences. One can differentiate the fixed and random effects model as the former allows variations in the intercept parameter for each entity while the latter treats heterogeneity across entities as a random component. Kpodar & Andrianaivo (2011) assert that the random effect estimator performs better in case of small T in a panel framework. Following equation can be formulated as follows:

$$Pov_{i,t} = \beta_0 + \beta_1 MFI_{i,t} + \beta_2 Fi_{i,t} + \beta_3 ICT_{i,t} + \Gamma_4 X_{i,t} + \delta_i + \epsilon_{i,t} \quad (3.2)$$

where $X_{i,t}$ is a set of other macroeconomic and institutional control variables discussed

above, δ_i deals with specific effects at individual country level and $\epsilon_{i,t}$ is the disturbance term.

3.3.2.1. Instrument Variables

Instrument variable (IV) regression is useful when some variables are being determined within the system termed as endogenous. Generally one or two explanatory variables are treated as endogenous in regression model in a situation where unexpected shocks affect both the explanatory and explained variables simultaneously. Instrument variable regression is also used to avoid endogeneity bias, one may assume that the number and growth of microfinance institutions is high in countries with higher number of poor. Hence, instrument variable regression (IV) is the best alternate to obtain the coefficients when one or more explanatory variables are endogenous. We used instrument variables determined by the finance growth literature such as a dummy of country's legal origin and absolute value (scaled 0-1) of the latitude as instruments of financial development (see, for instance, [Beck et al. \(2007\)](#)). To select an instrument for microfinance inclusion we use 3 year lag value of average Gross Loan Portfolio (GLP) divided by the number of microfinance institutions in a country and the cost of contract enforcement, in line with [Imai et al. \(2012\)](#). Lag (first and second to avoid from autocorrelation) values of the endogenous variables and indicators of fractionalization (religion, language and ethnic) are also used as instruments (see, for example, [Beck et al. \(2007\)](#), [Ben Naceur & Zhang \(2016\)](#)). Since our dataset is panel we need to assume the instruments $z_{i,t}$ that are correlated with the endogenous regressors $x_{i,t}$ and are uncorrelated with $\epsilon_{i,t}$.

IV model follows two stage approach and derives the reduced form equation. If we place the instrument of microfinance inclusion instead of the actual indicator, the reduced form equation is as follows which determines the suitability and presence of endogeneity in selected instruments, see, [Imai et al. \(2012\)](#).

$$MFI_{i,t} = \pi_0 + \pi_1 enf_{i,t} + \pi_2 lagglp_{i,t} + \pi_3 X_{i,t} + \pi_4 X_{i,t} + v_{i,t} \quad (3.3)$$

where "enf" is the cost of contract enforcement, "lagglp" is an indicator of microfinance inclusion (defined above) in a country, $X_{i,t}$ is the set of other explanatory

variables used in standard OLS model, $v_{i,t}$ is an i.i.d error term. It is worth mentioning that validity and suitability of instruments are crucial in the IV models, several post estimation techniques are used to assess the validity of instrument regressors. We used diagnostic tests suggested by Imai *et al.* (2012) for the same purpose. The first diagnostic test deals with the null that variables are exogenous; if we fail to reject its null we can not proceed further. The next step is to test the first stage regression which shows the correlation between additional instruments (x) and an endogenous regressor (y). Various criterion are used to do that task, such as R^2 and adjusted R^2 , F-statistics and Minimum eigenvalue statistic for 2sls bias and finally test of over identification restrictions. Test of over identification restriction is the most concerned and widely used diagnostic test for IV regressions, it tests two different things at the same time; first, the nonexistence of correlation between instruments and error term, second the equation is misspecified and that the one or more excluded exogenous variables should be included in structural form equation. In the next step we confirmed our results obtained through above mentioned econometrics techniques with robust and quintile regression. In addition to that we performed winsorizing at 1% and 99% to reduce the effects of potential outliers.

3.3.3. ICT penetration: A determinant of Financial Inclusion

In this study we are interested to explore the financial inclusion channel through which ICT development influences poverty and inequality. Three measures of ICT penetration have been used to investigate this hypothesized link, however in order to avoid redundant tables we report the results by using mobile phone penetration as an indicator of ICT development. Mobile phone penetration has higher correlation with the other two variables of ICT, i.e., fixed line telephone and Internet subscribers. Figure 3.2 (a) presents the trends in mobile versus Internet subscribers, both show increasing trends but mobile phone subscribers are growing at higher rates around the world. Figure 3.2 also illustrates positive correlation between finance and growth and mobile phone subscribers with economic growth and financial development. Furthermore, mobile phone penetration seems to show positive linear relationship with microfinance intensity measured as gross loan portfolio and microfinance intensity reveals positive relationship

with economic growth and negative with poverty headcount ratio. Each colored point represents region, where it can be observed that the African region under performs in capitalizing gains of ICTs as compared to the others.

After getting a general overview about the correlation among underlying variables we then move a step further. We followed Kendall *et al.* (2010), Kpodar & Andrianaivo (2011) to build a finer model to measure the possible impact of mobile phone on financial inclusion. Measurement of financial inclusion is yet a point of focus in ongoing research. Kpodar & Andrianaivo (2011) consider financial inclusion at aggregate level, however we included financial inclusion through microfinance as well as a newly developed index by Svirydzienka (2016). Following, Kpodar & Andrianaivo (2011) the model for the determinants of financial inclusion can be specified as follows:

$$FI_{i,t} = \zeta_0 + \zeta_1 mob_{i,t} + \zeta_2 y_{i,t} + \zeta_3 pden_{i,t} + \sum_{j=1}^n X_{i,t}^j + \varepsilon_{i,t} \quad (3.4)$$

Where FI stands for financial inclusion and used as a dependent variable (as explained earlier two measures of financial inclusions are used here). mob is approximated by the per head mobile phone users in a country; y and $pden$, GDP per capita and population density are the main control variables respectively in this regression; X contains other explanatory variables, we include bank overhead cost to account for banks' efficiency; whereas commercial bank branches per 1000 km^2 is used to represent geographic coverage and outreach of commercial banks. Finally, $\varepsilon_{i,t}$ represents the disturbance term.

3.4. Results and Discussion

We begin by examining the descriptive statistics of selected variables in table 3.1. It lists the number of observations utilized for the main analysis, mean, median, standard deviation, minimum and maximum values for each of the selected variable.

[Table 3.1 about here]

[Figure 3.3 about here]

In addition, figure 3.3 exhibits international comparisons of financial access and poverty. We show both types of financial access (i.e., Microfinance and commercial banking). We notice crippling kickoff phase of the microfinance sector during early 2000, but afterwards the outreach has increased significantly in terms of borrowers, depositors and the number of bank branches. All of the outreach indicators show increasing trends across regions from 2000 onwards. It might be possible to infer that the microfinance sector is booming and getting bigger in terms of outreach and profitability after its deadening outset. This figure also suggests a significant differences in microfinance outreach before during and after global financial crises. Which indicates the integration of microfinance sector with conventional financial markets. Moreover, notice an increase in the number of ATMs in all regions over the selected period, and higher poverty and poverty gap in SSA as compared to other regions.

3.4.1. Microfinance Inclusion

We start off the analysis with pooled ordinary least square regression (POLS) followed by fixed and random effects estimation. Furthermore, to account for outliers lead us to apply robust and quintile regression. In addition, we use instrument variable regression to overcome endogeneity issue. Tables 3.2-3.4 present the results of these five different models. We tested poverty headcount and Gini coefficients keeping same set of regressors in equations. Results of these tables confirm poverty & inequality reducing impacts of financial inclusion (MFIs and formal), the results remain significant even if we control for other indicators such as economic growth, arable land, government consumption and trade openness.

Table 3.2 reports the effects of microfinance inclusion on poverty & inequality. As can be observed in table 3.2 that the coefficient of loan portfolio stays in negative regime in most of the specification, hausman test indicates towards fixed effects model when poverty headcount ratio is dependent variable and random effects in case of Gini coefficient. Since, we have four observations per country, Kpodar & Andrianaivo (2011) suggest that random effects estimation technique is preferred in limited time dimensional data. They further argued that the large number of observations along with small time

dimension increases the possibility of bias in fixed effects estimation. To test the quality and validity of instruments, we performed test for weak identification, endogeneity and over identification. All diagnostic tests substantiate the selection of instrument variables, as we can reject the null of exogeneity whereas fail to reject the null of no correlation between instruments and residuals in both IV regressions, meaning that our instruments are appropriate and models are correctly specified. In addition, median regression also supports the findings of OLS and IV however the coefficient for inequality is negative but insignificant. The rest of control variables, for example arable land, trade openness, government consumption show expected coefficients signs in OLS and IV regressions.

[Table 3.2 about here]

Table 3.3 provides the results of microfinance inclusion on poverty & inequality.¹² This variable indicates the intensity and depth of microfinance institutions. Keeping the same set of regressors we find alike results. Again, the coefficients in random effects model are highly significant and according to the predictions, IV regression also shows significant and negative impact of microfinance inclusion on both poverty & inequality. This suggests that microfinance institutions promote financial inclusion by bringing unbanked poor into banking system and equip them to start small level businesses and other income generating activities. These findings are consistent with [Hermes \(2014\)](#) and [Imai *et al.* \(2012\)](#), they support poverty and inequality reducing effects of microfinance intensity.

[Table 3.3 about here]

3.4.2. Mainstream Financial Inclusion

Table 3.4 presents the results when we added a broad indicator of financial inclusion. The coefficient of formal financial inclusion is negative and highly significant in all models. As can be observed in Columns 1-10, deposits per head indicator remains negative and significant across table, which implies that greater financial inclusion corresponds to

12. In this table we use the alternate proxy of microfinance inclusion that is total number of borrower divided by total population.

lower poverty & inequality. Additional tests for the instruments also validate the findings of selected IV models. Access to finance in low income countries remains a paramount task, whereas economists suggest that timely and accessible finance can reduce poverty and income inequality. Our results indicate favorable benefits of financial inclusion for poverty & inequality in sampled countries. [Park & Mercado Jr \(2015\)](#) provide similar results in Asia, they construct an indicator of financial inclusion and suggest that higher financial access significantly reduces poverty and income inequality. [Burgess *et al.* \(2005\)](#) also show poverty reducing effects of financial inclusion through the expansion of state-led banks in India. [Honohan \(2008\)](#) constructs an index of financial inclusion and reports that better access to finance reduces poverty. Further, [Ben Naceur & Zhang \(2016\)](#) present similar findings.

[Table 3.4 about here]

3.4.3. ICT and Poverty

In the next step we used indicators of poverty & inequality as dependent variables and test whether ICTs reduce poverty & inequality by fostering financial inclusion, results are presented in tables 3.5 and 3.6. Our main indicators of ICTs such as mobile cellular subscriptions, fixed lines subscribers and Internet users show negative significant impact on poverty even in the presence of controlled variables such as level of economic development, inflation, government consumption and trade openness. This result implies that ICT related technologies significantly reduce poverty & inequality. The coefficient of personal computer is insignificant yet it shows a negative sign and the effect of the price of a 3-minute mobile local call is positive insignificant for poverty however it becomes significant for inequality. [Kpodar & Andrianaivo \(2011\)](#) find positive insignificant coefficient of personal computer and negative significant for price of a 3-minute mobile local call on economic growth. We take mobile penetration as an indicator of ICT diffusion in further analysis, where negative significant coefficient of mobile penetration on poverty & inequality can be noticed in IV regression. Meaning that, after controlling for endogeneity and using instruments of mobile penetration results hold as they were reported in pooled OLS. This confirms favorable role of ICTs diffusion in fight against

poverty. As discussed earlier, only a few studies elaborated the ICTs and poverty relationship, however there is considerable evidence about the role of ICTs and economic growth (see, for instance, [May & Diga \(2015\)](#)). [Tiwari \(2008\)](#) notes positive supply side ICT expansion effects for rural human capital in Madhya Pradesh, India. [Bhavnani *et al.* \(2008\)](#) also report a multidimensional-level impact of mobile telephony on sustainable poverty reduction.

[Tables 3.5 and 3.6 about here]

Table 3.7 summarizes findings of the impact of ICTs on poverty & inequality with respect to an interaction term of the different forms of ICTs and income level of the countries. Columns 1-4 provide the results of interaction terms of different set of ICT indicators such as mobile and telephone, mobile and GDP or Internet and GDP. It also quantifies the effects of ICT with consideration to the income levels of countries. Columns 5 and 6 present the results of the interaction of ICT indicator with a dummy variable of low middle and upper income countries. Columns 1-4 contain the interaction effect of two continuous variables, whereas columns 5 and 6 present the interaction of one continuous and one categorical variable.¹³ In this situation we have got mobile phone penetration which is a continuous and income levels are categorical variables. An interaction of a categorical and continuous variable suggests that the slope of a continuous variable is different for at least one or more levels of the categorical variable. A categorical variable is usually coded as zero/one. We include three groups i.e. low, middle and upper-income countries. By doing so we would be able to shape the differential effects of financial inclusion and ICT in three income groups.¹⁴

Columns 1-4 provide the nonlinear relationship between ICT and poverty. Column 1, displays the results on interaction term of mobile and fixed phones to show whether

13. We compute slope of the poverty head count ratio (dependent variable) on mobile phone penetration (independent variable) when fixed telephone (moderator variable) is held constant at different levels such as low to high.

14. Following equations can be formulated; (i) $y_{i,t} = \gamma_0 + \gamma_1 \ln gdp_{i,t} + \gamma_2 op_{i,t} + \gamma_3 govt_{i,t} + \gamma_4 inf_{i,t} + \gamma_5 Mobile_{i,t} + \gamma_6 Telephone_{i,t} + \gamma_7 Mobile_{i,t} \times \gamma_8 Telephone_{i,t} + \varepsilon_{i,t}$. (ii) $y_{i,t} = \gamma_0 + \gamma_1 \ln gdp_{i,t} + \gamma_2 op_{i,t} + \gamma_3 govt_{i,t} + \gamma_4 inf_{i,t} + \gamma_5 Mobile_{i,t} + D_{low} + \gamma_6 Mobile_{i,t} \times D_{low} + D_{mid} + \gamma_7 Mobile_{i,t} \times D_{mid} + \varepsilon_{i,t}$, where D_{low} and D_{mid} represent lower and middle income group countries respectively. More on interaction term for level of income see, [Ben Naceur & Zhang \(2016\)](#), for mobile and fixed phone [Lee *et al.* \(2012\)](#), [Kpodar & Andrianaivo \(2011\)](#).

they are compliments or substitutes. It shows negative and significant coefficient which implies that the mobile phones are substitutes for fixed telephones in sampled developing economies. Kpodar & Andrianaivo (2011) and Lee *et al.* (2012) presented similar finding in Africa. Lee *et al.* (2012) suggested that, holding all other variables fixed, the marginal (partial) effect of mobile phone penetration on poverty can be computed as follows:

$$\frac{\partial \text{Poverty headcount ratio}}{\partial \text{Mobile per head}} = 0.118 - 0.208 \times \text{Fixedtelephone}$$

A negative value of the interaction term ($\text{Mobile} \times \text{Fixedtelephone}$) also suggests that the marginal impact of mobile penetration is smaller for countries with higher fixed telephones outreach and the other way around. Marginal impact is stronger for a country with less developed fixed telephone infrastructure. This confirms the notion that mobile penetration is higher in developing economies because of poor fixed lines outreach while the impact of mobile penetration on poverty reduction is also significant in these countries. As Waverman *et al.* (2005) indicate that the poor infrastructure of fixed telephones lines in developing countries leads towards rapid mobile phone penetration. Furthermore, in columns (3) and (4) we introduced two interaction terms in each of the equations separately such as: ($\text{Mobile} \times \text{GDPpercapita}$) and ($\text{Internet} \times \text{GDPpercapita}$). Consistent with Kpodar & Andrianaivo (2011), Waverman *et al.* (2005), Lee *et al.* (2012), both interaction terms endorse the fact that the impact of ICTs related technologies is much stronger in low income countries.

[Table 3.7 about here]

Column 5 and 6 provide the results of an interaction of ICT indicator (Mobile penetration) with a dummy variable of low and middle income. We divided selected countries into three groups described earlier on the basis of World bank rankings. If dummies of low and mid equal zero, then the coefficient of *Mobile* on poverty explains variations in the dependent variable for upper income countries. Similarly, ($\text{Mobile} + \text{Mobile} \times \text{low}$) shows the effect of mobile penetration in low-income countries, whereas the expression ($\text{Mobile} + \text{Mobile} \times \text{mid}$) presents the impact of mobile penetration in countries categorized as middle-income (for an interaction term of ICT and financial

development see, [Sassi & Goaid \(2013\)](#)). The results of these interactions reveal that the impact of mobile penetration varies according to income group of the country. As observed in column (5) of table 3.7, the effect of mobile penetration in upper income countries is negative and significant by (0.218)¹⁵ percentage points; while its effect in low income countries is (0.051) ($-0.218 + 0.269 = 0.051$).¹⁶ This result indicates that the ICTs (mobile penetration) affect poverty differently according to the country's income level.

3.4.4. ICT and Financial Inclusion

Next we turn our attention to investigate whether mobile penetration affects financial inclusion. Table 3.8 suggests strong evidence of the positive significant impact of mobile penetration on financial inclusion measured either way by commercial banking or microfinance. Columns (1-2) depict positive impact of mobile penetration at 10-15% level of significance even in the presence of controlled variables; however coefficient is highly significant when a broad measure of financial inclusion is used as dependent variable. Columns (5) and (6) also confirm positive correlation of mobile penetration with access to finance, this measure is taken from [Svirydzenka \(2016\)](#), he constructs a broad financial development index by including a range of financial access and depth indicators. Finally, Columns (7) and (8) report the impact of mobile phone diffusion on microfinance inclusion.

It can be observed that the coefficient of mobile phone is very high in both columns at (1%) significance level. This findings conclude that the higher value of mobile penetration improves financial inclusion through formal and informal financial institutions. Moreover, income per capita and population density also increase financial inclusion as both show positive and significant coefficient for overall financial inclusion, whereas they behave differently for financial access and micro finance intensity. Banks overhead cost shows expected sign however remain insignificant in some equations, similarly quality of legal environment depicts positive coefficient in all models but only significant in column (2).

15. The value of the slope of poverty headcount ratio (dependent variable) on mobile (independent variable) is (-218), when dummy for low income countries equals zero, while the value of the slope when dummy equals 1 can easily be determined by adding both these coefficients.

16. This calculation is based on the following formula: $(Mobile + Mobile \times low)$.

Bank branches proxy takes positive significant coefficient on financial access, however continue to be insignificant but maintained expected sign in most of the equations. The main variable of interest mobile penetration does show significant positive coefficient in all columns. Our this findings also show greater resemblance with those of [Kendall *et al.* \(2010\)](#), [Kpodar & Andrianaivo \(2011\)](#), [Beck *et al.* \(2010\)](#), where they suggest positive effects of mobile phone penetration to expand financial access.

[Table 3.8 about here]

To further refine our analysis and to strengthen the estimation that ICT transmit beneficial effects to poor and foster economic growth through promoting financial inclusion. We used ICT indicators as instrumental variables for financial inclusion. The idea behind using ICT indicators as instruments is to determine how cross-border differences presented in the exogenous component of financial inclusion explain economic growth & poverty across countries [Beck *et al.* \(2000\)](#) and [Shamim \(2007\)](#). By so doing we seek to examine the channel through which the impact of ICT passes on to poor. We use GMM estimation following [Shamim \(2007\)](#), and select a vector of instrumental variables, assuming zero mean of error term. [Shamim \(2007\)](#) introduced ICT variables as instruments for financial development to examine their impact on GDP. We improve on [Shamim \(2007\)](#) by analyzing the fresh data and considered more dimensions of the financial inclusion. In addition, we focused on poverty related indicators and added microfinance intensity indicator that was not considered previously.

[Table 3.9 about here]

Table 3.9 presents the results of GMM analysis in which we attempt to predict financial inclusion through its exogenous components. Four measures of financial inclusions have been used in this analysis, all indicators are negative and significant at 5 and 10% respectively. This result suggests poverty reducing impact of ICT through financial inclusion. That also confirms the prediction of financial inclusion through its cross country exogenous components. Furthermore, this result also supports that the ICT affect poverty through promotion of financial inclusion; due to its correlation with both of the indicators i.e. endogenous and dependent in this equation. In addition, we

proceed by taking a broad measure of financial inclusion defined above in column (6-9), which presents negative and significant impact on inequality, poverty gap and poverty severity index while positive significant on economic growth. In all cases j-statistics confirms that the data do not reject the condition of orthogonality and the models are properly specified. The signs of all controlled variables used here are according to the expectations and as per theoretical predictions.

3.4.5. ICT, digital Finance and Financial Inclusion

This section explains the linkages between ICT diffusion and digital finance. We intent to examine whether countries with greater ICT diffusion provide suitable environment for the expansion of digital financial services. The digital finance indicators are, use of credit and debit cards (% age 15+) and the use of electronic means of payments (% age 15+) from World Bank. In addition, we attempt to explore the association between ICT and the adoption of mobile money (using mobile to pay, receive or send money). These indicators represent utilization of mobile phones in money transfers. Data for digital finance are available for only 2011; hence we applied correlation for the period of 2011 to available observations. Figure 3.4 presents the results of correlation among ICT-digital finance and overall financial inclusion variables.¹⁷ It shows that the indicators of digital finance are highly correlated with the all three indicators of ICT. This suggests the significance of ICT development for electronic banking. Whereas, the relationship between ICT and the usage of mobile phone is insignificant, this implies that there is a need to optimize the use of mobile phone in money transactions. The number of observations for mobile money transactions is very limited; this could be one of the reasons for its insignificant correlation with mobile penetration. However, the other ICT indicators such as Internet and fixed telephone are correlated at 10% level of significance with the use of mobile phone for money transfers.

Furthermore, this figure demonstrates the association between financial inclusion and digital finance. Higher correlations could be observed in all cases (except one). This association indicates the importance of financial development for advancement

17. This plot is produced using PerformanceAnalytics R-package. More detail available at: <https://www.r-bloggers.com/more-on-exploring-correlations-in-r/>

of electronic finance. It can also be established that the growth of electronic finance enhances financial inclusion. These findings are consistent with other studies like, Claessens *et al.* (2002), Christiansen (2002) and Shamim (2007) who reported positive relationship between ICT diffusion and e-financial services.

In addition, figure 3.5 exhibits the relationship and conditional effects between mobile penetration-digital finance and poverty, digital finance is measured through the log of electronic payments aged 15+. ¹⁸ Whereas, data limitation of poverty headcount ratio (PHCR) leads us to take the average of PHCR for the years of 2011, 2012 and 2013. Interaction of mobile and Internet on digital finance when plotted, depicted the complementarity of mobile phones and Internet use. The estimated coefficient for mobile per 100 adults increases as the number of Internet users increases along the x-axis. The second plot of interaction depicts the estimated coefficient of financial inclusion on poverty by mobile penetration, where we observe that the coefficient of financial inclusion becomes more negative with increased mobile penetration. This implies the significance of mobile penetration for financial inclusion and poverty reduction. Furthermore, figure 3.5 shows that the higher levels of electronic finance correspond to lower PHCR. Similarly, mobile penetration helps growth in digital finance.

[Figures 3.5 and 3.6 about here]

Figure 3.6 exhibits the geographical visualization of mobile penetration and poverty headcount ratio. Mobile cellular subscriptions (per 100 people) are for the period of 2014, whereas we took the most recent value of PHCR at \$1.90 a day. This clearly indicates the diminishing trends of poverty around the world, however central Africa still struggling in poverty reduction. On the other hand, mobile penetration is rising rapidly but most of the African nations are lacking behind as compared to the other regions. It can also be observed that the deeper intensity of mobile phones in first image corresponds to the lower poverty value in second image of the poverty headcount ratio.

18. This interaction plot has been produced using R-package “interplot”. More detail can be found at: <https://cran.r-project.org/web/packages/interplot/vignettes/interplot-vignette.html>

3.5. Conclusion

This study examined the impact of ICT diffusion on financial inclusion and poverty reduction. A number of existing studies investigated the impact of microfinance on household welfare and economic situation. However, its impact on poverty & inequality at aggregate level is relatively a new subject. As the direct link of ICTs and poverty is somewhat hard to determine however, we focus on the effects of ICTs on poverty through financial inclusion. This could be the potential channel through which ICTs affect poverty & inequality. We test whether ICTs reduce poverty by fostering financial inclusion. Several researchers concluded negative coefficient for finance on poverty. Nevertheless, the effect of financial inclusion is undetected enthusiastically in existing literature, while the role of ICTs diffusion in promotion of financial inclusion and access to finance also remains an interesting subject in digital age.

The findings of present study highlight the significance of financial inclusion and ICT development; particularly mobile phone penetration can promote financial inclusion in lower and middle income countries. Using the panel dataset of sixty-two countries over the period 2001-2012, we first examine the impact of two different forms of financial inclusion i.e., (i) broad or formal and (ii) microfinance. We observe poverty & inequality reducing effects of financial inclusion measured either way. Most noticeably, our results suggest negative association between microfinance intensity and poverty headcount ratio. Results remain unchanged when poverty headcount is replaced by Gini coefficient. These findings indicate that microfinance intensity not only reduces poverty but also its depth and severity measured as poverty gap and squared poverty gap. Our study depicted a negative relationship between ICT diffusion and poverty. Further, the results suggest that most ICT indicators can help reduce poverty and income inequality by fostering financial inclusion. More importantly, mobile phone diffusion exhibits positive association with financial inclusion measured either from microfinance intensity or from formal financial sector. Results of the study persist to be robust in case of GMM regression when ICT dimensions plugged in as instruments for financial inclusion. Findings also indicate that the ICT infrastructure in a country facilitates digital financial services.

In conclusion, policies to promote information and communication infrastructure

could stimulate financial inclusion by promoting e-finance. Moreover, better collaboration between ICT and financial sector will likely to improve digital/mobile banking. Finally, the role of regulators is imperative in order to harness the beneficial and sustainable gains from the increased tech (Fintech, digital-only or neobanks) entrants with an objective to provide financial services. Further research could be done to explore the risks associated to Fintech and its impact on the provision of financial services to the unbanked segment of society and finally it could be interesting to examine its impact on the transmission of monetary policy.

3.6. Appendices

Table 3.1 – Summary statistics

Variable	Obs.	Mean	SD	Median	Min	Max
Poverty headcount	197	2.724	2.724	3.034	-2.163	4.533
Poverty gap	196	1.597	1.597	1.915	-4.200	4.070
Gini coefficient	196	3.699	3.699	3.695	3.187	4.175
Microfinance loans/GDP	248	1.547	1.547	0.488	0	14.34
Borrowers/total population	248	1.849	1.849	0.774	0	12.36
Deposits per head	131	0.762	0.762	0.614	0.006	3.906
Loans per head	101	0.227	0.227	0.176	0.001	0.803
Access to Finance	244	0.204	0.204	0.128	0.006	0.949
Domestic Credit	243	3.203	3.203	3.251	0.908	4.988
Mobile per head	247	3.231	3.231	3.659	-1.796	5.017
Internet per head	248	1.702	1.702	1.914	-1.934	3.981
Fixed lines per head	248	1.585	1.585	2.142	-1.483	3.497
Personal computers	132	4.162	4.162	2.275	0.122	22.52
Price of 3-min local mobile call	53	0.697	0.697	0.685	0.141	1.351
Price of 3-min local fixed call	71	0.163	0.163	0.134	0	0.621
GDP per head	248	7.247	7.247	7.360	5.302	9.108
Government consumption	247	2.513	2.513	2.493	1.674	3.113
Openness index	248	4.247	4.247	4.254	3.276	5.058
Arable lands	248	2.550	2.550	2.572	0.361	4.150
Inflation rate	230	7.553	7.553	6.145	1.268	33.03
Bank overhead cost	245	5.144	5.144	4.546	0.918	19.46
Population density	248	4.228	4.228	4.282	1.764	7.001
Cost of contract enforcement	188	3.544	3.544	3.461	2.407	5.007
Index of civil liberties	248	4.251	4.251	4	2	7

Table 3.2 – Impact of Microfinance Intensity/ Inclusion on Poverty and Inequality

VARIABLES	Poverty Headcount Ratio					Gini coefficient				
	OLS (1)	FE (2)	RE (3)	QR (4)	IV (5)	OLS (6)	FE (7)	RE (8)	QR (9)	IV (10)
Log GDP per capita	-1.040*** (0.099)	-2.349*** (0.282)	-1.193*** (0.113)	-0.920*** (0.067)	-1.191*** (0.118)	0.034 (0.022)	-0.009 (0.040)	0.018 (0.021)	0.045** (0.020)	-0.003 (0.025)
Loan Portfolio /GDP	-0.057** (0.027)	-0.002 (0.024)	-0.054*** (0.020)	-0.041* (0.024)	-0.183*** (0.070)	-0.004 (0.007)	-0.008** (0.003)	-0.008*** (0.003)	-0.011 (0.007)	-0.042*** (0.015)
Arable lands	-0.381*** (0.143)	0.990* (0.530)	-0.308** (0.132)	-0.193*** (0.070)	-0.506*** (0.114)	-0.100*** (0.025)	0.016 (0.073)	-0.075*** (0.026)	-0.108*** (0.021)	-0.118*** (0.025)
Trade openness	-0.801*** (0.249)	-0.333 (0.290)	-0.559** (0.219)	-0.558*** (0.155)	-0.916*** (0.272)	-0.102* (0.059)	-0.023 (0.040)	-0.045 (0.034)	-0.093** (0.047)	-0.063 (0.059)
Government Consumption	-0.967*** (0.351)	-0.441 (0.384)	-0.618** (0.275)	-0.710*** (0.190)	-0.934*** (0.326)	0.019 (0.069)	0.016 (0.053)	0.021 (0.044)	-0.029 (0.057)	-0.000 (0.070)
Constant	17.337*** (1.877)	20.157*** (2.718)	16.361*** (1.359)	14.408*** (0.886)	19.433*** (1.517)	4.100*** (0.311)	3.794*** (0.380)	3.908*** (0.232)	4.141*** (0.266)	4.374*** (0.328)
R-squared	0.619	0.461	0.603		0.539	0.251	0.065	0.239		
Hausman			26.11 (0.000)					3.95 (0.556)		
Theta			0.70					0.80		
Pseudo R2				0.447					0.180	
Weak Identification					13.65					13.747
Endogeneity										
Durbin (score)					7.86					15.04
$\chi^2(1)$					0.005					0.000
Hansen stat (OIR)					0.74					0.073
Observations	196	196	196	196	123	195	195	195	195	123

Notes: Results of this table are derived from following baseline equation; $y_{i,t} = \gamma_0 + \gamma_1 \ln gdp_{i,t} + \gamma_2 loan_{i,t} + \gamma_3 arable_{i,t} + \gamma_4 op_{i,t} + \gamma_5 govt_{i,t} + \varepsilon_{i,t}$. OLS estimation with robust standard errors in parentheses. The dependent variables are i) poverty headcount ratio and ii) Gini coefficient. Gross Loan Portfolio /GDP, it shows the financial inclusion (MFIs) in a given economy. OLS, FE, RE, QR and IV represent Pooled OLS, Fixed and Random Effects, Quintile and Instrumental Variable regression respectively. ***, ** and * represent significance at 1%, 5% and 10%, respectively. The lower part of the table provides diagnostics and stability tests for applied models.

Table 3.3 – Impact of Microfinance Intensity/ Inclusion on Poverty and Inequality

VARIABLES	Poverty Headcount Ratio					Gini coefficient				
	OLS (1)	FE (2)	RE (3)	QR (4)	IV (5)	OLS (6)	FE (7)	RE (8)	QR (9)	IV (10)
Log GDP per capita	-1.017*** (0.100)	-2.303*** (0.287)	-1.179*** (0.114)	-0.879*** (0.066)	-1.090*** (0.103)	0.036 (0.022)	-0.004 (0.040)	0.018 (0.021)	0.046*** (0.020)	0.022 (0.022)
Borrower /Population	-0.056 (0.034)	-0.011 (0.031)	-0.068*** (0.024)	-0.054** (0.025)	-0.176** (0.073)	0.003 (0.007)	-0.010** (0.004)	-0.009*** (0.003)	0.001 (0.008)	-0.035** (0.016)
Arable lands	-0.379** (0.143)	0.970* (0.532)	-0.306** (0.132)	-0.235*** (0.070)	-0.495*** (0.114)	-0.097*** (0.024)	-0.004 (0.073)	-0.077*** (0.026)	-0.102*** (0.022)	-0.113*** (0.025)
Trade openness	-0.847*** (0.240)	-0.309 (0.297)	-0.529** (0.220)	-0.649*** (0.152)	-1.166*** (0.260)	-0.108* (0.057)	-0.005 (0.041)	-0.038 (0.034)	-0.122** (0.048)	-0.119** (0.056)
Government Consumption	-1.048*** (0.375)	-0.439 (0.383)	-0.703** (0.276)	-0.826*** (0.196)	-1.246*** (0.367)	0.028 (0.074)	0.013 (0.053)	0.011 (0.044)	-0.024 (0.061)	-0.059 (0.079)
Constant	17.574*** (1.904)	19.772*** (2.760)	16.381*** (1.355)	14.934*** (0.899)	20.546*** (1.748)	4.065*** (0.320)	3.749*** (0.383)	3.907*** (0.234)	4.214*** (0.280)	4.559*** (0.377)
R-squared	0.619	0.462	0.388		0.546	0.250	0.070	0.055		
Hausman			25.34 (0.000)					2.94 (0.567)		
Theta		0.707						0.809		
Pseudo R2				0.447					0.173	12.986
Weak Identification					13.07					
Endogeneity										
Durbin (score)					6.718					13.76
$\chi^2(1)$					0.009					0.000
Hansen stat (OIR)					0.400					0.015
Observations	196	196	196	196	123	195	195	195	195	123

Notes: Results of this table are derived from following baseline equation: $y_{i,t} = \gamma_0 + \gamma_1 \ln gdp_{i,t} + \gamma_2 bor_{i,t} + \gamma_3 arable_{i,t} + \gamma_4 op_{i,t} + \gamma_5 gov_{i,t} + \epsilon_{i,t}$. Borrowers /Population measured as the number of active borrowers/total population, it shows the financial inclusion (MFIs) in a given economy. (all notes are same as in table 3.2).

Table 3.4 – Impact of Financial Inclusion on Poverty and Inequality

VARIABLES	Poverty Headcount Ratio					Gini coefficient				
	OLS (1)	FE (2)	RE (3)	QR (4)	IV (5)	OLS (6)	FE (7)	RE (8)	QR (9)	IV (10)
Log GDP per capita	-0.534*** (0.182)	-1.094*** (0.379)	-0.764*** (0.144)	-0.551*** (0.108)	-0.201 (0.269)	0.089*** (0.032)	-0.091 (0.070)	0.048* (0.029)	0.101*** (0.027)	0.144** (0.060)
Deposits per head	-0.832*** (0.286)	-0.582*** (0.170)	-0.634*** (0.131)	-0.800*** (0.132)	-1.195*** (0.270)	-0.087** (0.037)	-0.053* (0.030)	-0.077*** (0.024)	-0.099*** (0.033)	-0.134** (0.061)
Arable lands	-0.070 (0.143)	-0.467 (0.636)	-0.204 (0.138)	0.002 (0.088)	0.222 (0.190)	-0.055* (0.031)	-0.071 (0.108)	-0.067** (0.028)	-0.086*** (0.022)	-0.032 (0.044)
Trade openness	-0.812*** (0.272)	0.533 (0.332)	-0.155 (0.234)	-0.486*** (0.183)	-0.808* (0.420)	-0.062 (0.064)	0.069 (0.058)	0.031 (0.044)	-0.016 (0.046)	-0.039 (0.094)
Government Consumption	-0.665 (0.464)	-0.508 (0.384)	-0.646** (0.287)	-0.326 (0.251)	-0.658 (0.493)	0.081 (0.079)	-0.005 (0.068)	0.018 (0.055)	0.074 (0.062)	0.157 (0.107)
Constant	12.745*** (2.901)	11.567*** (3.588)	11.772*** (1.707)	10.447*** (1.327)	9.973*** (3.227)	3.338*** (0.479)	4.353*** (0.630)	3.429*** (0.334)	3.164*** (0.332)	2.602*** (0.726)
R-squared	0.700	0.541	0.486		0.761	0.331	0.204	0.119		0.434
Hausman			18.67 (0.000)					10.13 (0.0716)		
Theta			0.779					0.814		
Pseudo R2				0.532					0.269	
Weak Identification					21.66					22.28
Endogeneity										
Durbin (score)					7.468					6.520
$\chi^2(1)$					0.006					0.010
Hansen stat (OIR)					0.151					0.103
Observations	107	107	107	107	29	107	107	107	107	29

Notes: Results of this table are derived from following baseline equation; $y_{i,t} = \gamma_0 + \gamma_1 \ln gdp_{i,t} + \gamma_2 dep_{i,t} + \gamma_3 arable_{i,t} + \gamma_4 op_{i,t} + \gamma_5 gouv_{i,t} + \varepsilon_{i,t}$. Deposits per head, total number of deposits divided by total population, it shows the financial inclusion (formal) in a given economy. (all notes are same as in table 3.2).

Table 3.5 – Effects of ICTs on Poverty and Income Inequality

VARIABLES	Poverty Headcount Ratio					Gini coefficient						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Log GDP per capita	-0.915*** (0.114)	-0.730*** (0.197)	-0.686*** (0.186)	-0.833*** (0.132)	-0.781*** (0.138)	-0.497*** (0.146)	0.053* (0.028)	0.118*** (0.036)	0.117*** (0.035)	0.056 (0.035)	0.059 (0.037)	0.041 (0.063)
Trade openness	-0.827*** (0.257)	-0.733*** (0.256)	-0.716*** (0.252)	-0.810*** (0.262)	-0.704** (0.293)	0.112 (0.406)	-0.100 (0.064)	-0.068 (0.064)	-0.070 (0.062)	-0.102 (0.065)	-0.115 (0.071)	-0.062 (0.166)
Government Consumption	-0.780** (0.363)	-0.680* (0.358)	-0.685* (0.355)	-0.737* (0.378)	-0.617* (0.336)	0.122 (0.235)	0.072 (0.080)	0.104 (0.081)	0.100 (0.079)	0.075 (0.082)	0.091 (0.089)	0.147 (0.107)
Inflation	-0.138 (0.149)	-0.140 (0.149)	-0.114 (0.141)	-0.149 (0.155)	-0.077 (0.142)	0.280** (0.130)	-0.018 (0.029)	-0.015 (0.028)	-0.011 (0.027)	-0.020 (0.029)	-0.002 (0.035)	0.122* (0.058)
Mobile	-0.116** (0.055)						-0.021** (0.010)					
Fixed Telephone		-0.265* (0.135)						-0.078*** (0.023)				
Total (Telephone+ Mobile)			-0.175** (0.074)	-0.176*** (0.062)					-0.044*** (0.011)			
Internet										-0.019 (0.017)		
Personal computers					-0.039 (0.032)						-0.006 (0.008)	
Price of 3-minute local call						0.698 (0.466)						0.342* (0.176)
Constant	15.655*** (1.860)	13.733*** (2.212)	13.726*** (2.015)	14.833*** (2.062)	13.501*** (1.979)	5.471*** (1.577)	3.655*** (0.390)	3.022*** (0.448)	3.133*** (0.419)	3.605*** (0.455)	3.575*** (0.466)	2.906*** (0.605)
Observations	190	190	190	190	102	27	189	189	189	189	102	26
R-squared	0.565	0.580	0.582	0.571	0.545	0.666	0.099	0.174	0.157	0.096	0.100	0.390

Notes: Results of this table are derived from following baseline equation; $y_{i,t} = \gamma_0 + \gamma_1 \ln gdp_{i,t} + \gamma_2 op_{i,t} + \gamma_3 govt_{i,t} + \gamma_4 \ln f_{i,t} + \gamma_5 ICT_{i,t} + \varepsilon_{i,t}$. Five indicators of ICTs are used in separate specifications. Mobile per head, Fixed lines per head Internet users Personal computers per head and Price of 3-minute mobile local call. (all notes are same as in table 3.2).

Table 3.6 – Effects of ICTs/ Mobile Penetration on Poverty and Inequality

VARIABLES	Poverty Headcount Ratio				Gini coefficient			
	(FE) (1)	(RE) (2)	(QR) (3)	(IV) (4)	(FE) (5)	(RE) (6)	(QR) (7)	(IV) (8)
Log GDP per capita	-2.302*** (0.412)	-1.023*** (0.135)	-0.792*** (0.087)	1.136 (1.255)	0.008 (0.057)	0.045* (0.025)	0.077** (0.030)	0.286* (0.164)
Trade openness	-0.329 (0.314)	-0.550** (0.229)	-0.653*** (0.158)	0.133 (0.564)	-0.022 (0.043)	-0.043 (0.036)	-0.136** (0.056)	0.118 (0.075)
Government Consumption	-0.342 (0.440)	-0.509* (0.298)	-0.343* (0.197)	0.221 (0.737)	0.042 (0.060)	0.052 (0.048)	-0.003 (0.070)	0.086 (0.091)
Inflation	0.005 (0.099)	-0.045 (0.090)	-0.028 (0.106)	0.022 (0.162)	0.002 (0.013)	0.002 (0.013)	-0.019 (0.037)	0.004 (0.021)
Mobile	-0.004 (0.058)	-0.130*** (0.040)	-0.121* (0.064)	-0.581** (0.264)	-0.012 (0.008)	-0.016*** (0.006)	-0.024 (0.023)	-0.070** (0.034)
Constant	22.058*** (3.343)	14.461*** (1.406)	12.888*** (1.001)		3.659*** (0.462)	3.469*** (0.244)	3.854*** (0.352)	
Observations	190	190	190	131	189	189	189	132
R-squared	0.443	0.091	0.065	0.065	0.044	0.591		-0.264
Number of Countries	62	62	49	49	62	62	50	50
Country FE	YES				YES			
Hausman		0.028				0.835		
Theta		0.815				0.721		
Pseudo R2			0.425				0.09	
Weak identification test (Cragg-Donald Wald F-stat)				6.553				6.360
Underidentification test (pvalue of the Anderson's stat)				0.000				0.000
overidentification test (pvalue of the Sargan's stat)				0.616				0.332

Notes: The dependent variables are i) poverty headcount ratio and ii) Gini coefficient. FE, RE, QR and IV represent, Fixed and Random Effects, Quintile and Instrumental Variable regression respectively. Robust standard errors are reported in parenthesis. ***, ** and * represent significance at the 1%, 5% and 10%, respectively. The lower part of table provides diagnostics and stability tests for applied models.

Table 3.7 – ICT-Poverty: Testing Country income level interaction

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Log GDP per capita	-0.915*** (0.114)	-0.567*** (0.203)	0.342 (0.226)	0.108 (0.206)	-1.014*** (0.178)	-0.730** (0.357)
Trade openness	-0.827*** (0.257)	-0.742*** (0.250)	-0.703*** (0.249)	-0.733*** (0.255)	-0.883*** (0.268)	-0.862*** (0.273)
Govt Consumption	-0.780** (0.363)	-0.551 (0.338)	-0.600* (0.347)	-0.559* (0.329)	-0.744** (0.357)	-0.698* (0.399)
Inflation	-0.138 (0.149)	-0.099 (0.132)	-0.118 (0.133)	-0.071 (0.136)	-0.123 (0.147)	-0.153 (0.137)
Mobile	-0.116** (0.055)	0.118** (0.054)	1.574*** (0.403)	-0.264** (0.120)	-0.218*** (0.079)	-0.408** (0.161)
Telephone		0.368** (0.142)	-0.312** (0.127)	-0.425*** (0.150)		
Mobile×Telephone		-0.208*** (0.037)				
Mobile×GDP per capita			-0.256*** (0.060)			
Internet				2.143*** (0.506)		
Internet×GDP per capita				-0.290*** (0.065)		
low					-1.230*** (0.366)	-1.125 (1.080)
Mobile×low					0.269*** (0.086)	0.432** (0.165)
mid						-0.302 (0.883)
Mobile×mid						0.215 (0.211)
Constant	15.655*** (1.860)	12.091*** (2.075)	6.816*** (1.825)	8.595*** (1.881)	16.958*** (2.222)	15.120*** (4.156)
Observations	190	190	190	190	190	190
R-squared	0.565	0.637	0.627	0.643	0.584	0.595

Note: This table reports the results of following baseline equation; $y_{i,t} = \gamma_0 + \gamma_1 \ln gdp_{i,t} + \gamma_2 op_{i,t} + \gamma_3 govt_{i,t} + \gamma_4 inf_{i,t} + \gamma_5 Mobile_{i,t} + \gamma_6 Telephone_{i,t} + \gamma_7 Mobile_{i,t} \times \gamma_8 Telephone_{i,t} + \varepsilon_{i,t}$. This table provides the results of interaction terms of different set of ICT indicators such as mobile and telephone, mobile and GDP or Internet and GDP. Column 5 and 6 present the results of the interaction of the ICT indicator with a dummy variable of low middle and upper income countries. This equation can be specified as; $y_{i,t} = \gamma_0 + \gamma_1 \ln gdp_{i,t} + \gamma_2 op_{i,t} + \gamma_3 govt_{i,t} + \gamma_4 inf_{i,t} + \gamma_5 Mobile_{i,t} + D_{low} + \gamma_6 Mobile_{i,t} \times D_{low} + D_{mid} + \gamma_7 Mobile_{i,t} \times D_{mid} + \varepsilon_{i,t}$, where D_{low} and D_{mid} represent lower and middle income group countries respectively.

Table 3.8 – Mobile Phone Penetration and Financial Inclusion

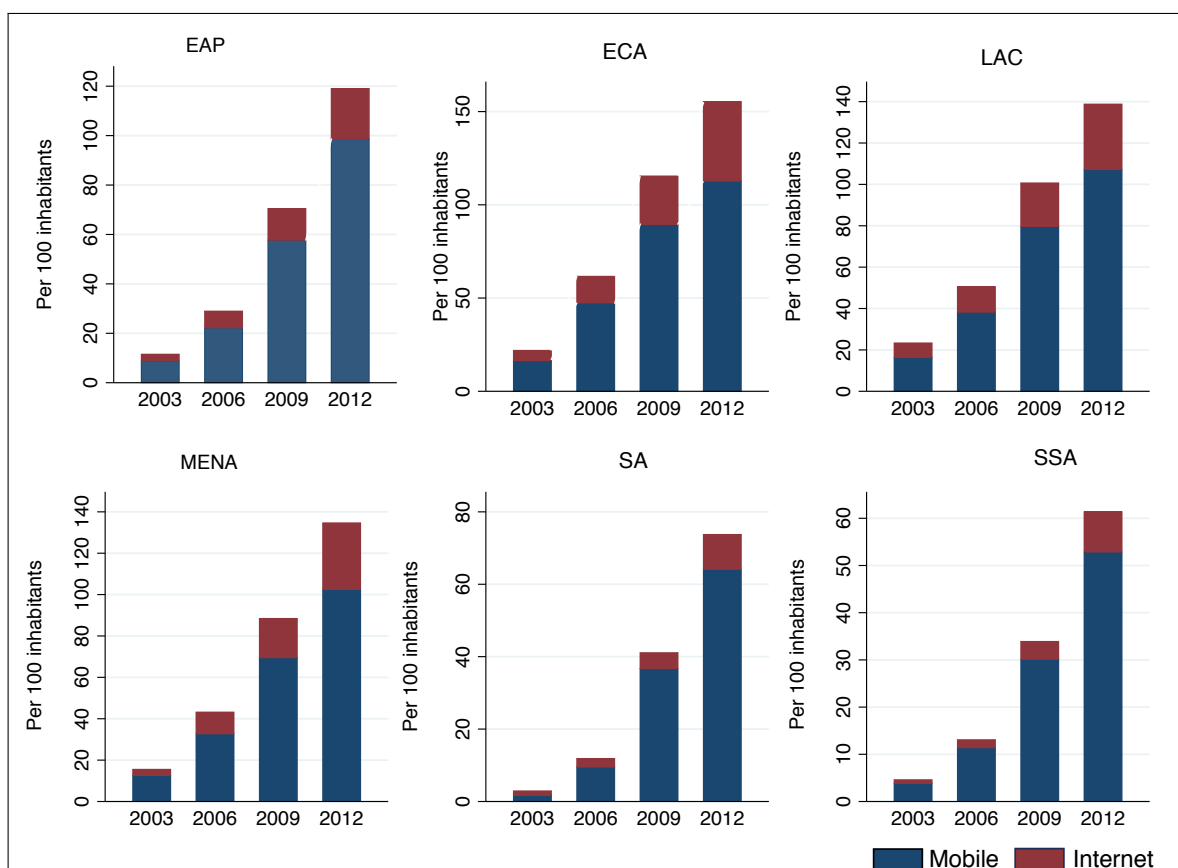
VARIABLES	Overall Financial Inclusion				Overall Access to Finance		Microfinance	
	Deposits per head	Domestic credit	Access to Financial Ins.	Glp/GDP	Bor/Pop			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mobile Phone per head	0.168 † (0.105)	0.183 † (0.127)	0.145*** (0.039)	0.221*** (0.077)	0.021*** (0.007)	0.025** (0.012)	0.962*** (0.218)	0.665*** (0.146)
Log GDP per capita	0.365*** (0.084)	0.224* (0.115)	0.322*** (0.080)	0.172 (0.110)	0.125*** (0.016)	0.100*** (0.015)	-1.198** (0.382)	-0.659* (0.309)
Population density	0.174*** (0.057)	0.203* (0.118)	0.216** (0.084)	0.074 (0.088)	-0.000 (0.015)	-0.048** (0.022)	-0.455 (0.356)	0.205 (0.482)
Overhead cost		-0.022 (0.020)		-0.064** (0.027)		0.004 (0.006)	-0.051 (0.055)	-0.041 (0.056)
Institutions		0.234** (0.099)		0.143 (0.088)		0.011 (0.013)	0.053 (0.188)	0.096 (0.184)
Bank branches		-0.002 (0.012)		0.002 (0.007)		0.007*** (0.002)		
Constant	-3.299*** (0.553)	-3.348*** (0.822)	-0.511 (0.685)	0.575 (0.748)	-0.772*** (0.098)	-0.523*** (0.158)	9.095** (3.457)	3.25 (2.714)
Observations	131	126	242	171	243	172	244	244
R-squared	0.397	0.488	0.361	0.456	0.563	0.698	0.201	0.100

Note: This table reports the results of following baseline equation; $F I_{i,t} = \zeta_0 + \zeta_1 mob_{i,t} + \zeta_2 y_{i,t} + \zeta_3 pden_{i,t} + \sum_{j=1}^n X_{i,t}^j + \varepsilon_{i,t}$. This table provides the results of the effects of ICT indicator measured as mobile subscribers per head on financial inclusion. Robust standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1 and † p<0.15. The dependent variable $F I$ is financial inclusion, measured as the number of deposits divided by adult population of the respective country in column (1) and (2); A broad measure of financial inclusion (CREDIT) in column (3) and (4); Access to financial institutions index is taken from [Sviryzhenka \(2016\)](#), column (5) and (6) present the impact of mobile penetration on access to finance. model (7) and (8) give the results when we use MFI borrower per capita and ration of borrowers to GDP to approximate financial inclusion. y and $pden$, GDP per capita and population density are the main control variable respectively in this regression (see methodology section for the explanation of all variables used here). This model is applied following [Kpodar & Andrianaivo \(2011\)](#).

Table 3.9 – Impact of ICT on Poverty and Inequality

VARIABLES	Instrumental Variables: GMM Estimation								
	HCR (1)	HCR (2)	HCR (3)	HCR (4)	HCR (5)	GINI (6)	PGAP (7)	PGAP2 (8)	GDPPC (9)
Log GDP per capita	-0.914*** (0.141)	-1.089*** (0.093)	-1.071*** (0.094)	-0.107 (0.468)	-0.767*** (0.202)	0.079** (0.039)	-1.003*** (0.212)	-2.006*** (0.425)	
Arable lands	-0.316** (0.129)	-0.362*** (0.124)	-0.369*** (0.126)	0.249 (0.314)	-0.277** (0.133)	-0.090*** (0.026)	-0.424*** (0.147)	-0.848*** (0.295)	-0.239 (0.147)
Trade openness	-0.744*** (0.278)	-0.767*** (0.253)	-0.798*** (0.244)	-0.439 (0.377)	-0.980*** (0.289)	-0.065 (0.068)	-0.845** (0.379)	-1.689** (0.758)	-0.011 (0.315)
Government Consumption	-0.912*** (0.347)	-1.057*** (0.312)	-1.189*** (0.312)	-0.078 (0.687)	-0.595 (0.424)	0.023 (0.077)	-0.917** (0.409)	-1.834** (0.818)	0.028 (0.411)
Financial Inclusion-1	-0.349* (0.198)					-0.118** (0.056)	-0.603* (0.313)	-1.206* (0.626)	1.620*** (0.231)
Financial Inclusion-2		-0.071* (0.041)							
Financial Inclusion-3			-0.075* (0.046)						
Financial Inclusion-4				-1.699** (0.826)					
A2F					-2.100* (1.203)				
Constant	16.915*** (2.055)	17.727*** (1.758)	18.102*** (1.718)	6.452 (6.198)	15.255*** (2.674)	3.946*** (0.364)	17.985*** (2.383)	35.970*** (4.765)	2.656* (1.488)
Observations	193	196	196	107	194	192	192	192	241
R-squared	0.580	0.617	0.615	0.577	0.618	0.007	0.544	0.544	
Hansen's J-stat	0.92	1.969	2.233	4.439	2.255	0.889	0.866	0.866	0.001
P-value	0.631	0.373	0.327	0.108	0.323	0.345	0.351	0.351	0.966

Notes: The dependent variables are i) poverty headcount ratio and ii) Gini coefficient, iii) Poverty Gap iv) squared poverty gap and Per capita Gross domestic product. Financial Inclusion-1 is measured through the log of (CREDIT), Financial Inclusion-2 is the ratio of gross loan portfolio of MFIs to GDP, Financial Inclusion-3 is microfinance borrower per capita, Financial Inclusion-4 is deposits per head and A2F is the access to financial institutions in a given economy. Instruments are ICT indicators (Mobile subscriptions per head, Internet users and fixed telephone lines per head) in addition to the included regressors except Financial Inclusion. weighting matrix: white covariance; clustered at country level; Robust standard errors are reported in parenthesis. ***, ** and * represent significance at the 1%, 5% and 10%, respectively.



(a) Trends in ICT: Internet vs Mobile subscriptions

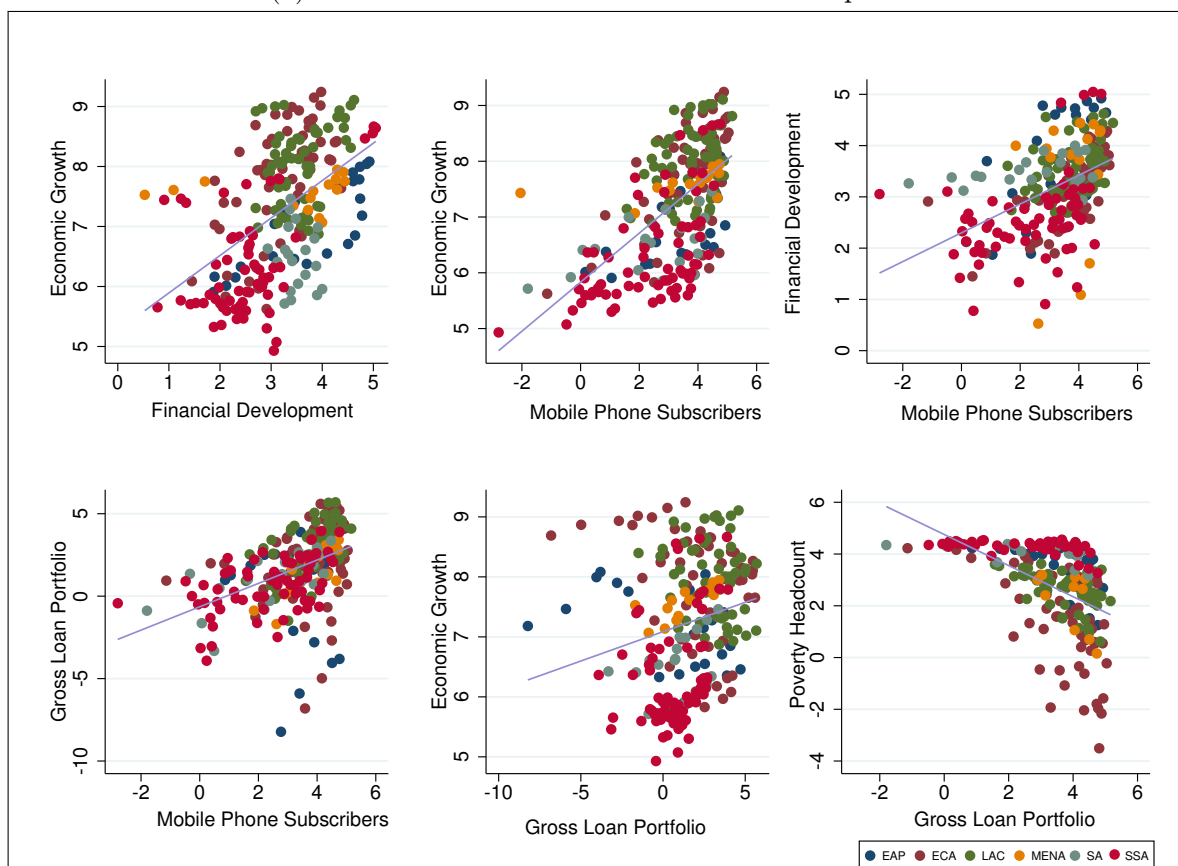


Figure 3.2 – Trends and Correlations

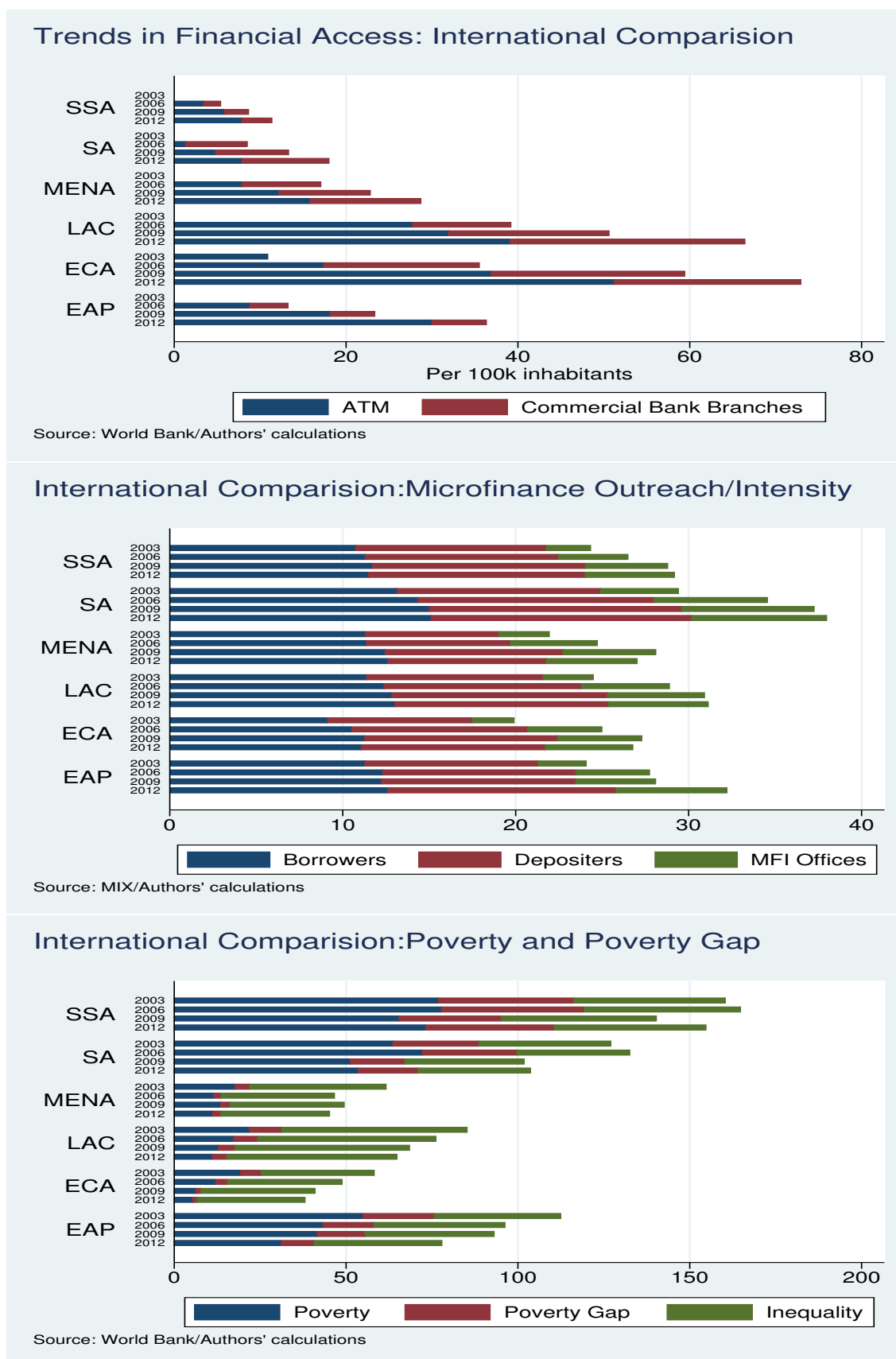


Figure 3.3 – Financial Access & Poverty:International Comparison

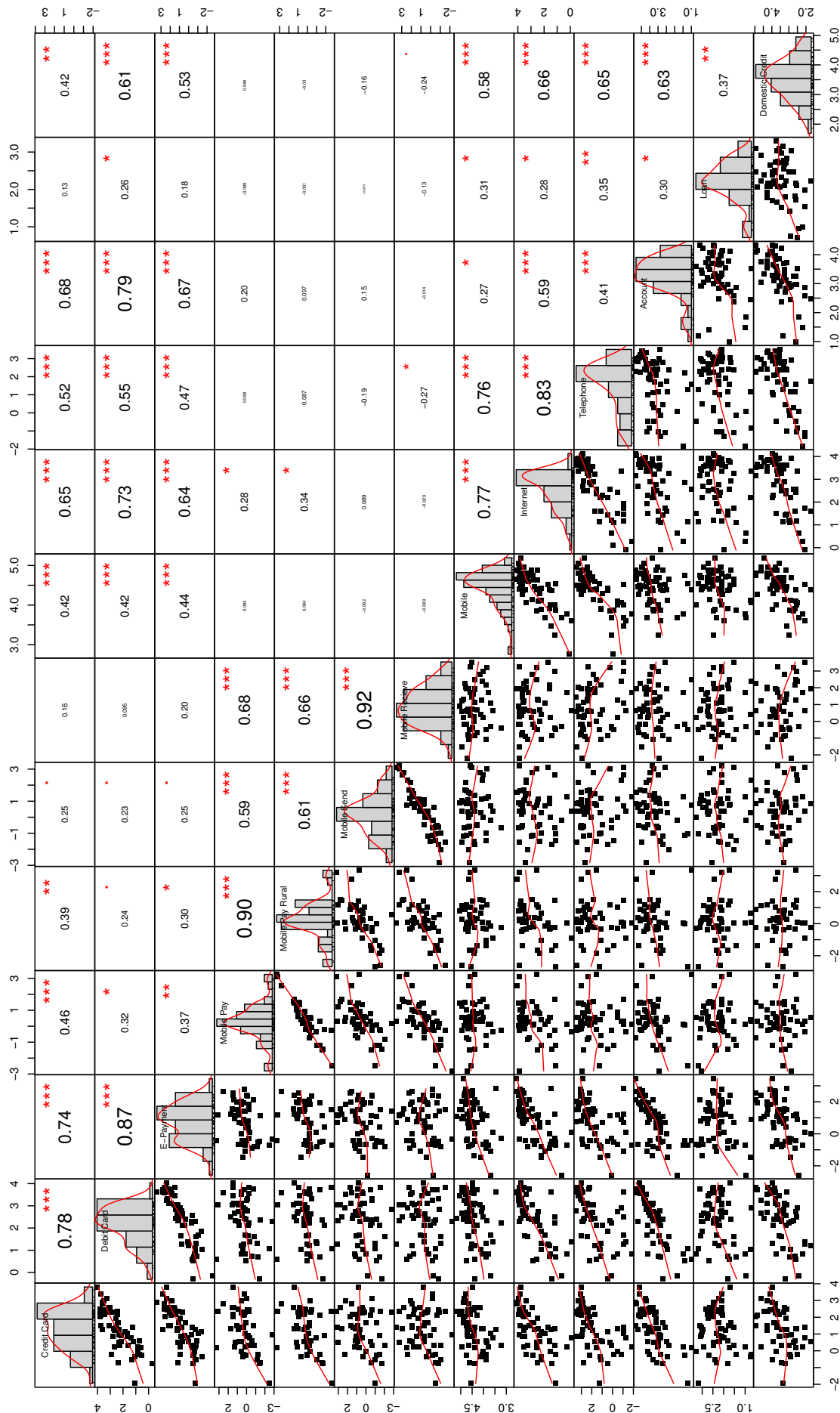


Figure 3.4 – ICT, Digital Finance and Financial Development

Source: World Development Indicators, Own calculations

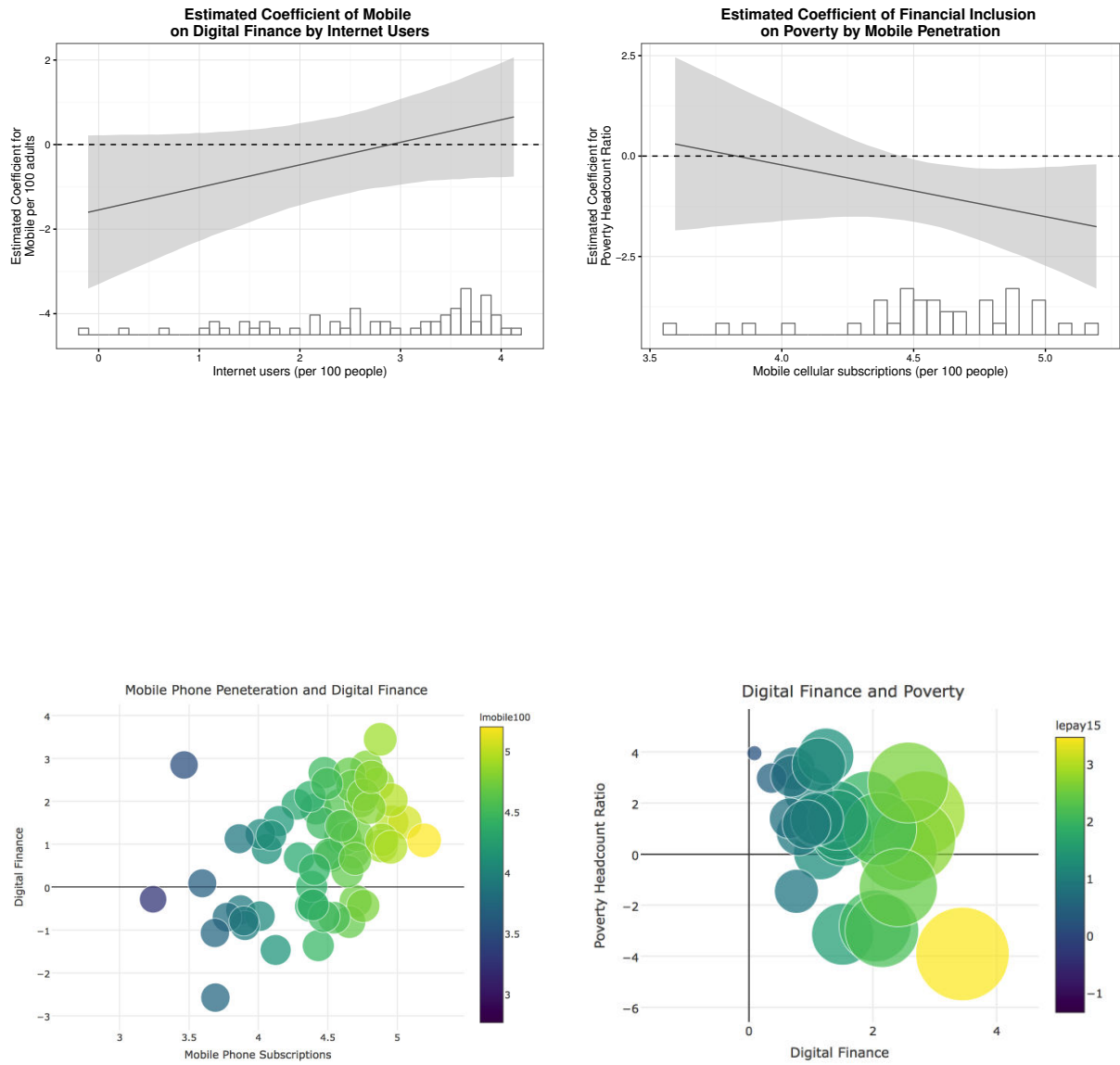


Figure 3.5 – Conditional Effects and Correlations

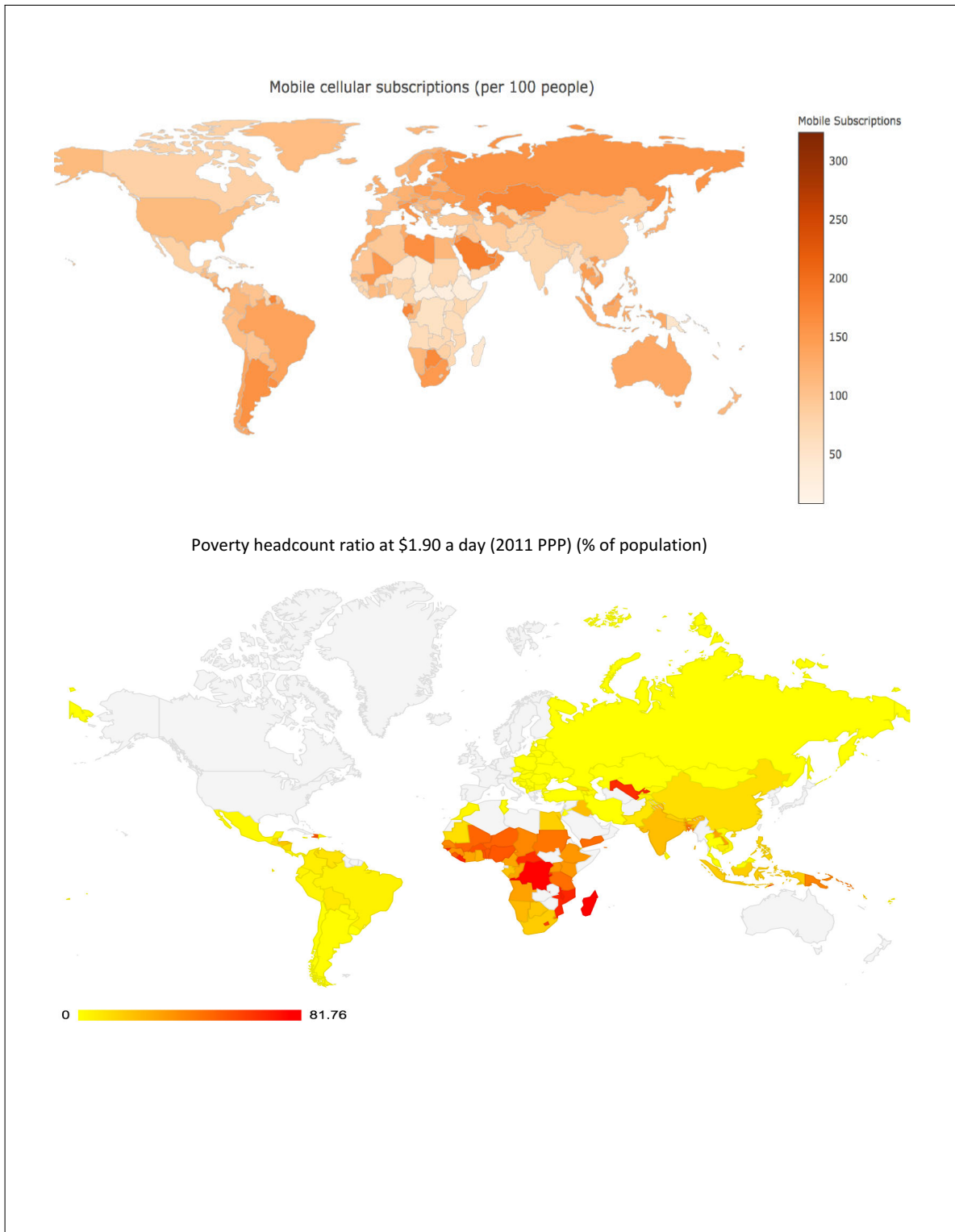


Figure 3.6 – Geographical Visualization of Poverty and Mobile Penetration

Source: World Development Indicators, Own calculations

Table 3.10 – Variables and Measurement

Variables	Definition	Source
Control		
Gross Domestic Product	Log of Gross Domestic Product Per Capita GDP	WDI
Inflation	Consumer Price Index	WDI
Trade Openness	Ratio of imports plus exports to GDP	WDI
Government Consumption	General government final consumption expenditure (% of GDP)	
Arable lands	Share of arable land/total land (% of GDP)	WDI
Population density	Population density (people per sq. km of land area)	WDI
Foreign Direct Investment	Foreign direct investment, net inflows to GDP	WDI
Poverty & Inequality		
Poverty	Measured as Poverty Headcount ratio at \$ 2 a day	WDI
Poverty Gap	Poverty gap at \$2 a day (PPP) (%)	WDI
Gini coefficient	Income Inequality, natural log of GINI coefficient	WDI
ICT		
Mobile	Mobile cellular subscriptions divided by total population	ITU
Internet	Number of people with access to the worldwide network divided by total population	ITU
Telephone	Fixed Telephone users divided by total population	ITU
Price of 3-minute call	Price of 3-minute local mobile call (peak -rate - US\$)	
Financial Inclusion (Informal)		
Gross Loan Portfolio	Gross Loan Portfolio divided by GDP	MIX
Borrower per capita	Total number of borrowers divided by total Population	MIX
Financial Inclusion (Formal)		
Domestic Credit	Domestic credit to private sector (% of GDP)	GFDD
Access to Finance	Depositors with commercial banks (per 1,000 adults)	IMF-FAS
Deposits per head	Number of Commercial Bank deposits divided by total population	IMF-FAS
Institutional Indicators		
Contract Enforcement	Cost of contract enforcement	Doing Business
Political Rights Index	Political Stability index, range 1-7	Freedom House
Index of Civil Liberties	Civil Liberties index, range 1-7	Freedom House
Other		
Latitude	Absolute value of the latitude of the capital city, range 0-1	La Porta <i>et al.</i> (1997)
Legal Origin	Dummy variable for legal origin of the country, 0/1	(La Porta <i>et al.</i> , 1997)
Religion	Measure of religious fractionalization	(Alesina <i>et al.</i> , 2003)
Language	Measure of linguistic fractionalization	(Alesina <i>et al.</i> , 2003)
Ethnic	Measure of ethnic fractionalization	(Alesina <i>et al.</i> , 2003)

Note: * The Global Financial Development Database. +The World Bank, World Development Indicators (WDI). ITU, International Telecommunication Union. MIX, Microfinance Information Exchange. IMF-FAS, International Monetary Fund, Financial Access Survey. WGI, World Governance Indicators.

Table 3.11 – List of Countries, Regions and Income group

Country	Region	Group	Country	Region	Group
Albania	ECA	UMI	Lao PDR	EAP	LMI
Armenia	ECA	LMI	Macedonia, FYR	ECA	UMI
Azerbaijan	ECA	UMI	Madagascar	SSA	LI
Bangladesh	SA	LI	Malawi	SSA	LI
Benin	SSA	LI	Mexico	LAC	UMI
Bolivia	LAC	LMI	Moldova	ECA	LMI
Bosnia and Herzegovina	ECA	UMI	Morocco	MENA	LMI
Brazil	LAC	UMI	Mozambique	SSA	LI
Bulgaria	ECA	UMI	Nepal	SA	LI
Burkina Faso	SSA	LI	Nicaragua	LAC	LMI
Cambodia	EAP	LI	Nigeria	SSA	LMI
Cameroon	SSA	LMI	Pakistan	SA	LMI
Chile	LAC	HI	Panama	LAC	UMI
China	EAP	UMI	Paraguay	LAC	LMI
Colombia	LAC	UMI	Peru	LAC	UMI
Congo, Rep.	SSA	LMI	Poland	ECA	HI
Costa Rica	LAC	UMI	Romania	ECA	UMI
Dominican Republic	LAC	UMI	Russian Federation	ECA	HI
Ecuador	LAC	UMI	Rwanda	SSA	LI
Egypt, Arab Rep.	MENA	LMI	Sierra Leone	SSA	LI
El Salvador	LAC	LMI	South Africa	SSA	UMI
Ethiopia	SSA	LI	Sri Lanka	SA	LMI
Guatemala	LAC	LMI	Swaziland	SSA	LMI
Guinea	SSA	LI	Tajikistan	ECA	LI
Honduras	LAC	LMI	Tanzania	SSA	LI
India	SA	LMI	Thailand	EAP	UMI
Indonesia	EAP	LMI	Turkey	ECA	UMI
Iraq	MENA	UMI	Uganda	SSA	LI
Jordan	MENA	UMI	Ukraine	ECA	LMI
Kazakhstan	ECA	UMI	Vietnam	EAP	LMI
Kyrgyz Republic	ECA	LMI	Zambia	SSA	LMI

Notes: Regions and Income groups are classified as per the World Bank classifications. Where, ECA: Europe and Central Asia, SA: South Asia, SSA: Sub-Saharan Africa, LAC: Latin America & the Caribbean EAP: East Asia and Pacific, and MENA: Middle East and North Africa. The income groups are UMI: Upper-middle-income, LMI: Lower-middle-income, LI: Low-income and HI: High-income economies.

Chapter 4

Understanding the linkages among Financial Literacy, ICT, Financial Inclusion and Household welfare in Pakistan

ICT-FINANCIAL LITERACY AND INCLUSION

4.1. Introduction

Standard finance is based on the notion of “Homo Economicus Chicagoensis” that is unbiased, rational, objective and unemotional. Whereas, behavioral finance highlights the irrationality and biasness in decision making process.¹ Neoclassical finance postulates that individuals are utility maximizers and always make utility-maximizing decisions (see, for example, (Neumann *et al.*, 1944)). Similarly, portfolio theory of Markowitz (1952) and efficient market hypothesis popularized by Schwartz (1970) are also in the favor of rational choices of the agents. Rational Choice Theory is another prominent economic principle that suggests, individuals always make prudent and logical decisions.² On the other hand, Mehra & Prescott (1985) explained various market imperfections and equity premium puzzle. Besides, the prospect theory by Kahneman & Tversky (1979) also challenged the idea of rational decision making. Personal attributes particularly behavioral factors are at play in decision making process. They further illustrate that the decisions can never be made in a vacuum by relying on the personal resources and rigorous models, which do not take into consideration the situation. Various mental and emotional factors are involved in the process of decision making, sometimes they may lead towards better decisions, while the other times they may result in poorer decision outcomes. The performance of any organization or household welfare largely depend on the decisions made by its managers. The argument of latter theorists was that the decision-making is a complex activity and individual’s decisions are not strictly based on rationality or on logical reasoning. In contrast, the other school of thought assumes that the agents are rational and make logical decisions Fama (1980), Shleifer & Vishny (1997).

Behavioral decision theory put forth by an American psychologist Edwards (1954) describes individual’s decision making in a systematic approach. It highlights that how values and beliefs of the individuals are incorporated into their decisions. Individual’s behavioral biases such as overconfidence and conservatism and personality traits also affect decisions Malmendier & Tate (2005). Overconfidence of the individuals may result

1. Robert B.H. Hauswald (2011) “Financial Market Anomalies”, Kogod School of Business, AU.

2. Rational Choice Theory pioneered by George Homas in 1961, later Gary S. Becker applied RCT in various disciplines.

in incorrect decisions.

Financial decision making behavior has potentially a wide range of implications on society. The economists believe that poor decisions of the households are one of the important precipitates of the global financial crises and economic downturns. Therefore, policy makers are determined to improve the quality of household financial decisions [Agarwal & Mazumder \(2013\)](#). If people do not possess sufficient knowledge about financial products or numeracy skills, they would hesitate in selecting financial products and will not demand them [Cole *et al.* \(2009\)](#) or even they may make wrong choices in choosing financial products. Therefore, financial literacy is equally important for households and for the overall financial sector of a country. According to the OECD definition, financial literacy is composed of cognitive skills, knowledge, attitudes and behaviors. [Lusardi \(May 11\)](#) argues that optimal decision making by individuals depends on the ability of basic financial management skills. In this paper we conceptualize financial literacy as cognitive skill that deals with personal and household financial management. Generally, financial literacy, financial knowledge and financial education are used interchangeably [Huston \(2010\)](#). However, financial literacy is a broader concept that includes knowledge and behavior in decision making process [Huston \(2010\)](#). In literature, financial literacy is being measured by the questions related to basic numeracy and some sophisticated financial concepts. Financial literacy is also used in lieu of cognitive skills, while both are correlated with the households economic outcomes (see, for instance, [Smith *et al.* \(2010\)](#), [Gaukecker & Von \(2015\)](#)).

Financial literacy has been defined by several organizations working to promote financial awareness among masses. In general financial literacy could be defined as the ability of individuals and households to manage their financial matters efficiently and effectively (OECD, "Measuring Financial Literacy"). While financial inclusion is a multidimensional concept, it refers to the access to and use of financial services (see, for instance, [Beck & Brown \(2011\)](#), [Beck & De La Torre \(2007\)](#)). A relatively recent empirical literature suggests that financial inclusion can reduce poverty, improve household welfare and promote economic growth [Sahay *et al.* \(2015\)](#), [Kpodar & Andrianaivo \(2011\)](#), [Beck & Brown \(2011\)](#). An inclusive and well developed financial sector helps stimulates economic

growth, poverty alleviation and reduction in income inequality (see, for example, [Beck et al. \(2007\)](#), [Levine \(2005\)](#), [Honohan \(2004\)](#), [Bruhn & Love \(2014\)](#)). To that end, financial markets can only flourish when individuals and households are financially literate and are able to make right decisions about savings, borrowing and investment. Moreover, the beneficial effects of financial markets can be achieved when households choose appropriate financial products and possess necessary financial markets knowledge. There are two aspects of financial inclusion, demand-side that is financial literacy and supply-side is the provision of financial services. Financial literacy instigates the demand side by letting people know what they can demand while financial institutions contribute from supply side by providing financial services according to the needs of consumers. [Cole et al. \(2009\)](#) exhibit that financial literacy promotes financial inclusion and demand for financial products. Financially literate people participate more in the financial markets, however the others remain financially excluded or participate ineffectively. Lack of knowledge about financial products may hinder their use, furthermore it is also argued that as people use financial products they get familiar and accumulate knowledge about them, in a learning by doing fashion. According to the World Bank Financial Capability Survey in Senegal 2015, there is no conclusive link between financial literacy and financial inclusion. However, people who are more financially aware use more financial products than the others. Moreover, financial capability increases financial inclusion, financial stability and helps proper functioning of financial markets.

In this era of digital and robotics technologies, the advent of electronic financial services such as digital, e-banking, debit and credit cards, insurance and investment products and cashless transactions have made the financial products fairly complex. Financial markets have become more sophisticated; even educated people face trouble to deal with the rapidly changing complexity of modern financial life [Prete \(2013\)](#). They also elaborated that economic literacy is imperative to gain from financial markets. A fair amount of research around the world reports substandard financial literacy scores. This evidence persists even for developed economies such as USA, UK, Australia, Germany, France and the Netherlands that are characterized by advanced financial markets and modern IT infrastructure. Pakistan being a developing economy struggling to achieve its

numerous economic targets is no exception in recording substandard scores in financial literacy. In addition, poverty, lower literacy rates, higher urban-rural divide and the lack of awareness and support impede financial literacy and inclusion in the country.

Household financial management has become a burning issue now a days. Household head needs to plan for inflows and outflows of their finances. They also have to manage and plan for food, health, dwellings, children education, marriage and retirement. While, the knowledge of financial products and financial markets could increase the household financial well-being. This work is grounded in behavioral decision theory as we consider financial literacy as an element of human cognition and social capital theory in which we assume the adoption of mobile phone and Internet related technologies help building a social network.³ Moreover, we believe that the new technologies keep the users updated about the economic and financial markets in turn it increases the likelihood of their financial market participation. The growing importance of financial literacy for financial inclusion and financial stability has been a motivation to undertake this study. It is imperative to explore the factors that potentially influence an individual or household's level of financial knowledge and financial inclusion. Thus, in this study we anticipate that Information and communications technologies (ICT)/Social media help in fostering the accumulation of financial literacy that eventually increase the likelihood of financial market participation. We also concentrate to identify whether financial literacy enhances financial inclusion and household welfare in Pakistan. This study also contributes to the literature by examining the role of financial literacy in retirement planning, savings and household budgeting in Pakistan. Moreover, to the best of our knowledge, this study utilizes the French school of "analyse des données" for the first time in this domain of research. This research is an independent project which differentiates it from the other studies that are conducted under the aegis of government/international donor organizations.

3. More detail on ICT in building social network see, Calabrese, A. And M. Borchert (1996). Prospects for electronic democracy in the United States: Rethinking communications and social policy. *Media, Culture, and Society* 18: 249-268.

4.2. Review of Literature

More recently, the development organizations with an objective to fight poverty in the world have acknowledged the potential of access to finance in poverty & inequality reduction. Affordable and accessible financial services could help small businesses and household to smooth consumption and earn respectable livelihood by reducing vulnerabilities, see, for instance [Jeanneney & Kpodar \(2011\)](#). However, financial management at firm or household level requires sophisticated knowledge about financial products and concepts. The lack of financial knowledge could hurt the firm or household due to suboptimal decisions. In addition, financially ignorant people continue to be financially excluded either voluntarily or due to non-availability of financial services. Thus, knowledge and availability of financial services are both important pillars of effective financial inclusion. In the following subsection, we conceptualize and design the relationship between financial literacy and financial inclusion. The first subsection arranges the studies that specifically examined the topics related to financial literacy and financial inclusion. The next subsection describes the framework for linkages among new technologies, financial literacy and financial inclusion and reviews related literature. Moreover, we also present the concepts of financial capability and literacy in the following subsections. Final subsection in this section illustrates the interactions between inequality in education and employability.

4.2.1. Financial Literacy and Financial Inclusion

Household financial management has become an important topic, as they have to plan for short-term as well as long-term to manage their finances for, health, food, future shocks, children's education, marriage and retirement. Besides, the knowledge of financial markets and products could increase the household financial well-being. Rising cost of living, financial products complexity and rapid technological advancement make the financial education important to secure present and future. There are many potential economic indicators that could influence households; therefore, a sufficient knowledge about these elements such as interest and inflation rates, trends in economic growth among others required to avoid any financial shock. [Chen & Volpe \(1998\)](#) conclude that

the individuals with higher level of financial literacy make better financial decision and harness sound economic outcomes.

Financial literacy and financial knowledge are two distinct yet interrelated concepts. Both terms are being repeatedly used interchangeably. Some argue that financial knowledge is a components of, but not equal to financial literacy (see, for instance, [Hung *et al.* \(2009\)](#) and [Huston \(2010\)](#)). They illustrate that financial education promotes the ability and skills of individuals to get the right place in the market for better investment. Moreover, financial education is a process that takes place to ameliorate level of financial literacy of an individual [Finke & Huston \(2014\)](#). Whereas, financial literacy is considered an application of knowledge and human capital that is related to the personal financial management, it also involves the capacity of an individual in financial decision making [Huston \(2010\)](#). Three dimensions of financial literacy suggested by [Agarwalla *et al.* \(2015\)](#) are as follows: Financial knowledge, financial behavior and financial attitude. In a comprehensive study about financial literacy measurement, [Atkinson & Messy \(2012\)](#) described that financial behavior and attitude are the main dimensions of financial literacy measure. In addition to financial behavior and attitude they consider financial knowledge to compute an overall score of financial literacy and showed positive correlations among financial knowledge, behavior and attitude. This implies that positive financial behavior and attitude are associated with higher level of financial knowledge and vice versa.

Research shows positive effects of financial literacy on financial market participation mainly in developed countries. However, more recently studies are being devoting efforts to determine this important link in developing economies. Financially literate individuals tend to participate more in financial markets [Van Rooij *et al.* \(2011a\)](#). The other related work of [Van Rooij *et al.* \(2011b, 2012\)](#) showed association of numeracy with better retirement planning and higher household wealth. Similarly, [Cohen & Young \(2007\)](#) and [Townsend *et al.* \(2012\)](#) depict some evidence about the influence of financial literacy on insurance adoption. [Cohen & Nelson \(2011\)](#) also suggest that providing education on financial matters can enable individuals to develop their skills and to choose between various products in the financial markets. They also noted that financial education

undoubtedly increases financial inclusion. [Atkinson & Messy \(2013\)](#) and [Huang *et al.* \(2013\)](#) found financial literacy an important determinant of financial inclusion. They further highlighted that financial knowledge empowers individuals to participate in financial markets effectively and increases the probability of holding a bank account. In a comprehensive report, [OECD *et al.* \(2013\)](#) reiterated the importance of financial education in achieving financial inclusion goals. In a like manner, [Honohan & King \(2012\)](#) find positive impact of psychological elements and education on the probability of financial inclusion.

The level of financial literacy is a significant driver of effective financial market participation. It improves individual's decision making process because of better understanding of financial products and services. [Estrada-Mejia *et al.* \(2016\)](#) find positive relationship between numeracy and financial position by computing numeracy score using 11-item scale. The expedient effects of financial knowledge on economic well-being and optimal financial decision making are also reported by [Hibbert *et al.* \(2012\)](#), [McCannon & Peterson \(2015\)](#). Some researchers argue that financial literacy alone can not determine optimal decisions. One may have to consider psychological elements such as individual cognitive ability, behavior, attitude, emotions and behavioral biases. As advocated by the behavioral economics and finance theories, individuals do not make rational choices always. Though, financial decisions are also predominantly prone to individual biases, attitudes and behaviors. These psychological factors significantly affect decision making, while financial education does not accomplish optimal decisions always. Economic psychology and behavioral economics focus on irrationality or lack of skills and information in optimal choices. Cognitive biases play a significant role in individual's decision making and hence overall financial well-being. The importance of studying cognitive abilities has been increased over the last decade. But the question still remains unclear and open to debate.

It is challenging task to avoid cognitive biases in decision making process. [Antonides *et al.* \(2011\)](#) find positive relationship between mental accounting and household financial management. [Bogan \(2014\)](#) explains how behavioral biases affect household investment decisions. The way a person behaves affects significantly their financial well-being.

Financial behavior and attitudes are important components of personal financial wellness (see, for example, [Gerrans *et al.* \(2014\)](#)). Similarly, [Sayinzoga *et al.* \(2016\)](#) observe a positive change in the behaviors of individuals post financial literacy training. These arguments indicate the significance of behavioral biases and cognitive attributes for financial literacy and personal finance. [Carpena *et al.* \(2011\)](#) show causal link between financial education and financial awareness and attitudes. More recent study of [Farrell *et al.* \(2016\)](#), demonstrates positive relationship between women's financial self-efficacy and personal finance outcomes. These studies outline that psychological factors and cognitive abilities are equally important for personal financial management.

More specifically, this strand of literature emphasized that financial knowledge does not entirely predict the financial behavior. They restated the importance of psychological traits such as self-esteem and self-efficacy in deriving responsible financial behavior. Similarly, [Letkiewicz \(2012\)](#) finds positive relationship between conscientiousness and optimal financial behavior. They further concluded that individuals with higher conscientiousness score are less likely to have experienced negative financial events. He suggests the importance of conscientiousness and financial literacy to improve consumer finances. Based on these studies it is evident that focus should be given to develop comprehensive financial literacy programs aimed at improving financial well-being and inclusion by considering psychological elements. In a comprehensive review of existing literature on this subject, [Hastings *et al.* \(2013\)](#) elaborated that a large body of research in this domain provides significant implications of financial literacy for financial outcomes. Lower level or lack of financial literacy results in suboptimal outcomes. Additionally, literature also concentrates on the financial mistakes of the consumers. Moreover, it indicates that individuals portray inadequate levels on test-based measures of financial literacy around the world.

Financial socialization is also believed to have positive relationship with beneficial financial practices and asset ownership (see, for instance, [Kim & Chatterjee \(2013\)](#)). Furthermore, [Danes \(1994\)](#) argues that an individual develops financial skills, tastes and dispositions by interacting other people in the society. In addition, parental education also affects the financial behavior and attitudes. Furthermore, [Grinstein-Weiss *et al.*](#)

(2011) pointed out that the level of parental education affects credit score of children.

Financial literacy and financial inclusion go hand in hand. Recent studies highlight the importance of financial literacy for household financial management and financial inclusion. Financial literacy is also significant for the stability of the overall financial sector. Access to and use of finance could potentially reduce poverty and improve household welfare. In the broader context, it is also believed that the credit expansion in an economy leads to the financial crisis and financial stability risks, however it is not the case with access to financial services such as automated teller machines (ATMs), number of bank branches and transaction accounts (see, for instance, [Sahay et al. \(2015\)](#)). Moreover, the increased access can help reduce gender gap in use of formal financial services which would help to boost economic growth without harming financial stability. [Mehrotra & Yetman \(2014\)](#) also argue that the financial inclusion has significant implications for monetary policy and financial stability; greater financial inclusion could help central banks by making interest rate an effective tool of monetary policy. [Burke & Manz \(2014\)](#) examined the relationship between economic literacy and inflation predictions by exploring two potential channels i.e., the choice and use of given information. They concluded that people with understanding of economic concepts are better at forecasting inflation relative to others. Similarly, [Bruine de Bruin et al. \(2010\)](#) focused on financial literacy along with demographic characteristics to investigate the subject's ability to forecast inflation. Based on survey data they report that the inflation expectations are dependent on the demographic and financial literacy differences. Using Mauritanian survey data, [Amendola et al. \(2016\)](#) find that the probability of access to finance by household increases if the household head is older and well educated. They further suggest that a comprehensive understanding of household welfare requires an analysis of both income and consumption patterns.

The growing importance of financial literacy has attracted a considerable attention of the researchers at micro level. However, research regarding impact of financial literacy at macroeconomic level is somewhat limited. Using panel data of 55 countries from the IMD World Competitiveness Yearbook, [Jappelli \(2010\)](#) documents positive correlation between financial literacy and human capital. The author reports that economic literacy

is a necessary condition to participate effectively and to reap benefits from financial markets. Prete (2013) presents that the economic literacy can also help reduce poverty and inequality by using financial products effectively. Economic literate individuals might increase their wealth by taking advantage of new investment opportunities in financial markets. The author is of a view that dissemination of the beneficial effect of financial sector for inequality largely depends upon the level of economic literacy. Previous studies exhibit disproportionately low representation of people in the financial markets with less formal education, minorities, low income groups, unmarried head of household, non-social households, women, rural poor and young generation (see, for example, Hong *et al.* (2004), Bertaut (1998)).

4.2.2. New Technologies (ICT), Financial inclusion & Literacy

By new technologies we mean the use of computers, Internet, smart phones, 3g/4g networks and social media. New technologies educate people and increase their knowledge about markets and economy. Moreover, technological advancement particularly mobile and Internet improves financial inclusion. Africa has witnessed a rapid decline in unbanked population since the advent of mobile based banking. Mobile phones are now more convenient to buy and the increased competition among smartphone companies made them accessible and affordable nearly for everyone in the world. Banks can reach out to the clients through mobile phones without physical presence (branch-less banking). This initiative would enable the bankers to approach the communities living in far remote areas and provide them banking services at their doorstep. It could be an efficient way out for bankers as well as for their clients to make financial transactions without physical contact, which requires cost of traveling to the bank and time. The expansion of mobile banking is beneficial for banks as well, it can reduce the cost of banking operation. In addition, it can save many expenditures which could occur to open a new bank branch. Similarly, the new age financial technology companies that operate in the form of peer-to-peer (P2P) lending and crowdfunding sites have managed to bring a significant number of underserved into mainstream financial sector.⁴ In rural areas most

4. see, http://www.cgap.org/sites/default/files/Brief-Crowdfunding-in-China-Jul-2017_0.pdf

of the people are illiterate or less educated, they are sometimes reluctant to go to bank for opening an account, they rather prefer to save at home or invest in the local stokvel (ballot committees, informal, interest-free savings circles). Where the stokvel organizers misuse the money deposited by the poor households. There are different kinds of stokvel schemes in Pakistan, that is an unregulated informal financial sector for the poor people particularly for women. Commercial or microfinance banks by offering mobile banking to these rural and low educated people could save them from these stokvel schemes.

Recently the concept of Fin-tech emerges, the word Fin-Tech is a combination of two words i.e., finance and technology. Fin-tech market is growing at a dramatic pace and is seen as the significant tool to expand access to finance. Various business models are being adopted by financial and technology companies to deliver financial services to the unbanked segments. The ultimate objective is to provide efficient and reliable financial services through digital platforms. These new startups can help bridge the financial access gap particularly in developing economies characterized by higher financial exclusion. As empirical evidence suggests that the adoption of modern technologies contributes to enhance financial inclusion. This evidence seem to hold in the U.S as well, [Karp *et al.* \(2015\)](#). In another report “Technology Enables Full Financial Inclusion 2013” published by Center for Financial Inclusion (CFI), describes the role of new technologies to advance financial inclusion. Technology along with financial capability can be significant driver of effective financial inclusion. This report also highlights the impact of smartphone and social media on financial inclusion. The use of smartphone will enable people to access more services and interfaces that could help to educate the lower end of society especially illiterate poor households. Social media on the other hand is believed to have the potential to achieve financial inclusion, through improved information sharing, changing behavioral patterns of the user, direct marketing of the financial products and services, while it also enhances the communication between users and financial service providers.

[Bogan \(2014\)](#) demonstrates the beneficial effects of new technologies to reduce information and transaction frictions. Consequently, lower market frictions attract household to participate in the financial markets. Based on the survey of low income bank custo-

mers in the USA, [Servon & Kaestner \(2008\)](#) suggest positive relationship between ICT and financial literacy. Furthermore, research indicates that market frictions also inhibit households to participate in financial markets. [Bogan \(2008\)](#) contends that information and transaction costs could limit stock market participation, however the increasing use of Internet reduces these frictions. Thereby, better ICT diffusion particularly Internet/computer potentially enhances the probability of stock market participation of the households. In 2011, the CFI has identified five key points that are indispensable to achieve a desired level of financial inclusion. These priority areas are: *a)* Addressing Customer Needs, *b)* Technology, *c)* Financial Capability, *d)* Client Protection and *e)* Credit Reporting.. Therefore, it can be inferred that the new technologies are significant drivers of financial inclusion, they can serve by building financial-technology partnership to reach out to far remote underserved or unbanked poor.

4.2.3. Inequality in Education and Employment

Inequalities in education and employment are related to the individual, family background and household characteristics. Similarly, inequalities in financial access persist all across world particularly in developing countries including Pakistan. [Arif & Saqib \(2003\)](#) analyzed Private, NGOs and Public schools on the basis of quality of education. They collected data of 4th class students from 50 schools located in six districts in Pakistan. Primarily, information regarding scores in general knowledge, Urdu and mathematics was gathered. The results showed that the students of private and NGO schools have the almost same score but the public schools students have lower score. The reason is due to the family background, teachers' trainings & education and students ratio in the public schools. In some districts public schools performed well as compare to the Private and NGO schools. [Carbonaro \(2006\)](#) documents the learning opportunities and achievements according to sector differences and presented mixed results. Achievements in the public and private schools are almost same while there is higher effect of learning opportunities on students learning. Using school level data in 19 OECD countries, [Dronkers & Robert \(2008\)](#) find that public school are more effective than private. Public schools are deprived of basic facilities in low income

countries. Whereas the private schools provide cutting edge standards to their students. Consequently, this creates a huge gap in education which eventually translates into the employment.

4.3. Financial Literacy, Inclusion & Retirement Planning: An Overview

In the following subsections we present some facts and figures on financial literacy and financial inclusion in Pakistan and around the world. The first subsection talks about financial literacy status in the world and Pakistan. It also describes the efforts and initiatives to improve financial literacy in the country. Second subsection is concerned about financial inclusion in Pakistan and where does it stand at international level. Final section explains the current status of retirement planning in Pakistan with an interesting figure ??.

4.3.1. Financial Literacy in Pakistan

A fair amount of research worldwide reports substandard financial literacy scores. This evidence equally prevails in the developed economies such as USA, UK, Australia, Germany and the Netherlands (see, for instance, [Shen et al. \(2016\)](#)).⁵ Moreover, financial illiteracy is higher in subgroups particularly, low income, rural, people with less formal education and women. A recent survey of S&P about Global Financial Literacy (GFLS) reveals alarming figures. It shows that only 33% of adults in the world are financially literate. Further, the percentage of men and women who are financially literate is 35 and 30 respectively.

Being a low and middle income economy it is not strange to expect suboptimal financial literacy scores in Pakistan. In addition, lower investment and savings rates, low financial market penetration and lax contract enforcement make the case more

5. Various studies show that a few number of people can answer correctly about financial literacy questions, in the U.S. only 30% , Australia 42.7%, for Germany 53.2% , 44.8% for the Netherlands, 27% and 3.7% for Japan and Russia respectively.

stronger to improve financial literacy.⁶ According to the GFLS, in Pakistan 26% of adults are financially literate compared with the global 33%, India 24% and Bangladesh 19%. A national level campaign namely “Financial Literacy Initiative in Pakistan (FLIP)” emerges with the help of “South Asian Federation of Exchanges (SAFE)” which was established in 2000 by the (SAARC) member countries. SAFE was established with an objective to advance securities markets in the region. Whereas, Financial Literacy Initiative (FLI) is one of the objectives to promote financial awareness and financial education through media, publications, workshops, conferences in collaboration with its member countries. The main audience of this “Financial Literacy Program” is adult age students from different Universities and Colleges, however it also runs the programs to promote financial skills, knowledge and capabilities in all segments of society. Similarly, “Nationwide Financial Literacy Program (NFLP)” to promote financial literacy in Pakistan launched by “State Bank of Pakistan (SBP)” in association with the Asian Development Bank (ADB). The purpose of this program is to develop financial knowledge and capability of the marginalized communities to broaden financial inclusion in Pakistan. SAFE presented a report about financial literacy in 2009, where it states low financial literacy levels in Pakistan, however it is much worse among women, elders and less educated people.⁷

Moreover, nearly 50% of Pakistanis have never reached to formal or informal financial institutions, around 19% of the financially excluded population voluntarily distanced themselves from financial markets due to insufficient or lack of required knowledge, skills about dealing in financial markets and their products.⁸ Some segments of society do not participate in financial institutions on religious grounds, as they believe that financial markets deal in interest rate (ribba) which is prohibited in Islam (see, for instance, Hassan Al-Tamimi & Anood Bin Kalli (2009)). They show that people in UAE are reluctant to trade in shares and bonds of traditional commercial banks due to religious beliefs. In Pakistan, the disturbing facts reveal that only 8% individuals

6. See, World Bank Pakistan Overview, <http://www.worldbank.org/en/country/pakistan/overview>

7. More detail on financial literacy programs in Pakistan can be found at <http://www.safe-asia.com/flip.php> also see, <http://www.financialliteracy.pk/About/FinancialLiteracy.aspx>

8. World Bank (2009) report on “Bringing Finance to Pakistan’s Poor”

deposit and 3% have ever borrowed from the mainstream financial institutions (NFIS Pakistan). Therefore, initiatives taken by the aforementioned organizations to promote financial literacy in all segments of society can help better retirement planning, savings, safe investments, better health care, household welfare, financial inclusion, stability and poverty reduction.

In an effort to bring world's 5% unbanked population, Pakistan kicks off a "National Financial Inclusion Strategy (NFIS)" in May 2015. According to the World Bank, NFIS provides a framework to bring unbanked into the formal financial system. Pakistan has set its goals for 2020 to increase financial inclusion by bringing half of the adult population into banking system. Its 2020 financial inclusion objectives also envisioned to expand the share of SME credit to at least 15% in commercial bank lending which currently stood at about 7%. Lack of capacity in both sides (financial institutions and clients) hinders the financial inclusion. Discrepancies regarding legal and judicial framework discourage financial sector lending. On client side, majority of the population lacks basic financial knowledge which restricts the demand for financial products and services.⁹ It is ineluctable to promote financial inclusion without financial literacy. NFIS Pakistan implements NFLI in cooperation with the State Bank of Pakistan (SBP). To achieve this target, NFIS considers ICT to reach out to the masses especially women and rural areas. Financial literacy and financial inclusion are equally important, the later is considered as the supply side whereas former is believed to be the demand side of financial markets.

4.3.2. Financial Inclusion and Digital Technology in Pakistan

Pakistan is a lower middle income country, faces a number of significant economic, governance and security challenges to achieve sustainable growth.¹⁰ Not unlike from other sectors of the economy, the financial sector of Pakistan also under performs. The World Bank 2015 estimates show that the ratio of (Credit/GDP) in Pakistan was 15.4 percent which is way lower than the other South Asian countries, which is about 42.5

9. For more detail see, National Financial Inclusion Strategy Pakistan, May 2015.

10. More detail about the economy of Pakistan see, <http://www.worldbank.org/en/country/pakistan/overview>

percent.¹¹ Moreover, it could only disburse approximately 7 percent of total bank lending to (MSMEs).¹² While financial inclusion remains a big challenge as the percentage of adult banked population is only 13 where over 100 million adult population is still unbanked which accounts for 5% of the world's total unbanked population (World Bank). Furthermore, the most astonishing number about women's financial inclusion in Pakistan shows less than 5 percent of women could made their way to formal financial markets, which is also very low as compared to the 37 percent average of other South Asian peer countries. Women's participation in financial markets is lower due to their lower representation in labor market. World bank estimates suggest 61 percent of population is living in rural areas of Pakistan. That accounts for around 120 million out of 199 million people, this figure seemingly corresponds to the previous number about unbanked population in the country. Table 1.1 exhibits the most recent statistics about financial inclusion in Pakistan.

These numbers suggest the potential clients for banks and financial institutions which could expand in order to bring millions of people that are outside the purview of the formal financial sector. The world bank report on financial inclusion in Pakistan demonstrates that the use of financial instruments is too low, only 2.9 percent of country's adult population reported to have access to debit card whereas hardly 1 percent use their cards to make online payments, 1.4 percent own an account to receive salary and 1.8 percent use their account to make transactions with government. Despite these gloomy numbers, it is worth mentioning that Pakistan has higher digital finance and branchless banking compared with the regional average. As the regional average of mobile account is 2% of the adult population while In Pakistan this number is about 6 percent.¹³ In addition, GDP growth is exhibiting sustained recovery, lowering inflation, injection of energy into power grids and improved security conditions are the indications of economic recovery in Pakistan. The poverty headcount ratio also shows substantial decline from 64.3 percent in 2001/02 to 29.5 percent in 2013/14. Most importantly, the

11. This average is computed using data of Pakistan, India, Bangladesh, Bhutan, Nepal and Sri Lanka.

12. In Pakistan there are 3.2 million SMEs but a small number (188,000) of them has managed to receive bank credit, 95 percent of the small enterprises are unbanked.

13. World Bank report on financial inclusion in Pakistan, February 8, 2016.

higher growth of youth population in Pakistan is a potential demographic dividend for the country. Pakistan stands at 62nd position in the World Bank rankings according to young population with an age under 15, whereas it has more than 30 percent people between 10-24 years old in total population.¹⁰

According to the Pew Research Center survey, the number of active users of social media is on the rise, however larger share is held by the population between 18-29 years old and 30-49 years in the USA.¹⁴ In Pakistan “Facebook” is the most popular social media platform followed by “Google”, “Twitter” and “Instagram”. According to the Facebook audience insights tool, there are more than 25 million facebook users in Pakistan, it also shows that 15-20 million Pakistani users are men and approximately 5-6 million are women. The first and foremost number is 2 out of 3 users are under the age of 25 which indicates its popularity among youth. In addition, Pakistan passes the 32 million mark of 3g/4g networks which is growing, while the number of mobile phone users in the country reached 133.91 million.¹⁵

The access to and usage of social media and Internet among young folks advance their knowledge and interest in financial products particularly in risk management techniques. The understanding and learning capacity can be improved by using Internet. Millennials are also on top of the other cohorts when it comes to the independent learning. This develops the financial capability of the millennials and gives the competence and greater confidence in personal financial management.¹⁶ As millennials are not very good at financial literacy thus encounter struggling debt issues.¹⁷ Keeping in view of the main social media user cohort is youth, the financial markets and policy makers should focus on to expand mobile and Internet technologies along with the financial education products. Notwithstanding the rapid diffusion of mobile technologies and social media, rural population in Pakistan lacks behind due to poor infrastructure. The majority of

14. This survey also highlights the growth of 60-63 age cohort; in addition, on all platforms of social media mainly two age cohorts are leading the way 16-24 and 25-34. This report is published by the Pew Research Center in 2016 “Global social media research summary 2016”.

15. Pakistan Telecommunication Authority PTA, August 29, 2016. These facts are taken from the “Facebook ad manager”, respective official social media pages, <https://www.techjuice.pk/pakistan-facebook-users-crosses-the-landmark-of-20-million-users/> and also <http://karandaaz.com.pk/Using-Mobile-Money-to-Promote-Financial-Inclusion-in-Pakistan>

16. The article originally published in the Economic Times India, by Rjat Gandhi on May 16, 2015.

17. More detail available in “The Financial Capability of Young Adults-A Generational View” article by Mottola, Gary R, March 2014. Published by FINRA).

Internet and social media users are mainly from urban areas of Pakistan. Primarily in rural areas youth is the audience of social media and Internet yet bulk of the rural youth is deprived of 3g/4g networks and even Internet. The lower penetration of Cellular networks and Internet in the far remote villages and lack of relevant skills to handle new devices are the main reasons.

At the same time, rural women are largely unaware of these technologies.¹⁸ Interestingly, some villages and families do not allow females to keep personal mobile phones, because elders of the village or family consider that the use of mobile phone and Internet put negative impact on young girls. As women comprise half of the adult population and it is inevitable to encourage those financially excluded female's participation in financial markets to achieve financial inclusion 2020 goals. The rural woman might get greater benefits from new technologies and social media if they are allowed to use them. Therefore, financial literacy and inclusion programs should take into account the lower penetration of ICT and cultural barriers particularly regarding women's related programs in remote villages. More specifically, they must understand the needs of diverse population in Pakistan.

4.3.3. Retirement Planning in Pakistan

Unlike developed world, Pakistan does not have many specialized institutions that can provide guidance and consultations about management and investment of pension funds. More recently, some financial institutions such as MCB begins Pakistan Pension Fund (PPF), UBL's Retirement Savings Fund (URSF) and Standard Charter's sharia complaint Meezan Tahafuzz Pension Fund (MTPF). Several pension systems operate in Pakistan, for example government has different structure than the private sector. Similarly, semi-government institutions also have their own schemes. If we talk about the government structure of pensions, there is minimum requirement of job term to attain retirement benefits.

The increment in monthly installment of pensions are also according to the amount of basic pension. While, the higher inflation rates damage the purchasing power of pension

18. "Financial Inclusion Insights reports 42% gender gap in mobile phone ownership, while 30% of the women do not even access to the anyone else's mobile phone".

dependent households. Old age, women/widows of retired people still have to wait in the long lines outside post offices or National Bank to get their monthly pension installment. They could have received the pension amount through online transfer in their bank account. The military accounts department has taken this step to deposit pension directly to the bank account of retired soldiers or officials. Generally, the recipients of monthly pensions are older people while many of them could not fill their receipt by themselves. For that purpose there is an extra service provided in the premises of general post office that charges as low as (Rs.10-50 \approx 10-50 cents) to fill the form and pension book. Moreover, fraudulent savings schemes drastically impacting the pension holders senior citizens of Pakistan. In this scenario, how one can expect that people who can not fill their pension books and use their thumbs impressions, they had post retirement plans. However, the case might be different for higher ranks employees due to their education, awareness and knowledge. The people in Pakistan generally give less priority to post retirement planning due to aforementioned reasons. Thus, these factors lead us to examine if people in Pakistan plan their retirement and how financial literate are different at post retirement plans. To the best of our knowledge this subject has been barely investigated in the context of Pakistan. Therefore, this study is an effort to explore how financial literacy affects retirement planning in Pakistan how good the public are at savings plan and household budgeting.

4.3.4. Spatial Patterns in Poverty & Microfinance in Pakistan

We placed the map of Pakistan in figure A.2a along with the names of neighboring countries, that shows geographic distribution of the microfinance borrowers. According to “Pakistan Microfinance Network”, the number of active borrowers is increasing at high pace. It can be observed from the map that microfinance is concentrated mainly in Punjab and some parts of Sindh province of Pakistan. Formal banking is also concentrated in these regions, as they are the two most populous provinces of country.¹⁹ Whereas, the large number of potential clients in Khyber-Pakhtunkhwa (KPK) and Baluchistan

19. Punjab and Sindh are the largest provinces in terms of population as they account for 101 million and 56 million people respectively. According to the recent statistics of Pakistan Bureau of Statistics (PBS), Punjab is home to 50% and Sindh 25% of the total population.

provinces are still without access to microfinance institutions. These provinces share frontiers with Afghanistan and Iran respectively, both were the main targets of terrorism (see General introduction for more detailed discussion on the impact of terrorism on financial markets in Pakistan). Thus, vulnerable security situation hinders the financiers to reach out to the poor of these regions. Consequently, a large portion of low and middle income inhabitants remain unbaked or undeserved.

Figure A.2b displays the map of Pakistan depicting geographical distribution of poverty. It can be noticed that Baluchistan, some parts of south eastern Sindh and tribal regions experience higher levels of poverty due to their geographical location and security situations. If we compare these two maps that show financial inclusion in figure A.2a and poverty in figure A.2b, they present contrasting spatial perspective on the two factors. That is to say, the greater financial inclusion regions in map A.2a correspond to lower poverty levels in map A.2b. Thus, geographical location is very important determinant of financial inclusion and poverty in Pakistan. As discussed earlier, the volatile regions lack financial outreach and basic infrastructure, consequently they remain poor and unbanked. In addition to these maps, figure A.1 presents a comparative overview of commercial banks outreach in South Asia over time. We presumed that rich, people with university degrees living in big cities and highly paid employees are more likely to enter financial markets. While on the other hand, poor, uneducated or lower educated, unemployed, females and rural households are more likely to continue to remain unbanked.

4.4. Data and Methodology

4.4.1. Sample

This study took place in four main cities of Pakistan, namely Karachi, Lahore, Rawalpindi and Faisalabad.²⁰ Primary data was collected through a structured questionnaire explained below. We randomly invited one member of the household (irrespective of the gender, education and occupational status) to take part in this face to face

20. For a detailed description on the economy, geography and financial markets in Pakistan see general introduction of the thesis.

survey. Respondents were asked questions about basic and advanced financial literacy followed by financial inclusion, retirement planning, self-perceived risk and confidence. We also collect data regarding these demographic variables such as age, sex, education attained, employment status of the respondents along with income level and vicinity of the household. Table 4.1 presents the definitions and classifications of all concerned variables of this study.²¹ The total number of filled and completed questionnaire was (n=409) and the data collection process lasts for about three months (July-September 2016). In the following section we discuss variables and how they were measured.

4.4.2. Variables of Concern

4.4.2.1. Financial Literacy

As defined above financial literacy is related to individual's psychological elements and analytical abilities. In order to measure financial literacy, researchers used diverse set of questions. [Chen & Volpe \(1998\)](#) analyzed the impact of financial literacy on personal finances with the help of financial literacy questionnaire. The author defines dimensions of financial literacy for example, general knowledge, savings, borrowing, insurance and investment decisions. They computed a score to represent financial literacy of an individual by computing mean percentage for correct responses. Similarly, [Disney & Gathergood \(2013\)](#) computed financial literacy score to investigate its relationship with consumer credit portfolios. Besides, [Knoll & Houts \(2012\)](#) focused on item response theory (IRT) approach to measure financial literacy score, this approach selects only the best question to be used and includes all areas of personal finance. While it also has some drawbacks, as it considers financial knowledge and ignores the skill component of human capital, secondly the items are more skewed towards investing and finally it incorporates the existing set of questions in financial knowledge scale (see, for instance, [Finke & Huston \(2014\)](#)). In addition, [Klapper *et al.* \(2013\)](#) used principle component analysis and constructed an index to estimate financial literacy.

Following, [Van Rooij *et al.* \(2011a\)](#) and [Mitchell & Lusardi \(2015\)](#), we measure financial literacy in two parts. The first part drafted with an aim to measure basic

21. We mainly follow [Bhandari & Kundu \(2014\)](#) in sample selection and number of respondents.

financial literacy (the ability to perform basic calculations), while second section is designed to collect more sophisticated financial knowledge of the respondent. Similarly, [Almenberg & Gerdes \(2012\)](#) split financial literacy into two categories i.e., basic and advanced and showed a negative correlation between exponential growth bias and these two measures of financial literacy.²² Basic financial literacy aimed at examining the basic numeracy levels of respondents. It includes questions about numeracy, interest compounding and inflation.²³ Basic literacy questions measure the ability of the respondent to make simple calculations. While advanced financial literacy however includes relatively complex questions. Keeping in mind the expected level of financial literacy for target population, these questions are about risk diversification, liquidity, stocks and bonds. In standard financial literacy questions we made some minor modifications, such as dollar currency symbol was replaced by rupee (Rs.) which is generally used to represent Pakistani Rupee (PKR), (see questionnaire for exact wording of these questions). The approach we used to measure financial literacy is more appropriate and practical in case of Pakistan. The whole population might not possess the advanced financial knowledge due to inequality of opportunity and widening disparity among different income groups and geographical location.

4.4.2.2. Financial Inclusion

Due to lack of standard measure of financial inclusion, researchers mainly rely on bank account ownership, frequency of bank account use, borrowing from financial institutions, stock market participation etc. In this study, questions about having a bank account, debit or credit card and frequency of use were asked to determine whether the respondent is financially included or excluded. [Demirgüç-Kunt & Klapper \(2013\)](#) formulated a benchmark for financial inclusion and report that 50% of the adults around the world hold bank account. Following [Beck & Brown \(2011\)](#), [Anson *et al.* \(2013\)](#), [Allen *et al.*](#)

22. The authors selected the number of correct answers for basic and advance financial literacy to construct relevant variables.

23. [Van Rooij *et al.* \(2011a\)](#) used five questions to determine financial literacy, however in our study we only used first three and skipped the questions about money illusion and time value of money. Because of the fact that in pilot testing process, more than 90% of the respondents were unable to get them right. Thus the remaining questionnaires were sent by including only three questions to capture basic financial literacy, that were also sufficient to serve the said purpose.

(2016), in this study we defined financial inclusion as the ownership and use of formal bank account. Our questionnaire also asked the respondents to report a possible barrier of not having a bank account. The potential barriers for not owing an account could be the distance from bank, lack of necessary documents and most importantly insufficient funds among others [Allen et al. \(2016\)](#).

4.4.2.3. Access to and use of ICT

In this study we also collected data about the use of mobile phone, 3g/4g networks, use of computer and broadband to proxy ICT use. This indicator has been constructed following [Bogan \(2008\)](#), where they considered binary variables related to the ICT Access and usage by households. [Karp et al. \(2015\)](#) used access to smartphone and Internet to depict their impact on financial inclusion in the USA. Based on these researches we collected information on the following indicators to proxy access to and use of ICT of the respondents. We computed binary variables for each of the following questions including the ownership of mobile phone and the use of cellular networks and social media.

1. Do you own a mobile phone ?	Yes	No
2. If yes, what type of mobile phone do you own ?	Simple	Smart
3. Do you use cellular Internet on you phone ?	Yes	No
4. If yes, what type of cellular Internet do you have access to ?	3G	4G
5. Do you use any social media platform?	Yes	No
6. If yes, which social media platform do you use primarily ?	Open-ended	
7. Do you own a personal computer/laptop ?	Yes	No
8. Does your household have a broadband Internet connection ?	Yes	No

The motivation behind using the social media and ICT related indicators as potential determinant of financial inclusion comes from the strand of research about social capital and financial market participation. One of the most notable studies conducted in the USA by [Hong et al. \(2004\)](#) using a national level survey data after controlling for demographic indicators. They concluded that the social households are more likely to take part in financial market than non-social households. Similarly, based on Italian data [Guiso et al. \(2004b\)](#) report that the in high social regions, households use more financial products, have higher probability of owing a formal banking account as compared to the non-social regions. In another study from Mexico, [Martinez \(2012\)](#) argues that individuals

with higher interpersonal and local government trust are highly likely to participate in financial markets/hold an account. Access to and use of mobile and Internet related technologies is bringing people together in a way that no other technology has ever done before. Thus, we consider ICT and social media as a modern social capital, which could influence the decisions of individuals/households to participate in financial markets.²⁴

4.4.2.4. Retirement Planning & Savings

As discussed earlier, the lower levels of financial literacy in Pakistan, one may assume poor or no retirement planning in larger strata of population. This study follows the approach of (Van Rooij *et al.*, 2012) to determine whether the respondents are planning for their retirements and how good their plans are. This approach is based on a single question about retirement planning. In addition, we used two questions to proxy savings and household budgeting. The question related to savings is about putting money aside for future and household budgeting question asked whether household prepare budget for their inflows and outflows or not.²⁵

4.4.2.5. Financial Risk Preferences

Personal financial risk preferences of the respondents are measured with a four point Likert scale. This construct measures the individual's self assessed attitude towards financial risk taking (for example, see, Farrell *et al.* (2016)).

How willing you would be to take a financial risk if you had some spare cash for an investment ? a) Not willing to take any risk; b) Average risk; c) Above-average risk; d) Substantial risk.

4.4.2.6. Self-Perceived Confidence

We also attempt to determine self-perceived confidence about personal financial management. This question is taken from Mallios (2010).

24. As the idea defined by the OECD Insights: Human Capital, it describes that the "Greenpeace or Amnesty International-can exist in the "real" world", virtually through Internet without having physical interaction and could create a new form of community.

25. These questions are taken from OECD toolkit for measuring financial literacy and inclusion.

Q. How sure do you feel about your ability to manage your own finances ?

1. Not sure at all - I wish I knew a lot more about money management;
 2. Not too sure - I wish I knew more about money management;
 3. Somewhat sure - I understand most of what I'll need to know;
 4. Very sure - I understand money management very well.
-

4.4.2.7. Household Characteristics (Covariates)

We consider those controls that are previously used in this domain of research. Moreover, in explaining probability of financial market participation by households (see, for example, [Bogan \(2008\)](#), [Bertaut \(1998\)](#)). A set of household characteristics controlled variables is selected for this study such as age of the respondent, gender, marital status, education, occupation, experience, vicinity and finally parent's occupation and education. We take data from an individual with minimum age of 20 following [Shen *et al.* \(2016\)](#).

4.4.3. Methodology

4.4.3.1. The Logit models

[Brooks \(2014\)](#) describes that linear probability model (LPM) is used whenever the regressand is dichotomous (0,1) dummy variable such as yes, no or male, female etc. The outcome variable habitually takes on the value ($Y=1$) in case of success and ($Y=0$) as a failure. While the explanatory variables could include either discrete (dummies) or continuous (quantitative) or both. Further, the author stated that LPM is simple to estimate and intuitive but the problem arises when probabilities go beyond (0,1), which leads to the process of truncation. In addition, the residuals from LPM violate the homoskedasticity and normality assumption of OLS residuals which leads to the invalid standard errors and hypothesis testing. However, he proposes the use of logit and probit models to overcome the limitation of LPM. So, the problem of deriving probabilities resolves and the fitted values would be within (0,1) interval. In most of the cases logit and probit models provide similar results. Both models are preferred over the linear probability models, however, logit and probit models will be non-applicable in case of

unbalanced split of Y_i , that is when $Y_i = 1$ occurs only 10% of the time.²⁶

Logit regression has been used to find out the hypothesized association, see for instance, financial knowledge and probability of holding a bank account [Huang *et al.* \(2013\)](#), multivariate probit to investigate financial self efficacy and personal financial behavior of women [Farrell *et al.* \(2016\)](#), impact of social interaction and the likelihood of stock ownership [Hong *et al.* \(2004\)](#), access to and use of computer/Internet and probability of stock market participation [Bogan \(2008\)](#).

Following traditional practice in this stream of research we estimated a probit model to estimate the effects of financial literacy and ICT on the likelihood of financial inclusion, retirement planning and household budgeting. In addition, an ordered probit model is used when outcome variable is household income. This study also introduces correspondence analysis to further refine the results of probit models.

The standard probit model specification is as follows:

$$FI_i = \beta_0 + \beta_1 ICT_i + \beta_2 FL_i + \sum_{j=3}^K \beta_k X_{jk} + \varepsilon_t \quad (4.1)$$

Empirical research generally reports marginal effects of probit model instead of coefficients that can be calculated as: All else equal $P(Y = 1|X = x)$

$$\frac{\partial P(y_i = 1|x_i)}{\partial x_i} = \frac{\partial E(y_i|x_i)}{\partial x_i} = \partial(x'\beta)\beta$$

4.4.3.2. Correspondence Analysis (CA)

Correspondence analysis is handy when we are interested to examine the association between qualitative/categorical variables. This data analysis technique was introduced by French statistician ([Benzécri, 1973](#)), and is considered as French school of “analyse des données”. This approach is similar to the Principal Component Analysis (PCA) for quantitative data. It operates within the framework of contingency table that contains frequencies/counts. The CA approach gives factor scores (coordinates) of column and row in the contingency table. These coordinates are then used to visualize graphically

²⁶. For detailed explanation of limited dependent variables (for example, see, [Brooks \(2014\)](#)), Where he also added that the logit and probit models are non-linear and they can not be estimated using OLS but non-linear least square (NLS), maximum likelihood (ML).

the association between categorical variables recorded in the rows and columns of the table. In short, it reduces the dimensionality of data both in the rows and columns, the left out information after reduction process is called eigenvalue.²⁷ The results of CA analysis are usually presented with the help of graphs. Therefore, in this study we reported visual results along with some important values.

4.5. Results

4.5.1. Descriptive Statistics

Summary statistics on all underlying variables is given in Table 4.1. Our sample includes a diverse set of randomly selected respondents. As it can be observed that males comprised 65% of the sample, while around 50% of the respondents are married. The breakdown of age is as follows: Age ≤ 30 (65%), $30 < \text{age} \leq 40$ (24%), $40 < \text{age} \leq 50$ (6%), $50 < \text{age} \leq 60$ (3%) and Age > 60 (1%). 37% of our respondents have University degree whereas 30% and 10% completed higher secondary and secondary school education respectively, a portion of 12% respondents finished middle school, while 2% completed primary school or below.²⁸ The total household income from all sources is divided into five classes: Income $\leq 15\text{K}$ (10%), $15\text{K} < \text{income} \leq 25\text{K}$ (11%), $25\text{K} < \text{income} \leq 35\text{K}$ (14%), $35\text{K} < \text{income} \leq 50\text{K}$ (16%) and Income $> 50\text{K}$ (47%). Further, 5% of our study respondents are housewives and 30% are student in different universities of Pakistan.²⁹ The sample includes nearly 25% of the individuals who are self employed or belong to working class, while 39% are white collar employees. The remoteness indicator demonstrates that 60% of respondents live in urban areas and 40% are from rural places of the country. Furthermore, 92% of respondents own a mobile phone, whereas 38% reports ownership of simple mobile phone and 55% own and use a smart phone. A total of about 81% respondents reported as social media users,

27. More detail about the correspondence analysis and its implementation with R can be found at:<http://www.sthda.com/english/>

28. There are too few observation in primary school or below, hence we merged this with middle school category for further analysis.

29. In our sample housewives group accounts for only 5% of the total which is unsuitable to take as a representative group for probit analysis, thus we combined this with student group for our further analysis.

70% and 77% have broadband Internet and personal computer at home. In addition, 66% of respondents use cellular Internet via mobile phones, while 52% are 3G network subscribers and only 14% are 4G subscribers.

Financial literacy is divided into two parts, first is the basic financial literacy which includes three simple questions of interest, savings and diversification while the second part comprises advanced questions. Where, 78% of respondents answered question 1 correctly, similarly 76 and 75 percent have answered question 2 and question 3 correctly. Nearly 60% of the respondents correctly answered all three questions related to the basic financial literacy. In addition, questions 4,5 and 6 represent advanced financial literacy, the percentage of correct answers is 62, 39 and 72 respectively. While, only 17 percent of the respondents could answer correctly all three questions about advanced financial literacy.

Financial inclusion on the other hand is measured through the ownership of bank account. A total of 74% respondents reported to have a formal bank account, while 58 percent possess debit or credit card. The use of debit card is about 52 percent and credit card 25 percent. 13% of the financially excluded individuals have no money to deposit at any financial institution. Following are the reported barriers of financially excluded people in Pakistan: bank is too far (0.98%), have no trust in banking sector (0.24%), lack of required documents to open an account (0.49%) and others (6%).

We also asked respondents whether they know any microfinance institution (MFI) or no, around 56 percent responded answered yes but only 15 percent have an account or ever saved at MFIs. Moreover, 48 percent of respondents reported that they prepare household budget. In order to take risk in financial markets, our sample provides that 26 percent are not willing to take any kind of risk, however 50 percent are ready to take average risk while 23 percent report that they could take above average risk, whereas only 1% could take substantial risk. The sample also reports self-perceived confidence, where we noted that about 1% are not confident at all, 10% are not too confident, 50 percent somewhat confident, while 30% believed to be very confident.

In order to exhibit the association between categorical variables we used mosaic contingency plots.³⁰ Figures 4.1 and 4.2 demonstrate the association between bank

30. We used R-packages vcd, alluvial diagram and riverplot along with ggplot for visuals in this

account and gender, bank card and gender respectively. In both figures it can be noticed that males are relatively dominant in owing formal bank account and bank cards in Pakistan. Females on the other hand also use bank accounts and debit cards, however the number of these women is less than their male counterparts. Figure 4.1 demonstrates that in our sample males were the majority of the account holders and minority of the without account holding group. Similarly, figure 4.2 depicts that the females are minority in bank card category while the number of males possessing a bank card is higher than the females. Moreover, figure 4.3 shows the association among basic financial literacy, sex and financial inclusion, it can be observed that half of the plot's cells represents less observations than expected. Female without bank account and good financial literacy levels show more observations than expected. Generally speaking it might be possible to say that respondents who scored high on basic financial literacy are more likely to hold bank account. Figure 4.4 presents the association among advanced financial literacy, sex and financial inclusion. We notice an interesting findings here i.e., individuals with moderate level of advanced financial literacy irrespective of sex are highly likely to have bank accounts. As noted earlier the number of respondents who have correctly answered all the questions of advanced financial literacy is very low. Our sample shows marginal variation between males and females on financial literacy instrument. The association between financial literacy and inclusion in males found to be most statistically significant than females.

Figure 4.5 displays alluvial diagram which is widely used to visualize frequency distributions. We used here to present the association among financial literacy, sex and financial inclusion. In this plot three blocks correspond to financial literacy, sex and financial inclusion respectively. Each category block is a stack bar chart which shows the relative frequencies for each level of financial literacy, male/female, have bank account or no. The column bank with (No) shows that females are more likely without bank account even if their financial literacy score is high. This finding could be related to the fact that in Pakistan males are responsible for household financial matters, while females relatively have less stake in the financial matters. Thus they remain unbanked as they do not need bank account, also housewives in Pakistan prefer to save money at

section

home rather depositing at bank. The parallel coordinates show that the respondents who reported to hold a bank account are more likely to be male; however both sexes who reported bank account ownership are in higher financial literacy categories particularly in (four, five and six). In conclusion, this plot endorses the idea that financially literate individuals are more likely to hold bank account.

Finally, figure 4.6 exhibits the association between self perceived confidence and self reported financial risk preferences. The argument that overconfidence leads to higher risk taking could be established here marginally, (see, for instance, [McCannon et al. \(2016\)](#)). The number of substantial risk takers in our sample is very small. However a large number of respondents reported that they are willing to take average risk followed by above average risk, while the majority of these risk takers are somewhat and very confident. Most of the respondents who are somewhat confident about their financial knowledge are willing to take average risk.

4.5.2. Probit Analysis

The coefficients of probit estimation only give us the greater likelihood or less likelihood of having a bank account or not. However marginal effects explain the probability of owing a bank account. Furthermore, probit is a non-linear model, hence it is difficult to interpret its coefficients; average marginal effects are reported instead. Probit marginal effects are usually discussed in this strand of research (see, for instance, [Allgood & Walstad \(2016\)](#), [Stango & Zinman \(2009\)](#)). Similarly, following noteworthy studies also exhibit the marginal effects, stock market participation [Almenberg & Dreber \(2015\)](#), likelihood of using a bank account [Klapper et al. \(2013\)](#), retirement planning [Lusardi & Mitchell \(2008\)](#), and consumer over-indebtedness [Gathergood \(2012\)](#). The interpretation of marginal effects is also different for discrete and continuous dependent variables.³¹ In case of binary explanatory variables it measures the discrete change i.e.,

31. Computation of marginal effects for continuous and dummy variable also differs, $MarginalEffectsCont = \frac{1}{n} \sum_{i=1}^n \varphi(x_i' \beta) \beta$
 $MarginalEffectsDummy = \frac{1}{n} \sum_{i=1}^n [\phi(x_i' \beta | x_i^k = 1) - \phi(x_i' \beta | x_i^k = 0)]$. The Marginal effects (MEF) tell that if a categorical dummy variable changes from zero to one, the probability for left hand side dependent variable taking the value one rises by X percentage points, see, for instance [Allgood & Walstad \(2016\)](#) and [Spermann, A. \(2009\) "The Probit Model"](#).

how the predicted probabilities change as the dichotomous predictor goes from 0 to 1 and for a continuous independent variable MEF is the instantaneous rate of change.

Tables 4.1 and 4.2 provide the results of OLS and probit estimates respectively by using same specifications. As can be noticed that the coefficients in both tables are not largely different in terms of level of significance and signs. Household and individual characteristics dummies were also included in all columns.³² We could not find a significant coefficient for the basic financial literacy indicator, however advanced financial literacy's coefficient appears to be positive and significant on dependent variable bank account (0/1). Individual and household characteristics are according to theoretical predication and in line with the previous studies. Except remoteness and religion variables all other demographics appear to have expected sign, such as male and marital status show positive and statistically significant association with bank account. ICT indicators, smartphone, mobile phone, Internet and broadband Internet access are indeed strong predictor of formal bank account.

Tables 4.3 and 4.4 display coefficients and marginal effects from Probit regressions respectively, as noted earlier the coefficients of probit equation are somewhat complex to interpret, marginal effects are interpreted here instead. The coefficients in both table do not exhibit unlike sign, however they are dissimilar when it comes to the magnitude of impact of independent variables. The dependent variable to approximate financial inclusion equals 1 whether the participant holds a formal bank account or not. Individual and household characteristics are used as controlled variables in these equations. Columns (1) and (2) of table 4.4 mainly show the MEF of basic and advanced financial literacy respectively on our dependent variable. Consistent with Beck & Brown (2011), the overall fit of the model seems to be reasonably fair, with Pseudo R^2 ranging between 0.41 and 0.45 for columns (1) to (5).

We notice insignificant impact on bank account ownership of our basic financial literacy measure (i.e., the number of correct responses). However the advanced financial literacy measure shows positive and significant (at 15% level) coefficient on bank account. It implies that each additional correct response on financial literacy question might raise

32. Marginal effects are reported by including all demographic characteristics, while the results of OLS and probit coefficients are reported for only main indicators, due to redundant tables.

the likelihood of using a formal bank account.³³ This evidence is in accordance with the findings of Klapper *et al.* (2013). Results also reveal significant connectedness of bank account to gender, marital status, age, education, profession and household income. The reported marginal effects suggest that male and married participants are highly likely to engage in financial market activities. Age of the participant is divided into five categories, where the base category includes relatively young participants. Education variable also divided into five categories, the base category included primary or below however it had too few observations to serve as a base category, we then merged it with middle school education. Similarly, housewives category for profession included insufficient number of observations, we combined it with the student group and came up with three classes of profession variable. Household income on the other hand is classified into four categories, see the descriptive statistics table 4.1 for detail. Numbers in columns (1) of table 4.4 testify that our survey respondents who are older (i.e., middle age category with marginal effects of (14%) and (18%)), well educated (26, 37, 38 and 39 percent), having good employment (i.e., white collar jobs (11.4%)) and have higher household income (18.7 and 22.8 percent) have higher probability of using a bank account. Our these results are from a sample of Pakistan however broadly speaking these are in concert with the findings of Beck & Brown (2011), Klapper *et al.* (2013), Huang *et al.* (2013), Allen *et al.* (2016). All variables show expected sign except remoteness variable which indicates whether survey participant's house is in rural or urban area of Pakistan, showed insignificant impact on dependent variable.

In column 3-5 of table 4.4 we examine whether mobile phone access affects the probability of holding a bank account. For that purpose three proxies were utilized i.e., mobile, simple mobile and smartphone access. Control variables as well as their sign remain unchanged for all specifications. We observe positive and statistically significant marginal effects for mobile phone access (43.7%) and smartphone access (15.5%) on account ownership. One exception is simple mobile access, we define this indicator equals 1 if respondent has access to mobile phone without Internet, camera or touchscreen, zero otherwise. Smartphone access on the other hand equals 1 if respondent has access to a phone that can run Internet, take photos while using touchscreen of the phone, zero

33. These results are significant at 15 percent significance level.

otherwise. Results suggest that households who have access to mobile phone particularly access to smartphone increases the chances of holding a bank account. Similar results have been reported by [Kpodar & Andrianaivo \(2011\)](#) by utilizing secondary data from Africa and based on panel data, [Shamim \(2007\)](#) suggests that the number of mobile phone subscribers positively related to the financial deepening. Some other authors also believe in the favorable impact of mobile phone penetration and Internet use on financial markets and economic growth, see for instance, ICT and Singapore's economic growth [Vu \(2013\)](#), impact of mobile money in promotion of financial inclusion in developing world [Donovan \(2012\)](#), a comprehensive study by including 55 countries and larger dataset from 1870-2000, [Comin & Nanda \(2014\)](#) contend that financial markets play positive role in technology diffusion. [Diniz *et al.* \(2012\)](#) report the improvement in financial inclusion based on ICT development which leads to advance branchless banking.

To further refine our analysis whether ICT increase probability of holding bank account, we collect additional data whether the participant uses cellular Internet on mobile phone, access to 3G, use of any social media platform, ownership of personal computer and access to broadband Internet at home. Tables 4.5 and 4.6 provide results of probit coefficients and marginal effects along with all individual and household characteristics controls. As noted earlier, sign of the coefficients remain unchanged in both tables. Table 4.6 columns 1-5 show that if controlled variables remain constant at their mean, all indicators of ICT show positive and statistically significant coefficients. Which implies that the access to and use of ICT related technologies increase the chances of bank account ownership. More specifically, the use of cellular Internet raises the likelihood of holding a bank account by (18.3%), access and use of 3G network (16.9%), use of social media accounts for (22.7%), access to personal computer (8.5%) and access to high speed Internet at home (17.8%). We obtained a decent Pseudo R^2 ranging from 0.47 to 0.50 for columns (1) to (5) in table 4.6, it suggests that model is fitted satisfactorily. Our findings is also in consonance with those of [Bogan \(2008\)](#) and [Kpodar & Andrianaivo \(2011\)](#).

Table 4.7 displays the estimates of ordered probit for household income (where the categories are ranked (1: Low to 5:High)). We intend to explore whether higher financial

literacy along with financial inclusion and ICT are related to household income. Columns 1-3 of table 4.7 display the results of financial inclusion and literacy while columns 4-6 present estimates of ICT indicators on ordinal levels of household income. The demographic variables have expected coefficients sign, such as religion (1 if respondent is Muslim 0 otherwise) is seen as a positive predictor of the household income in our sample. The ordered log-odds estimate for gender, marital status and remoteness variables are found to be insignificant in most of the columns. Respondents who are old, highly educated and white collar jobs are more likely to have higher household income. Our main interest is to discover the effect of having a bank account, which is positive and statistically significant (column 1). The ordered log-odds estimate show the comparison of individuals having bank account with those who do not on expected household income. Therefore, the coefficient implies that the households who have bank account, there is greater probability that they are in higher income group. The ordered probit for bank account holders being in higher income group is about (0.737) higher than those who do not have a formal bank account when all other variables are held constant. Similarly, column 2 reports positive and statistically significant coefficient for financial literacy score. Which is also in line with the prediction that higher financial literacy corresponds to higher household income and wealth accumulation [Van Rooij *et al.* \(2012\)](#). In column 3 we include both indicators i.e., financial inclusion and literacy and find the alike results. Consistent with [Klapper *et al.* \(2013\)](#), we can conclude that both the financial literacy and inclusion are positively connected to household income in Pakistan. Our next set of ordered probit regressions whether household income depends on ICT indicators. To proxy ICT, we used two indicators i.e., i) access to smartphone and ii) access to high speed Internet at home, in columns 4-5 of table 4.7. The coefficients of smartphone and access to high speed Internet are positive and highly significant. ICT related indicators reveal positive association with household income, we see that households with ICT access and usage are more likely to earn higher income compared to those without access to ICTs. Finally, we include an interaction term of access to ICT and bank account in column 6 of table 4.7. Its positive coefficient suggests that households with access to ICT along with ownership of bank account are less likely to be in lower income group.

Moving forward, we take our analysis to the next level in which savings, retirement planning and household budget were the main variables of concern. Results in table 4.8 show two equations for each variable using basic and sophisticated financial literacy respectively along with individual and household characteristics controlled variables. First two columns of table 4.8 report the marginal effects on savings question. Where we can observe positive and statistically significant coefficient for both literacy measures. We also notice that male and married respondents do not care about savings plan, however older participants in our sample are more likely to be better at savings. This analysis also shows that higher income leads to less likelihood of savings. Results of basic and advanced financial literacy do not vary significantly across both columns. Columns (3) and (4) provide results of retirement planning and (5) and (6) household budget. We observed insignificant coefficients of both measures of financial literacy for retirement planning and household budget preparation. This result further strengthens the idea that in Pakistan less concentration is given on planning post retirement life. This seems possible due to the fact that country is characterized as collective society. Mainly joint family system, where older people after retirement are the responsibility of their children. Even non-pensioner parents in general are being taken care by the children. A few people also consider it a burden on their shoulder, however society's pressure, shared cultural values and sometimes Islamic beliefs force them to take this responsibility. This situation leads to unplanned retirement in Pakistan. Education also remained insignificant when it comes to the probability of retirement planning. However indicator of profession shows that individuals at higher posts (white collar) are more likely to plan their retirement. Furthermore, in columns (5) and (6) we notice insignificant coefficients of financial literacy. Again, this result could be attributed to the fact that in joint family system households earn more income due to more earning members. So the contribution of these members gives a sense of relief to the household head. Which keeps him away from preparing a budget in the household. In some cases the economic members of the household are managing the needs of non economic members and for overall households without keeping any written record. Thus the role of financial literacy becomes less important here. Results also show that married, educated and wealthy respondents are

more likely to report that they prepare budget at the household level.

4.5.3. Results of Correspondence Analysis (CA)

This section discusses the results of CA. As noted earlier in section 4.4 that CA is used to investigate the association between categorical variables. We intent to examine whether there is association between income and education, income and profession, association of financial literacy with income, profession and education respectively. We reported the result of (χ^2) along side graphic visualization. Presenting graphs of correspondence analysis has been the choice in the prior literature. We hypothesize that there is no relationship between income and education. Figures 4.7a and 4.7b show the association between household income divided into four categories in rows and education in columns. The size of each dot in a cell represents magnitude of the value it contains. The very next figure shows the CA scatter plot for these two categorical variables along with chi square statistics, degree of freedom and p-value. In this plot blue dots reflect rows while columns are denoted with red triangles. Smaller the distance between row and column points implies greater association or similarity and vice versa.³⁴ According to the CA we can fairly say that in our sample there exists a strong association between income and education. As can be noticed individuals with above secondary level education expected to be in high income group.

Similarly, we observed association between income and profession. Figures 4.7c and 4.7d display that the white collar employees have more chances to fall in the high income group. CA scatter plot reverify the association, as the distance between high category of income and white collar category of occupation is very small. The probability value of chi square is also less than the conventional decision criteria. The null of no association could reasonably be rejected on the basis of this result. Thus it might be possible to say that, in our survey sample occupation and income are positively associated. Moreover, figures 4.7e and 4.7f provide the results of association between profession and education. Again a significant association can be seen from these diagrams which is confirmed by chi square as well.

34. It is also important to note that we report symmetric plot which shows the global pattern of association, asymmetric biplot is also used, which shows the distance with the help of lines on the maps.

These findings indicate educational and employment inequalities with respect to financial status in Pakistan. The poor kids remain out of schools at large or their education is limited to primary or middle school attainment. Children of poor households mainly attend government schools, where they have to pay nominal or no fee. But the quality of education is low as compared to private school system. Rich kids go to the private school systems, that are costly and out of the reach of poor. Resultantly passing out kids from both systems have to compete for the jobs, where the students of private schools have comparative advantage over the formers. Additionally, the inheritance wealth of those kids and access to the higher posts via illegal channels make it possible to get better jobs. While on the other hand poor kids with low quality of education, without contacts of any influential political leader remain jobless or get lower caliber jobs. Furthermore, inequality in female education persists largely due to various reasons. Predominantly, the family structure and access to school or university prohibit female's education in Pakistan. The cultural barriers are the major reasons for female illiteracy and participation in the job market. Our results about inequalities are consistent with those of, inequality of employment [Cohn & Fossett \(1995\)](#), difference in the quality of education in Private, NGO and Public schools in Pakistan [Arif & Saqib \(2003\)](#) and privatization reforms and inequality of educational opportunity by [Torche \(2005\)](#).

Figures [4.8a](#) and [4.8b](#) exhibit association between levels of financial literacy and household income. Financial literacy is divided into seven categories (low to high) and shown in the columns. On the basis of this analysis we notice that, in Pakistan financially literate people are more likely to be rich and have higher income. CA scatter plot also confirms this result where the distance between two categories of financial literacy (Excellent and Very Excellent) with row variable income (high) is very small. Furthermore, the probability value of chi square is well within the rejection region with degree of freedom (18).

Next we move on to explore whether there is association between occupation and financial literacy. We barely notice any conclusive picture from figures [4.8c](#) and [4.8d](#). Moreover, this leads us to the acceptance of null hypothesis as the p-value of chi square is (0.573). Hence we might say that in our sample there is no association between the

profession of individual and their level of financial literacy. As financial literacy is type of cognitive skill, thus any person could learn the concepts related to his personal financial matters irrespective of occupation. Besides, we expected positive association between education and financial literacy but we could not notice any signs of this association see figures 4.8e and 4.8f. Chi square also confirms the acceptance of null hypothesis of no association. But in figure 4.8f, we can see the small difference between some of the rows and column variables. Which indicates some signs of association between different dimensions of these underlying variables.

4.6. Conclusion

Financial exclusion massively persists in Pakistan, only 13% of the adult population have formal bank account.³⁵ The majority of unbanked population is poor, living in rural areas and women. While the utmost participation in financial markets by low and moderate income groups is limited to deposits, savings for contingencies, getting small amounts of loan and simple insurance products. Similarly, financial literacy figures for Pakistan are also not encouraging. The South Asian Federation of Exchanges (SAFE, 2009) reported very low levels of financial literacy in Pakistan, however it is much worse among women, elders and less educated people. Moreover, nearly 50% of Pakistanis have never reached to formal or informal financial institutions, around 19% of the financially excluded population voluntarily distanced themselves from financial markets due to insufficient or lack of knowledge about the financial markets and their products.

This paper explores the importance of financial literacy alongside ICT related indicators for financial inclusion and household welfare. We survey low and middle income households living in Pakistan and find that higher financial literacy raised the probability of having a formal bank account. We find that rich, educated, and white collar job holders are more likely to hold formal bank account. Our estimates also show that the access and usage of ICTs lead to an increased probability of financial market participation. These findings are also consistent with the influential work of Klapper

35. This statistics is from the World Bank financial inclusion report on Pakistan, for more detail about financial inclusion and literacy see section 4.2 of the paper.

et al. (2013) in Russia and Beck & Brown (2011) in transition economies. In addition, we notice that total household income is higher for financially included participants than the unbanked. They are also more likely to report greater access to and use of new technologies such as mobile phones and Internet. Thus, it seems obvious that financial literacy is an important element for individuals, households, financial markets and for aggregate economy. Similarly, better connectivity i.e., access to the latest technologies also promotes financial inclusion and household welfare. Our study also shows that financial literacy increases the likelihood of savings, but it remains inactive when it comes to retirement planning and household budgeting in Pakistan.

This project is limited to bank account ownership it does not consider the stock market. In future we are interested to examine the stock market participation, gender gap and the role of behavioral factors in financial literacy and choosing financial market products. Finally, as more resources and time become available we would be able to expand the sample size.

4.7. Appendices

Table 4.1 – Descriptive statistics

Statistic	N	Mean	St. Dev.	Min	Max
Male	409	0.6479	0.4782	0	1
Married	409	0.5037	0.5006	0	1
Age \leq 30	409	0.6553	0.4759	0	1
30 < age \leq 40	409	0.2396	0.4274	0	1
40 < age \leq 50	409	0.0587	0.2353	0	1
50 < age \leq 60	409	0.0342	0.1820	0	1
Age > 60	409	0.0122	0.1100	0	1
Primary or lower	409	0.0244	0.1546	0	1
Middle School	409	0.1222	0.3280	0	1
Secondary School	409	0.1027	0.3039	0	1
Higher Secondary	409	0.3081	0.4623	0	1
University	409	0.3741	0.4845	0	1
Above Graduate School	409	0.0660	0.2486	0	1
Income \leq 15K	409	0.1051	0.3071	0	1
15K < income \leq 25K	409	0.1125	0.3163	0	1
25K < income \leq 35K	409	0.1443	0.3518	0	1
35K < income \leq 50K	409	0.1663	0.3728	0	1
Income > 50K	409	0.4719	0.4998	0	1
Housewife	409	0.0513	0.2210	0	1
Student	409	0.3130	0.4643	0	1
Blue collar	409	0.2469	0.4318	0	1
White collar	409	0.3888	0.4881	0	1
Urban	409	0.6039	0.4897	0	1
Mobile Access	409	0.9267	0.2610	0	1
Simple Mobile	409	0.3814	0.4863	0	1
Smart Phone Access	409	0.5452	0.4986	0	1
Social Media	409	0.8142	0.3894	0	1
Broad Band Access	409	0.7017	0.4581	0	1
Personal Computer Access	409	0.7702	0.4212	0	1
Cellular Internet	409	0.6650	0.4726	0	1
Third Generation 3G	409	0.5281	0.4998	0	1
Fourth Generation 4G	409	0.1369	0.3442	0	1
Mobile Money Transfers	409	0.9022	0.2974	0	1

(continued)

Continued...

Statistic	N	Mean	St. Dev.	Min	Max
Q1correct	409	0.7824	0.4131	0	1
Q2correct	409	0.7628	0.4259	0	1
Q3correct	409	0.7482	0.4346	0	1
Basic Financial Literacy	409	0.6064	0.4892	0	1
Basic Financial Literacy Index	409	2.2934	1.0156	0	3
Q4correct	409	0.6284	0.4838	0	1
Q5correct	409	0.3912	0.4886	0	1
Q6correct	409	0.7286	0.4452	0	1
Q7correct	409	0.4621	0.4992	0	1
Advanced Financial Literacy	409	0.1711	0.3771	0	1
Advanced Financial Literacy Index	409	1.7482	0.8181	0	3
Overall Financial Literacy	409	4.0416	1.4110	0	6
Bank Account	409	0.7384	0.4401	0	1
Debit Card	409	0.5208	0.5002	0	1
Credit Card	409	0.2543	0.4360	0	1
Debit/Credit	409	0.5819	0.4938	0	1
Bank Far	409	0.0098	0.0985	0	1
No Money	409	0.1345	0.3416	0	1
No Trust	409	0.0024	0.0494	0	1
Bank Fee	409	0.0513	0.2210	0	1
No Documents	409	0.0049	0.0698	0	1
Others	409	0.0587	0.2353	0	1
Know MFIs	409	0.5550	0.4976	0	1
MFI account	409	0.1540	0.3614	0	1
Household Budget	409	0.4841	0.5004	0	1
Not willing	409	0.2567	0.4374	0	1
Average	409	0.5012	0.5006	0	1
Above average	409	0.2323	0.4228	0	1
Substantial	409	0.0098	0.0985	0	1
Not Sure	409	0.0978	0.2974	0	1
Not too	409	0.1002	0.3007	0	1
Somewhat	409	0.5061	0.5006	0	1
Very confident	409	0.2958	0.4570	0	1

Table 4.1 – OLS Results

	<i>Dependent variable:</i>				
	Bank Account				
	(1)	(2)	(3)	(4)	(5)
Male	0.234*** (0.039)	0.241*** (0.039)	0.214*** (0.038)	0.216*** (0.037)	0.197*** (0.038)
Married	0.138*** (0.040)	0.127*** (0.040)	0.096** (0.040)	0.114*** (0.038)	0.098** (0.039)
Religion	0.040 (0.045)	0.050 (0.045)	0.039 (0.044)	0.037 (0.043)	0.042 (0.043)
Remoteness	0.003 (0.037)	0.003 (0.037)	-0.014 (0.036)	0.009 (0.035)	0.014 (0.035)
Basic Financial Literacy	-0.007 (0.018)				
Advanced Financial Literacy		0.039* (0.022)			
Access to Smartphone			0.197*** (0.039)		
Access to Cellular Internet				0.257*** (0.039)	
Access to High Speed Internet					0.268*** (0.041)
Constant	-0.037 (0.078)	-0.122 (0.075)	-0.048 (0.063)	-0.080 (0.062)	-0.135** (0.063)
Age Dummies	Yes	Yes	Yes	Yes	Yes
Education Dummies	Yes	Yes	Yes	Yes	Yes
Profession Dummies	Yes	Yes	Yes	Yes	Yes
Income Dummies	Yes	Yes	Yes	Yes	Yes
Observations	409	409	409	409	409
R ²	0.408	0.412	0.445	0.467	0.467
Adjusted R ²	0.380	0.385	0.419	0.442	0.442
Residual Std. Error (df = 390)	0.346	0.345	0.335	0.329	0.329
F Statistic (df = 18; 390)	14.914***	15.201***	17.339***	18.983***	18.976***

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 4.2 – Probit Coefficient

	<i>Dependent variable:</i>				
	Bank Account				
	(1)	(2)	(3)	(4)	(5)
Male	1.016*** (0.186)	1.062*** (0.189)	0.992*** (0.196)	1.084*** (0.202)	0.949*** (0.198)
Married	0.656*** (0.210)	0.612*** (0.212)	0.469** (0.219)	0.548** (0.221)	0.514** (0.222)
Religion	0.194 (0.210)	0.239 (0.213)	0.155 (0.218)	0.207 (0.223)	0.265 (0.218)
Remoteness	-0.049 (0.188)	-0.043 (0.188)	-0.151 (0.197)	0.003 (0.201)	-0.002 (0.199)
Basic Financial Literacy	-0.053 (0.086)				
Advanced Financial Literacy		0.167* (0.106)			
Access to Smartphone			0.898*** (0.200)		
Access to Cellular Internet				1.118*** (0.200)	
Access to High Speed Internet					1.079*** (0.198)
Constant	-2.475*** (0.432)	-2.889*** (0.435)	-2.632*** (0.396)	-2.959*** (0.420)	-3.151*** (0.425)
Age Dummies	Yes	Yes	Yes	Yes	Yes
Education Dummies	Yes	Yes	Yes	Yes	Yes
Profession Dummies	Yes	Yes	Yes	Yes	Yes
Income Dummies	Yes	Yes	Yes	Yes	Yes
Observations	409	409	409	409	409
Log Likelihood	-138.211	-137.183	-127.959	-121.836	-122.716
Akaike Inf. Crit.	314.421	312.367	293.918	281.673	283.432

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 4.3 – Probit Coefficients

	(1)	(2)	(3)	(4)	(5)
Male	1.045*** (0.184)	1.094*** (0.188)	1.097*** (0.206)	1.042*** (0.184)	1.017*** (0.192)
Married	0.678*** (0.208)	0.642*** (0.209)	0.480** (0.222)	0.663*** (0.209)	0.486** (0.217)
Remoteness	-0.036 (0.186)	-0.031 (0.186)	-0.055 (0.203)	-0.050 (0.188)	-0.141 (0.195)
Age dummies					
Base group:age ≤ 30					
30 < age ≤ 40	0.338 (0.273)	0.330 (0.272)	0.207 (0.289)	0.330 (0.272)	0.294 (0.279)
40 < age ≤ 50	0.872* (0.511)	0.840* (0.504)	0.818 (0.518)	0.870* (0.511)	1.003* (0.524)
50 < age ≤ 60	1.214 (0.804)	1.300 (0.846)	1.524* (0.780)	1.202 (0.813)	1.184 (0.869)
Age > 60	0.041 (0.783)	0.134 (0.801)	0.745 (0.923)	-0.021 (0.780)	-0.002 (0.782)
Education dummies					
Base group:Middle School or lower					
Secondary School	1.047*** (0.374)	1.084*** (0.374)	1.102*** (0.397)	1.052*** (0.374)	0.959** (0.390)
Higher Secondary/Vocational	1.600*** (0.345)	1.638*** (0.347)	1.712*** (0.371)	1.605*** (0.345)	1.519*** (0.353)
University	1.651*** (0.336)	1.636*** (0.336)	1.791*** (0.360)	1.637*** (0.336)	1.511*** (0.344)
Above Graduate School	1.714*** (0.483)	1.770*** (0.491)	2.024*** (0.553)	1.707*** (0.484)	1.655*** (0.510)
Profession dummies					
Base group:Housewife+Student					
Blue Collar	0.335 (0.252)	0.312 (0.256)	0.426 (0.277)	0.337 (0.253)	0.331 (0.262)
White Collar	0.588*** (0.220)	0.561** (0.220)	0.564** (0.240)	0.593*** (0.221)	0.697*** (0.232)
Income dummies					
Base group:Income ≤ 25K					
25K < income ≤ 35K	0.371 (0.260)	0.398 (0.262)	0.344 (0.273)	0.395 (0.262)	0.486* (0.272)
35K < income ≤ 50K	0.829*** (0.266)	0.788*** (0.265)	0.971*** (0.293)	0.783*** (0.266)	0.683** (0.273)
Income > 50K	1.059*** (0.234)	1.005*** (0.234)	1.140*** (0.253)	1.000*** (0.240)	0.782*** (0.245)
Financial Literacy					
Basic	-0.058 (0.085)				
Advanced		0.153† (0.106)			
ICTs					
Access to Mobile			2.784*** (0.583)		
Access to Simple phone				-0.130 (0.190)	
Access to Smartphone					0.904*** (0.201)
Constant	-2.379*** (0.430)	-2.761*** (0.428)	-5.204*** (0.761)	-2.410*** (0.412)	-2.574*** (0.401)
Observations	409	409	409	409	409
Method	Probit	Probit	Probit	Probit	Probit
Pseudo R2	0.41	0.41	0.50	0.41	0.45
Log-likelihood	-138.65	-137.83	-116.74	-138.65	-128.22

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 4.4 – Probit Marginal Effects

	(1)	(2)	(3)	(4)	(5)
Male	0.227*** (0.041)	0.238*** (0.042)	0.200*** (0.038)	0.227*** (0.041)	0.205*** (0.040)
Married	0.130*** (0.039)	0.123*** (0.040)	0.077** (0.036)	0.127*** (0.040)	0.086** (0.039)
Remoteness	-0.007 (0.035)	-0.006 (0.035)	-0.009 (0.032)	-0.009 (0.035)	-0.024 (0.033)
Age dummies					
Base group:age ≤ 30					
30 < age ≤ 40	0.063 (0.049)	0.062 (0.049)	0.033 (0.045)	0.062 (0.049)	0.051 (0.047)
40 < age ≤ 50	0.143** (0.068)	0.139** (0.068)	0.111* (0.058)	0.143** (0.068)	0.149** (0.062)
50 < age ≤ 60	0.182** (0.082)	0.190** (0.082)	0.173*** (0.057)	0.180** (0.084)	0.168* (0.090)
Age > 60	0.008 (0.156)	0.026 (0.153)	0.103 (0.103)	-0.004 (0.159)	-0.000 (0.145)
Education dummies					
Base group:Middle School or lower					
Secondary School	0.259*** (0.086)	0.266*** (0.086)	0.254*** (0.086)	0.261*** (0.086)	0.223*** (0.086)
Higher Secondary/Vocational	0.373*** (0.077)	0.379*** (0.077)	0.362*** (0.078)	0.374*** (0.077)	0.329*** (0.076)
University	0.382*** (0.076)	0.379*** (0.076)	0.374*** (0.076)	0.380*** (0.077)	0.328*** (0.077)
Above Graduate School	0.394*** (0.098)	0.402*** (0.098)	0.405*** (0.094)	0.393*** (0.098)	0.351*** (0.097)
Profession dummies					
Base group:Housewife+Student					
Blue Collar	0.069 (0.051)	0.064 (0.052)	0.072 (0.046)	0.069 (0.051)	0.064 (0.050)
White Collar	0.114*** (0.043)	0.108** (0.043)	0.092** (0.039)	0.115*** (0.043)	0.124*** (0.042)
Income dummies					
Base group:Income ≤ 25K					
25K < income ≤ 35K	0.091 (0.063)	0.096 (0.063)	0.076 (0.060)	0.095 (0.063)	0.100* (0.055)
35K < income ≤ 50K	0.187*** (0.058)	0.177*** (0.058)	0.185*** (0.053)	0.176*** (0.059)	0.136** (0.054)
Income > 50K	0.228*** (0.054)	0.216*** (0.054)	0.208*** (0.049)	0.215*** (0.055)	0.152*** (0.051)
Financial Literacy					
Basic	-0.011 (0.016)				
Advanced		0.029† (0.020)			
ICTs					
Access to Mobile			0.437*** (0.083)		
Access to Simple phone				-0.024 (0.036)	
Access to Smartphone					0.155*** (0.032)
Observations	409	409	409	409	409
Method	Probit	Probit	Probit	Probit	Probit
Pseudo R2	0.41	0.41	0.50	0.41	0.45
Log-likelihood	-138.65	-137.83	-116.74	-138.65	-128.22

Notes: Each column reports the average marginal effects of probit estimates on financial inclusion indicator (a dummy variable = 1 if the respondents have a formal bank account and zero otherwise). The standard errors in parentheses and *** p<0.01, ** p<0.05, * p<0.1 while † p<0.15. Source: Author's regressions using survey data.

Table 4.5 – Probit Coefficients

	(1)	(2)	(3)	(4)	(5)
Male	1.111*** (0.200)	1.091*** (0.195)	1.034*** (0.186)	0.986*** (0.195)	1.018*** (0.201)
Married	0.571*** (0.216)	0.642*** (0.215)	0.611*** (0.212)	0.540** (0.222)	0.455** (0.225)
Remoteness	0.018 (0.198)	0.033 (0.195)	0.005 (0.189)	0.009 (0.198)	0.036 (0.201)
Age dummies					
Base group:age ≤ 30					
30 < age ≤ 40	0.376 (0.275)	0.369 (0.272)	0.361 (0.277)	0.150 (0.289)	0.357 (0.297)
40 < age ≤ 50	1.040* (0.560)	1.045* (0.537)	0.959* (0.521)	1.065* (0.558)	1.153** (0.564)
50 < age ≤ 60	1.366 (0.892)	1.271 (0.869)	1.344* (0.778)	1.341* (0.732)	1.700* (0.981)
Age > 60	0.049 (0.814)	0.140 (0.828)	0.124 (0.806)	0.417 (0.872)	0.662 (0.910)
Education dummies					
Base group:Middle School or lower Secondary School					
Higher Secondary/Vocational	0.717* (0.399)	0.814** (0.391)	1.034*** (0.377)	1.108*** (0.393)	0.838** (0.404)
University	1.621*** (0.367)	1.707*** (0.362)	1.662*** (0.353)	1.645*** (0.365)	1.651*** (0.377)
Above Graduate School	1.526*** (0.351)	1.594*** (0.346)	1.680*** (0.344)	1.688*** (0.355)	1.511*** (0.361)
Profession dummies					
Base group:Housewife+Student Blue Collar					
White Collar	0.329 (0.266)	0.340 (0.262)	0.378 (0.256)	0.407 (0.268)	0.425 (0.273)
Income dummies					
Base group:Income ≤ 25K					
25K < income ≤ 35K	0.579** (0.234)	0.578** (0.232)	0.640*** (0.223)	0.690*** (0.231)	0.678*** (0.239)
35K < income ≤ 50K	0.269 (0.279)	0.207 (0.277)	0.406 (0.263)	0.456* (0.273)	0.315 (0.279)
Income > 50K	0.594** (0.285)	0.623** (0.282)	0.693** (0.271)	0.633** (0.280)	0.613** (0.287)
ICTs					
Access to Cellular Internet	1.117*** (0.199)				
Access to 3G network		1.008*** (0.195)			
Access to Personal Computer			0.462** (0.214)		
Access to High Speed Internet				1.066*** (0.196)	
Social Media					1.437*** (0.228)
Constant	-2.868*** (0.423)	-2.827*** (0.414)	-2.814*** (0.425)	-3.023*** (0.420)	-3.382*** (0.457)
Observations	409	409	409	409	409

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 4.6 – Probit Marginal Effects

	(1)	(2)	(3)	(4)	(5)
Male	0.213*** (0.039)	0.215*** (0.039)	0.220*** (0.041)	0.189*** (0.039)	0.186*** (0.038)
Married	0.096*** (0.036)	0.111*** (0.037)	0.115*** (0.040)	0.092** (0.038)	0.074** (0.037)
Remoteness	0.003 (0.033)	0.006 (0.033)	0.001 (0.035)	0.002 (0.033)	0.006 (0.032)
Age dummies Base group:age \leq 30					
30 < age \leq 40	0.062 (0.043)	0.062 (0.044)	0.067 (0.049)	0.026 (0.049)	0.057 (0.045)
40 < age \leq 50	0.147** (0.062)	0.151** (0.061)	0.152** (0.065)	0.149** (0.061)	0.153*** (0.057)
50 < age \leq 60	0.178** (0.081)	0.174** (0.084)	0.192*** (0.073)	0.176*** (0.068)	0.199*** (0.072)
Age > 60	0.009 (0.141)	0.025 (0.143)	0.024 (0.153)	0.068 (0.129)	0.098 (0.115)
Education dummies Base group:Middle School or lower Secondary School					
Higher Secondary/Vocational	0.164* (0.089)	0.188** (0.088)	0.254*** (0.087)	0.254*** (0.085)	0.189** (0.088)
University	0.333*** (0.076)	0.356*** (0.075)	0.382*** (0.077)	0.352*** (0.077)	0.333*** (0.078)
Above Graduate School	0.318*** (0.076)	0.337*** (0.075)	0.385*** (0.077)	0.358*** (0.077)	0.311*** (0.078)
Profession dummies Base group:Housewife+Student Blue Collar					
White Collar	0.349*** (0.092)	0.351*** (0.095)	0.397*** (0.097)	0.377*** (0.097)	0.333*** (0.097)
Income dummies Base group:Income \leq 25K					
25K < income \leq 35K	0.059 (0.047)	0.062 (0.048)	0.077 (0.051)	0.075 (0.048)	0.074 (0.046)
35K < income \leq 50K	0.098** (0.039)	0.100** (0.041)	0.122*** (0.042)	0.119*** (0.040)	0.111*** (0.039)
Income > 50K	0.052 (0.054)	0.043 (0.058)	0.093 (0.060)	0.091* (0.054)	0.062 (0.054)
ICTs					
Access to Cellular Internet	0.108** (0.051)	0.121** (0.054)	0.151** (0.059)	0.122** (0.054)	0.113** (0.052)
Access to 3G network	0.109** (0.048)	0.145*** (0.049)	0.182*** (0.055)	0.142*** (0.051)	0.137*** (0.048)
Access to Personal Computer	0.183*** (0.029)				
Access to High Speed Internet		0.169*** (0.030)			
Social Media			0.085** (0.039)	0.178*** (0.029)	
					0.227*** (0.030)
Observations	409	409	409	409	409
Method	Probit	Probit	Probit	Probit	Probit
Pseudo R2	0.47	0.47	0.41	0.47	0.50
Log-likelihood	-122.28	-136.55	-123.46	-123.46	-116.99

Notes: Same as in 4.4

Table 4.7 – Ordered Probit Estimates

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Male	0.083 (0.138)	0.293** (0.130)	0.100 (0.138)	0.182 (0.133)	0.171 (0.133)	0.051 (0.139)
Married	-0.094 (0.140)	-0.005 (0.138)	-0.119 (0.141)	-0.154 (0.142)	-0.101 (0.140)	-0.181 (0.143)
Remoteness	0.042 (0.125)	0.044 (0.125)	0.043 (0.125)	-0.018 (0.127)	0.081 (0.126)	0.075 (0.126)
Religion	0.263* (0.151)	0.335** (0.151)	0.299* (0.153)	0.287* (0.152)	0.299** (0.151)	0.261* (0.152)
Age dummies Base group:age ≤ 30						
30 < age ≤ 40	0.109 (0.161)	0.124 (0.160)	0.112 (0.161)	0.089 (0.162)	0.022 (0.163)	0.029 (0.164)
40 < age ≤ 50	-0.319 (0.269)	-0.251 (0.268)	-0.316 (0.269)	-0.212 (0.272)	-0.232 (0.271)	-0.285 (0.272)
50 < age ≤ 60	0.796** (0.360)	0.880** (0.359)	0.792** (0.361)	0.772** (0.362)	0.914** (0.359)	0.912** (0.364)
Age > 60	1.969*** (0.725)	1.873*** (0.694)	2.005*** (0.728)	1.795** (0.717)	2.065*** (0.728)	2.040*** (0.748)
Education dummies Base group:Middle School or lower						
Secondary School	-0.148 (0.248)	0.035 (0.242)	-0.126 (0.248)	-0.178 (0.248)	-0.055 (0.245)	-0.174 (0.249)
Higher Secondary/Vocational	0.799*** (0.208)	1.081*** (0.198)	0.820*** (0.208)	0.866*** (0.202)	0.931*** (0.200)	0.777*** (0.209)
University	0.692*** (0.210)	0.960*** (0.200)	0.686*** (0.210)	0.765*** (0.204)	0.830*** (0.202)	0.662*** (0.211)
Above Graduate School	0.884*** (0.310)	1.158*** (0.302)	0.882*** (0.311)	0.907*** (0.306)	1.028*** (0.305)	0.844*** (0.312)
Profession dummies Base group:Housewife+Student						
Blue Collar	0.359** (0.180)	0.447** (0.177)	0.347* (0.180)	0.447** (0.180)	0.457** (0.179)	0.373** (0.182)
White Collar	0.231 (0.151)	0.328** (0.148)	0.216 (0.152)	0.376** (0.150)	0.358** (0.149)	0.278* (0.153)
Access to High Speed Internet					0.719*** (0.135)	0.197 (0.239)
Bank Account	0.737*** (0.161)		0.724*** (0.162)			0.223 (0.224)
Internet× Bank Account						0.593** (0.297)
Advanced Financial Literacy		0.078* (0.041)	0.068* (0.042)			
Access to Smartphone				0.757*** (0.128)		
Constant cut1	0.628*** (0.212)	0.946*** (0.273)	0.912*** (0.275)	0.602*** (0.211)	0.843*** (0.214)	0.649*** (0.229)
Constant cut2	1.149*** (0.215)	1.447*** (0.276)	1.435*** (0.278)	1.131*** (0.213)	1.366*** (0.218)	1.187*** (0.232)
Constant cut3	1.670*** (0.220)	1.955*** (0.281)	1.960*** (0.284)	1.671*** (0.219)	1.901*** (0.225)	1.733*** (0.237)
Method	Ordered	Ordered	Ordered	Ordered	Ordered	
Pseudo R2	0.11	0.10	0.12	0.13	0.13	0.14
Log-likelihood	-455.57	-464.30	-454.24	-448.47	-451.81	-445.35
Observations	409	409	409	409	409	409

Notes: Each column reports the ordered probit estimates on household income indicator (a categorical ranked variable =1 (Low)-5(High). The standard errors in parentheses and *** p<0.01, ** p<0.05, * p<0.1. Source: Author's regressions using survey data.

Table 4.8 – Probit Marginal Effects

	Savings Plan		Retirement Planning		Household Budget	
	(1)	(2)	(3)	(4)	(5)	(6)
Basic	0.094*** (0.027)		0.025 (0.025)		-0.010 (0.027)	
Advanced		0.136*** (0.034)		0.031 (0.031)		0.056 (0.033)
Male	-0.149* (0.060)	-0.131* (0.060)	-0.062 (0.056)	-0.058 (0.056)	-0.041 (0.060)	-0.034 (0.061)
Married	-0.238*** (0.061)	-0.275*** (0.063)	-0.277*** (0.057)	-0.285*** (0.058)	0.169** (0.061)	0.151* (0.062)
Islam	-0.120 (0.069)	-0.130 (0.069)	-0.102 (0.067)	-0.101 (0.067)	0.029 (0.070)	0.042 (0.070)
Urban	-0.034 (0.056)	-0.047 (0.057)	-0.029 (0.053)	-0.030 (0.053)	-0.018 (0.056)	-0.017 (0.056)
30 < age ≤ 40	0.082 (0.071)	0.104 (0.071)	0.072 (0.065)	0.078 (0.065)	-0.135 (0.071)	-0.131 (0.071)
40 < age ≤ 50	0.155 (0.127)	0.222 (0.128)	0.130 (0.122)	0.145 (0.121)	0.037 (0.129)	0.049 (0.129)
50 < age ≤ 60	0.532** (0.169)	0.647*** (0.175)	0.195 (0.151)	0.220 (0.151)	0.136 (0.163)	0.146 (0.163)
Age > 60	0.207 (0.241)	0.377 (0.248)	0.140 (0.246)	0.183 (0.247)	-0.030 (0.255)	0.009 (0.258)
Secondary School	0.063 (0.113)	0.043 (0.114)	-0.059 (0.117)	-0.072 (0.117)	0.301* (0.121)	0.301* (0.121)
Higher Sec/Voc	0.075 (0.094)	0.064 (0.095)	-0.266** (0.095)	-0.276** (0.096)	0.385*** (0.102)	0.387*** (0.102)
University	-0.089 (0.095)	-0.100 (0.096)	-0.303** (0.096)	-0.310** (0.096)	0.549*** (0.104)	0.541*** (0.104)
Above Graduate	-0.117 (0.137)	-0.113 (0.138)	-0.422** (0.131)	-0.425** (0.132)	0.646*** (0.144)	0.643*** (0.144)
Blue-collar/Self	-0.091 (0.081)	-0.123 (0.082)	0.032 (0.074)	0.024 (0.074)	0.179* (0.081)	0.169* (0.081)
White-collar	0.039 (0.069)	0.029 (0.069)	0.173** (0.065)	0.167** (0.065)	0.089 (0.068)	0.082 (0.068)
25K < income ≤ 35K	-0.023 (0.092)	-0.041 (0.092)	0.121 (0.089)	0.118 (0.089)	0.033 (0.094)	0.039 (0.094)
35K < income ≤ 50K	-0.210* (0.089)	-0.207* (0.089)	0.036 (0.083)	0.038 (0.083)	0.189* (0.089)	0.183* (0.089)
Income > 50K	-0.078 (0.076)	-0.079 (0.076)	0.064 (0.072)	0.066 (0.072)	0.150 (0.077)	0.143 (0.077)
Intercept	0.116 (0.121)	0.129 (0.116)	0.443*** (0.121)	0.454*** (0.117)	-0.630*** (0.133)	-0.749*** (0.130)
McFadden R-sq.	0.1	0.1	0.1	0.1	0.1	0.1
Cox-Snell R-sq.	0.2	0.2	0.2	0.2	0.2	0.2
Nagelkerke R-sq.	0.2	0.2	0.2	0.2	0.2	0.2
Likelihood-ratio	76.3	80.8	66.6	66.6	76.4	79.1
p	0.0	0.0	0.0	0.0	0.0	0.0
Log-likelihood	-244.2	-241.9	-232.0	-232.0	-245.1	-243.7
Deviance	488.3	483.8	464.0	464.0	490.2	487.5
AIC	526.3	521.8	502.0	502.0	528.2	525.5
BIC	602.6	598.1	578.3	578.3	604.4	601.7
Observations	409	409	409	409	409	409

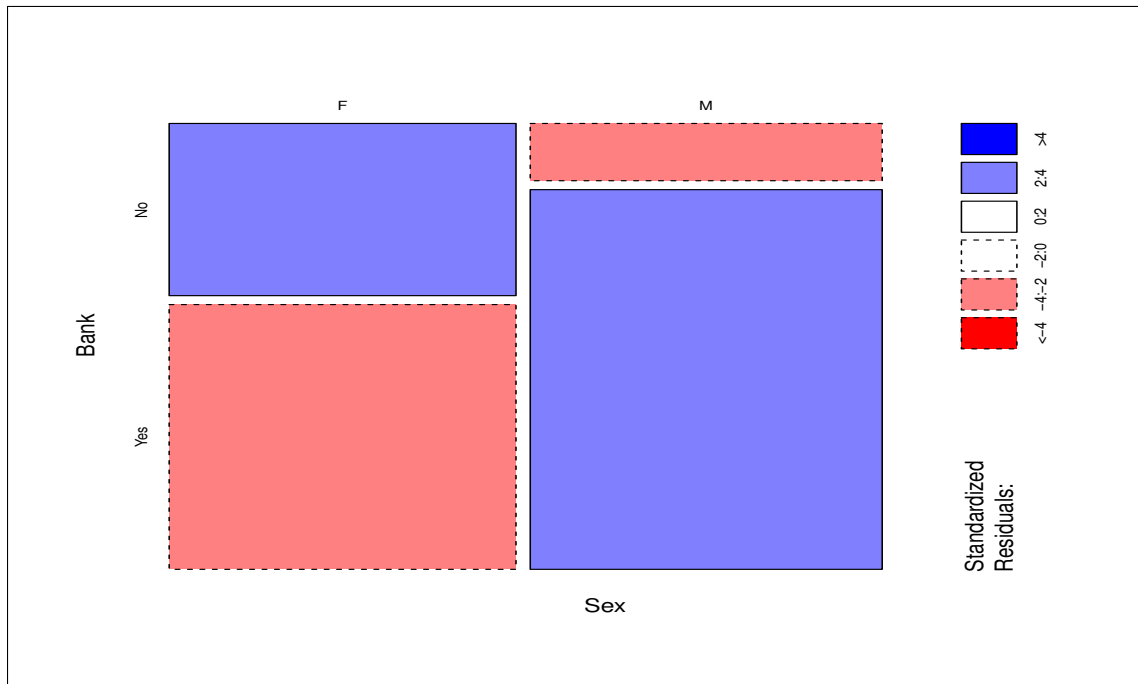


Figure 4.1 – Account Ownership by Gender

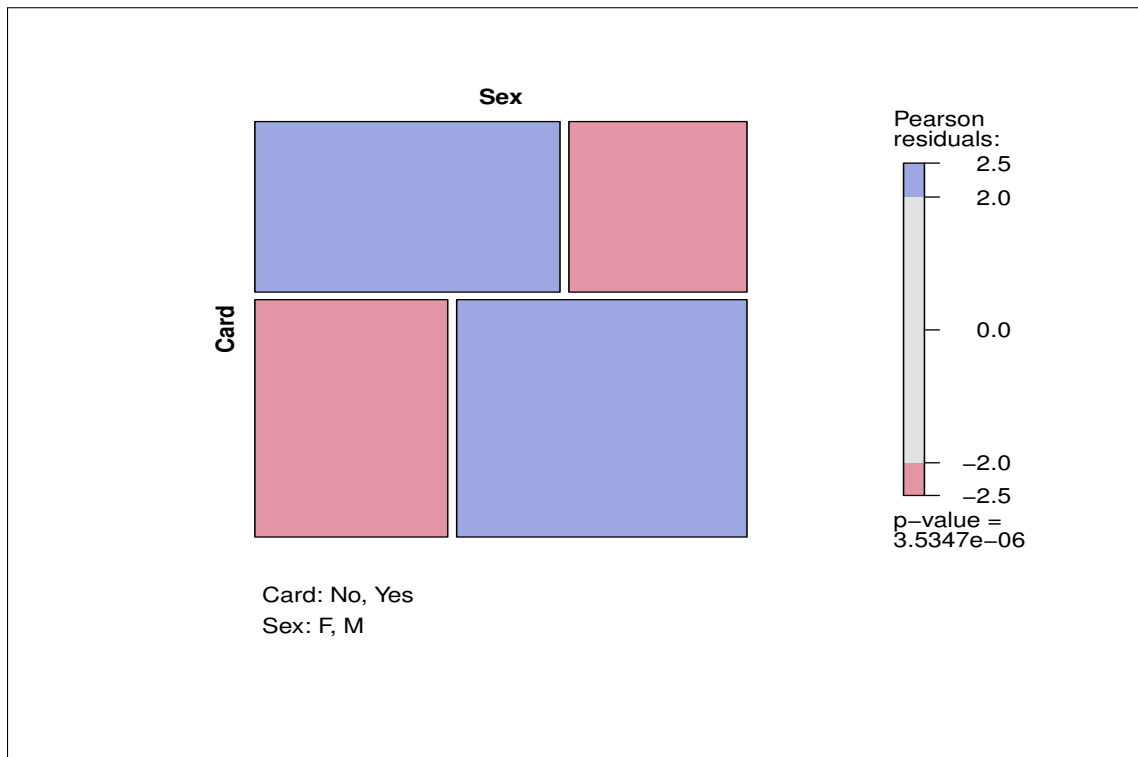


Figure 4.2 – Debit/Credit Card by Gender

Source: Author's calculations

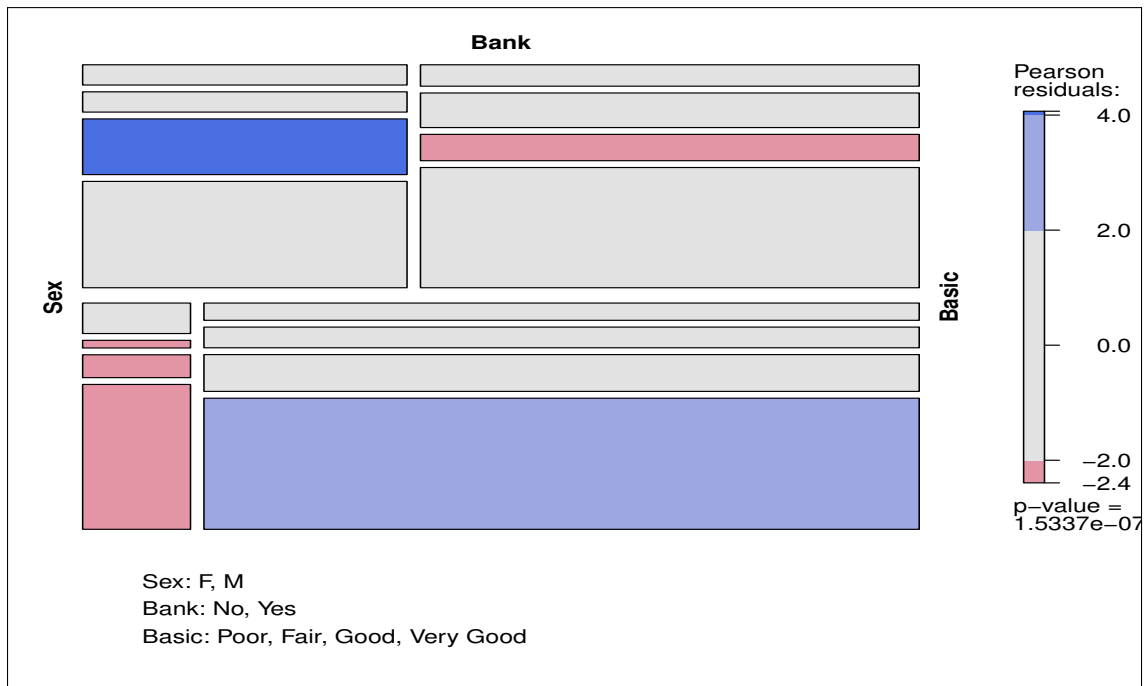


Figure 4.3 – Account Ownership , Gender and Basic Financial Literacy

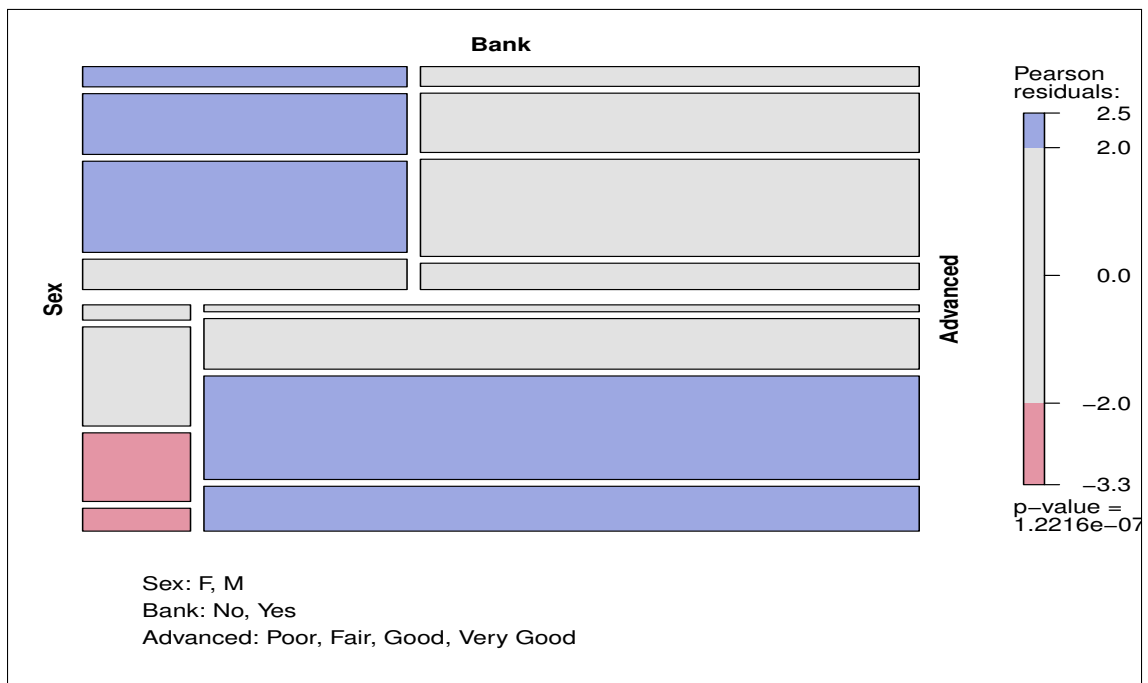


Figure 4.4 – Account Ownership , Gender and Advanced Financial Literacy

Source: Author's calculations

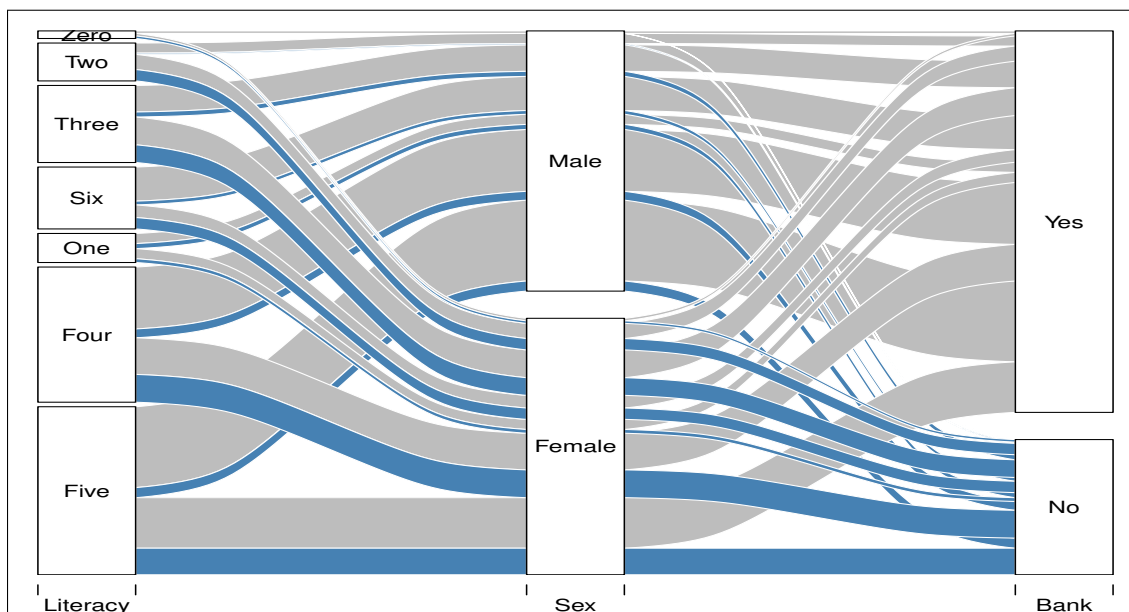


Figure 4.5 – Account Ownership , Gender and Financial Literacy

Source: Author’s calculations

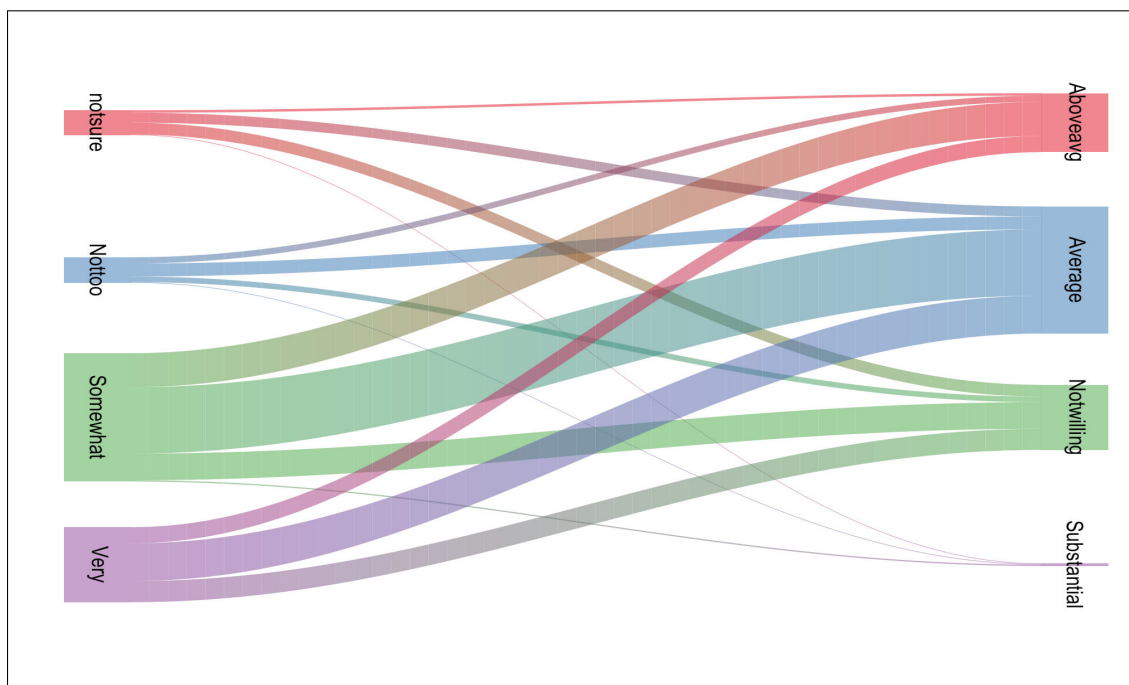
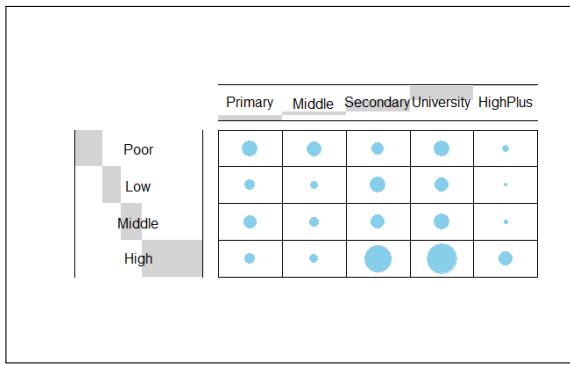
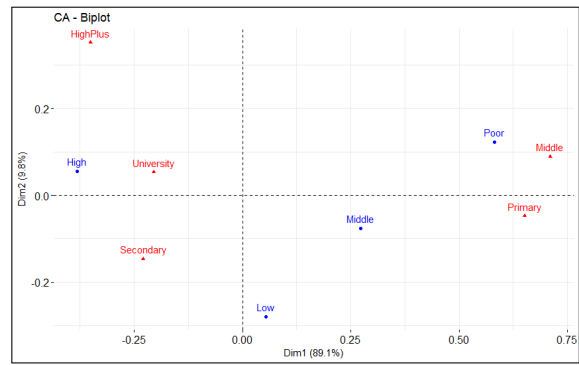


Figure 4.6 – Self-perceived Confidence and Risk taking

Source: Author’s calculations

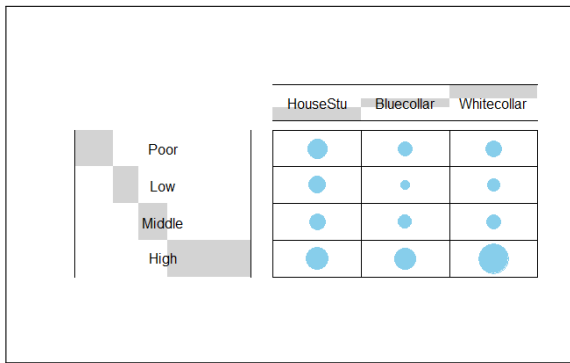


(a) Association b/w Income and Education

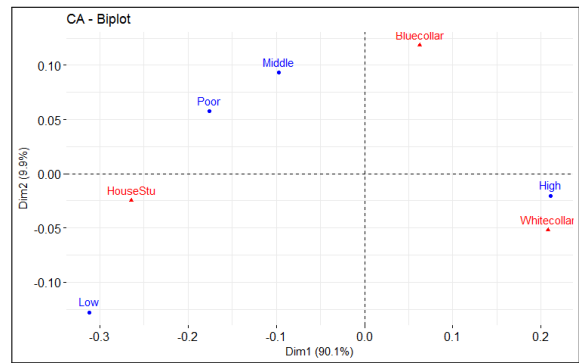


(b) CA scatter plot: Income and Education

$$\chi^2 = 71.16, df = 12, p - value = 0.000$$

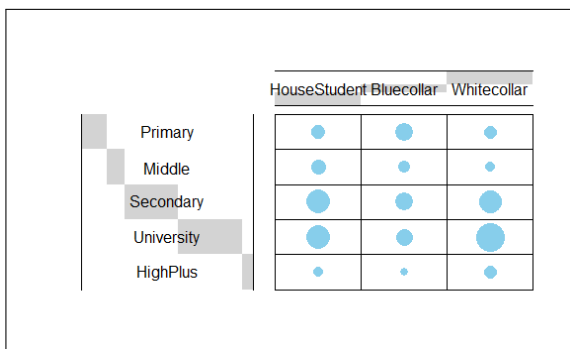


(c) Association b/w Income and Occupation

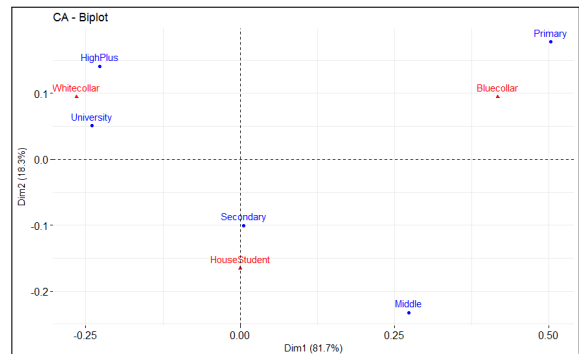


(d) CA scatter plot: Income & Occupation

$$\chi^2 = 19.63, df = 6, p - value = 0.003$$



(e) Association b/w Occup and Education



(f) CA scatter plot: Occupation & Education

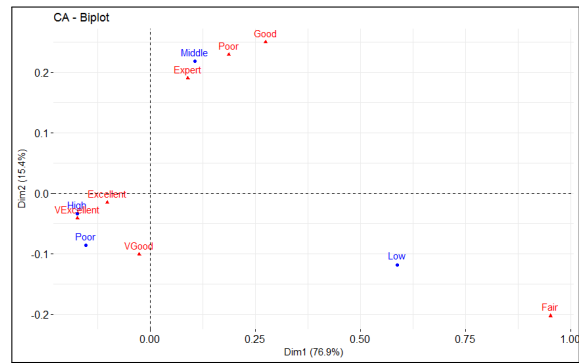
$$\chi^2 = 35.092, df = 8, p - value = 0.000$$

Figure 4.7 – Association of Income with Education, Occupation

Source: Author's calculations

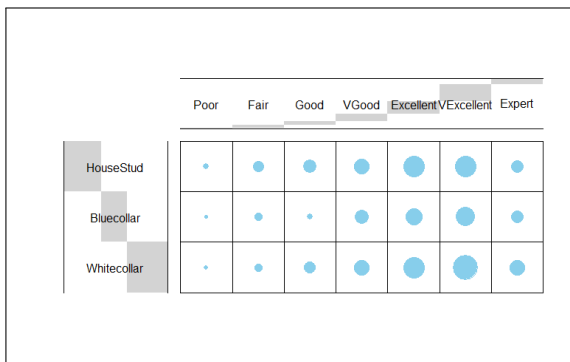


(a) b/w Income and Financial Literacy

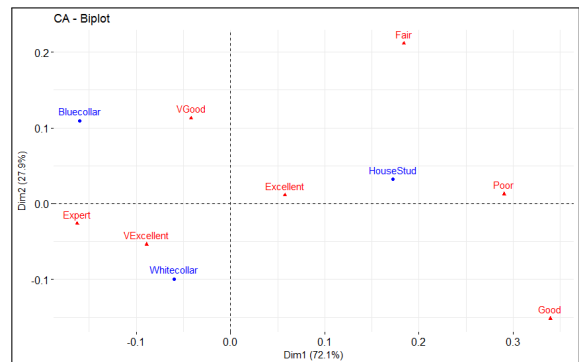


(b) CA scatter plot:

$$\chi^2 = 37.52, df = 18, p - value = 0.004$$



(c) b/w Occupation and Financial Literacy

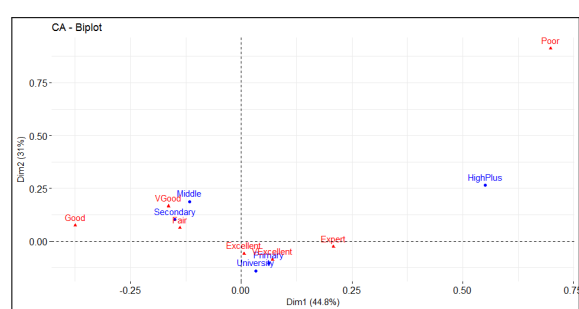


(d) CA scatter plot:

$$\chi^2 = 10.49, df = 12, p - value = 0.573$$



(e) b/w Education and Financial Literacy



(f) CA scatter plot:

$$\chi^2 = 26.83, df = 24, p - value = 0.314$$

Figure 4.8 – Association of Financial Literacy with Income, Occupation, Education

Source: Author’s calculations

Chapter 5

ICT adoption and Access to Finance: Evidence from SMEs in Pakistan

ICT ADOPTION AND ACCESS TO FINANCE

5.1. Introduction

Small and medium-sized enterprises (SMEs) are considered as engines to promote economic growth [Beck & Demirguc-Kunt \(2006\)](#). This sector also accounts for a considerable number of employed work force and reasonable share in exports. Despite aforementioned prosperous effects nearly 50% of the SMEs worldwide are still without access to finance.¹ Besides, flourishing SME sector develops entrepreneurial cultural which ultimately leads to innovation and multiple substitutions for final consumer. Conversely, it is also believed that the greater presence of SMEs increases the competition that reduces the prices and hence entrepreneurship gains.²

The growing importance of SME sector has turned the attention of policy makers and regulators to create a conducive environment for this sector and to address their obstacles. Where, access to finance is one of the biggest obstacles faced by SMEs particularly in developing world. Financiers usually avoid lending to micro and small businesses due to lack of collateral [Galor & Zeira \(1993\)](#), [Beck & Demirguc-Kunt \(2006\)](#). According to the World Bank, around 70% of MSMEs confront credit constraints mainly in emerging markets. Resultantly, they have to rely on personal funds and/or informal borrowing from friends and family or higher interest rate debt. In contrast, several entrepreneurs remain financially excluded willingly due to their less knowledge about financial markets. Consequently, they could not capitalize their profits, savings and availability of finance and information for the improvement of business. On the other hand, these firms continue to be less innovative and reluctant towards adoption of new technologies. Recent empirical research provides mixed evidence about firms innovation and access to finance (see for instance, [Dalla Pellegrina *et al.* \(2017\)](#), [Lee *et al.* \(2015\)](#)).

Research in corporate finance is composed of various arguments about the capital structure of a firm. Influential work of ([Devos *et al.*, 2012](#)) demonstrates that financial constraints are major determinants of firm's tendency towards equity financing. Further, small and younger firms with higher growth opportunities lease their assets and conserve

1. SME sector accounts for 40% in GDP and about 60% of employed labor force in emerging economies see, <http://www.worldbank.org/en/topic/financialsector/brief/smes-finance>.

2. https://en.wikibooks.org/wiki/Small_and_Medium_Enterprises_and_ICT/SME_Adoption_of_ICT

cash flows. Smaller firms avail greater benefits from financial development argued by [Beck *et al.* \(2008\)](#). In contrast, financial development disproportionately helps larger firms [Greenwood & Jovanovic \(1990\)](#). Small and medium sized enterprises are robustly associated with the availability of local bank and lower likelihood of firm's exit [Fafchamps & Schündeln \(2013\)](#). Empirical evidence highlights that the financial development in an economy is conducive for the growth of SMEs, however beneficial impacts largely depend upon the size of firms.

Firm-level characteristics such as age, size, growth opportunities among others are potential indicators that determine firm's access to finance. Mature firms have more expertise, skills and knowledge of the market than relatively younger and new firms. Hence, this experience could get them through rapid growth, higher profitability and facile access to credit (see, for example [Vos *et al.* \(2007\)](#), [Asiedu *et al.* \(2013\)](#), [Fafchamps & Schündeln \(2013\)](#)). Usually firms with less than 10 years of age are considered as young (see, for instance, [\(Rajan & Zingales, 1998\)](#)).³ Furthermore, size of the firm is also an important predictor of its access to finance, larger firms have comparative advantage over the small firms argued by [Guiso *et al.* \(2004a\)](#). In this study, we followed standard measures suggested by the World bank to approximate size of firm, which is the number of full time workers. Firms are classified as small (less than 20 employees), medium (20-100) and larger firms are those that have more than 100 full time workers.

Our study is different from those that investigate the firm's financial constraints. It delivers a different perspective, as it examines the association between ICT and financial inclusion in SME sector of Pakistan. The World Bank has identified Pakistan as one of the 25 focus countries with higher financial exclusion. In Pakistan there are 3.2 million SMEs but only 188000 were able to secure loan from banks while only 7% share of private credit goes to MSMEs (World Bank). We intent to determine firm's access to finance and how firms differ according to the access to and use of ICT. Firms at infant stages and small size are more likely to be financially constrained. While, firms with easy access to financial markets are not un-levered however the flip side of story is unaccessible financial markets restrict firms' capital structure only to equity

3. Our sample is based on SMEs, thus there is less probability for IPOs and going public for the small firms.

financing. In addition, we examine the dimensions where government can emphasize in order to achieve financial inclusion 2020 goals. As noted earlier, a sufficient strand of literature demonstrates corporate capital structure and financial constraints. However, examination of access to finance by SMEs remained less attractive for the researchers. Firm level evidence from around the world reveals that SMEs are the main victims of financial constraints in developing world. Moreover, the role of ICT adoption in access to finance also less documented in the previous literature. This motivates us to extend our knowledge by exploring the firm-level evidence about these significant dimensions.

5.2. Theoretical Perspective & Related Literature

The increasing use of Information and Communication Technologies (ICT) by individuals, corporations and governments makes it obligatory to understand the implications of ICT for these stakeholders. Therefore, this thesis attempts to examine the influence of ICT for households, SMEs and overall economy. Chapter 3 of this document concentrates on to uncover the importance of the access to and use of ICT at the global level by considering lower and middle income countries. Similarly, Chapter 4 attempts to investigate the role of ICT at household/individual level. However, this study focuses on to examine the impact of ICT at SME level. Moreover, ICT adoption is thought to have an impact on household welfare/firm profitability/economic growth through financial inclusion channel. For this reason, all three chapters exploit financial inclusion channel. This chapter exclusively considers the SMEs' ICT adoption and access to finance in Pakistan.

According to [Gono *et al.* \(2016\)](#), ICT adoption by SMEs and its impact can be grounded in technology acceptance model (TAM), technology-organization-environment (TOE) and resource-based theory (RBT). Our work is based on the resource-based theory (RBT) to describe the role of ICT adoption by SMEs and access to finance. The RBT provides a broad framework related to the firm resources (tangible and intangible) and their contribution to firm performance see [Barney \(1991\)](#). In addition to the ICT adoption, this study also considers firm age, size and location that determine the comparative advantage (see, e.g., [Ozturk & Mrkaic \(2014\)](#)). By ICT adoption we mean,

the use of mobile phone by SMEs to interact with employees and clients, use of email and Internet and maintaining a business website. Access to and use of ICT increases the likelihood of SME to access financial markets to set up a bank account, line of credit and working capital financed by banks. Furthermore, banks might prefer to offer credit to large and mature firms and avoid small and young firms due to risky lending.

In this section we discuss studies related to SMEs' access to finance, ICT adoption and their role in overall economy. The remainder of the section is organized as follows, we break the literature in three subdivisions, firstly we discuss the role of SMEs in economic growth and poverty, secondly firms' access to finance and financial constraints, finally we review evidence regarding the association between ICT and firms' access to finance. In seminal article based on cross country evidence, [Beck et al. \(2005\)](#) concluded that the role of SMEs in economic growth can not be neglected. They found conflicting results with and without controlling for endogeneity. However, their study categorically reject the argument of beneficial impacts of SME sector for poverty reduction. In contrast, [Sharafat et al. \(2014\)](#) find poverty reducing effects of SMEs in case of Pakistan. Whereas, [Shaffer \(2002\)](#) concentrated on to examine what size and types of firms are important for economic growth. A recent study of [Myslimi et al. \(2016\)](#) showed positive impacts of SME sector development and economic growth of Albania.

Another stream of literature focuses on firms' access to finance, size and growth (see, for instance, [Beck & Demirguc-Kunt \(2006\)](#), [Beck et al. \(2008\)](#)). Size of the firm vastly considered as an influential determinant of access to finance. [Beck & Demirguc-Kunt \(2006\)](#) summarized cross country evidence and concluded that, as compared to larger firms SMEs confront greater obstacles including access to finance. In addition, they also suggest that an economy's business environment considerably influences small firms growth. Besides these arguments, [Beck et al. \(2008\)](#) find that smaller firms benefit more from financial development than large firms. They also indicate detrimental implications for small firms due to underdeveloped financial sector. [Vos et al. \(2007\)](#) examined SMEs from UK and USA and provided insights on access to finance and firm-level characteristics. Their study shows that younger and high growth firms are more likely to engage in financial markets than mature and low growth. [Beck & Peria \(2009\)](#) presented

supply side evidence such as bankers willingness and perception to extend credit to SMEs. They report that banks regard SMEs as profitable clients but credit expansion for this sector predominantly driven by the macroeconomic and business environment. Furthermore, they also noticed that all types of banks extend credit to SMEs, but banks in developing countries found to be reluctant in SME financing even charge higher interest rates.

Banerjee (2014) shows that smaller firms and start-ups experience greater financial constraints that also affect their profitability. However in post crisis period mature firms that were start-ups during pre-crises also witnessed reduction in profitability due to financial constraints. Haber *et al.* (2003) tried to explore the relationship between financial intermediary and firms' productivity in Brazil and Mexico. They demonstrated that if there are restrictions on growth of financial intermediaries there will be higher industrial concentration, lower productivity and competition in the market. Moreover, Presbitero & Rabellotti (2016) presented evidence from Latin America and reported that small and younger firms are more likely be financially constrained. They also provide supply side determinants of SMEs' access to credit and show beneficial effects of higher bank penetration and competition while negative implications of foreign bank presence particularly in less developed economies. Based on gender based financial exclusion Asiedu *et al.* (2013) argue that female owned enterprises in sub-Saharan Africa (SSA) are more likely to be financially constrained as compared to the male owned SMEs. However, they found no evidence of gender based financial exclusion in other regions, they also notice greater financial constraints for small enterprises than large. Following authors also hailed the importance of firm size for access to finance in India, Ghosh (2007) and in Kenya Nkurunziza (2010).

A growing body of literature describes SMEs' access to finance and obstacles, however examination of association between ICT and SMEs' financial access is relatively a new topic. That has recently attracted a massive concentration of researchers to explore the dynamics of ICTs for firm growth, profitability and credit access. For instance, Gono *et al.* (2016), Arendt (2008) shed light on an interesting dimension ICT adoption and barriers. They presented that the ICT adoption is higher in firms with owner/managers'

greater IT expertise. Further, they also highlighted significant benefits of ICT adoption for South African SMEs. The use of Internet, like maintenance of business website and email to interact with various stakeholders is widely considered to proxy SMEs' ICT adoption. [Ramayah *et al.* \(2016\)](#) exhibit firm-level empirical evidence from Malaysia, where they find that CEO's attitude towards IT is one of the major determinants in firm's intention to maintain business website. ICT adoption and firms' growth and profitability also noted by [Afolayan *et al.* \(2015\)](#) in Nigeria, [Matthews \(2007\)](#) survey results from 46 countries, in New Zealand and Scotland by [Galloway *et al.* \(2016\)](#), in rural Scotland by [Deakins *et al.* \(2004\)](#) and [Beckinsale *et al.* \(2011\)](#) brought in the impact of ethnic minority businesses in ICT adoption.

Another strand of relatively new literature explains ICT adoption and SMEs' access to finance. For instance, [Dalla Pellegrina *et al.* \(2017\)](#) argue that banks extend credit to those small firms that have adapted ICTs because they perceive this strategy as a signal of SMEs' innovation. Similarly, [Benfratello *et al.* \(2008\)](#), [Sharma \(2007\)](#) show that financial sector development significantly contributes to innovation by small firms. On the contrary, [Westhead & Storey \(1997\)](#) presented that more technologically advanced firms experience higher financial constraints than the others. Besides, [Bircan & De Haas \(2015\)](#) identify credit constraints for firms in Russia and suggest that financial constraints halt firm's innovation process. While, timely and accessible credit encourage firm's innovation activity. They also generalized this findings for developing countries. Along the same lines, [Han \(2008\)](#) finds that financial constraint could be determined by extent to which a firm uses on line banking. They also maintained that relationship banking may ease credit constraints for SMEs in UK. Further, they postulate the importance of entrepreneurial characteristics in firm's access to finance.

As noted earlier, a little evidence exists on SMEs' ICT adoption and access to finance. However, most recent studies are focusing on SMEs' ICT adoption effect on growth, performance and access to finance. This study is an effort to bridge this gap by engaging WBES data from an emerging market Pakistan. In context of Pakistani SME sector, this study is a unique effort to provide insights on SMEs' access to finance and initiatives to achieve UFA-2020. The objective of this study that makes it significant from the others

are threefold. First, it presents recent scenario of financial inclusion and ICT adoption in Pakistan and compares it to the previous level. Second, it describes Universal financial access 2020 goals and the progress of Pakistan towards achieving those goals. Third, this study takes on an exploratory data analysis approach and French school of “analyse des données” (Multiple Correspondence Analysis) that is barely used in previous studies in this stream of literature.

5.3. Data and Methodology

The methodology of this study is divided into two parts. First part incorporates exploratory data analysis approach (EDA). It is based on visual inspection of the data by considering the variables of concern. The objective to use EDA approach is to visualize the current status of financial access and ICT in Pakistan compared with other regional countries. Moreover, this section also focuses on financial access goals by 2020 and strategies to achieve these goals. In addition, this section explores the financial constraints related to SMEs and financial gap with respect to 2020 targets. Part two of the study examines the relationship between, SMEs' ICT adoption and access to finance in Pakistan. This section utilizes correlation analysis, multiple correspondence and probit analysis.

In this paper we mainly utilized two datasets provided by the World Bank Enterprise Survey (WBES). The World Bank started these firm-level surveys in 2002 through face-to-face interviews of owners and top managers of the firms in 148 economies. The aim of WBES is to collect information on a wide range of topics about firm's internal and external environments in which they operate. A comprehensive questionnaire is used for that purpose with the help of local team members to collect and compile internationally comparable data.⁴

In Pakistan, the first round was conducted in 2002 followed by 2007 and the most recent completed in 2014/15. Two rounds of enterprise surveys in Pakistan meet the criteria of global methodology, first was completed in 2007 and second in 2015. Therefore,

4. More detailed information about these surveys can be found on the official website: <http://www.enterprisesurveys.org/>

this study utilizes the dataset provided by the most recent surveys i.e., 2007 and 2013/14 for comparisons. While, for cross sectional data analysis this study only considers the latest dataset. This survey used stratified random sampling technique based on industry, firm size and location.⁵ Although these surveys collect information on a broad range of issues related to SMEs. We mainly focus on access to finance, ICT adoption related indicators of SMES. In addition, we also used size, age and region of SMEs in Pakistan in the analysis. It also concentrates on SMEs' financial constraints and the role of national financial inclusion strategy (NFIS) to achieve financial inclusion 2020. Described characteristics and the significant contribution of SMEs in aggregate growth led us to study this underlying puzzle with respect to an emerging market. It is also worth examining the ongoing progress of the national level financial inclusion strategies (NFIS) in Pakistan under the platform of Universal Financial Access 2020 (UFA-2020).

5.3.1. Data Description

The following subsections describe variables used in this study. As noted earlier, enterprise surveys collect information on various topics related to firm's internal (e.g., performance and business environment) and external (such as infrastructure and competition) indicators. The scope of this study is limited to the SMEs' ICT adoption and access to finance in Pakistan. Definition and main categories of indicators of ICT and financial access are those as defined by the World Bank.

5.3.1.1. Financial Access

The main outcome variable of this study is SMEs' access to finance. Firms' financial access has been a subject of interest for various economists due to its role in firm performance, employment generation, poverty reduction and economic growth (see, for example, Beck & Demirguc-Kunt (2006), Beck *et al.* (2008)). This study used following indicators regarding firms' access to finance. The WBES collects information about financial access and constraints faced by SMEs under the category of "Finance". In order

5. More detailed information about sampling, selection of firms and location can be found in Pakistan - Enterprise Survey 2013, accessed at: http://microdata.worldbank.org/index.php/catalog/2363/related_materials

to approximate SMEs' access to finance and financial constraints in Pakistan we use following indicators. (i) firm's bank account; (ii) line of credit; (iii) overdraft facility; (iv) working capital and investment financed by bank.

In addition, we also make use of firms' financial access constraints indicators such as, collateral, loan application outcome and internally financed investments (more detail on SMEs' financial constraints can be found in [Beck & Demirguc-Kunt \(2006\)](#), [Beck & Pería \(2009\)](#)). It is important to note that some variables (for example, loan application outcome and collateral) appear in EDA were excluded from further (correlation and probit) analysis due to insufficient number of valid responses.

5.3.1.2. ICT Indicators

The existing and relatively new literature uses several proxies to approximate SMEs' ICT adoption. For instance, based on the data from Italian SMEs, [Dalla Pellegrina et al. \(2017\)](#) used five indicators to proxy firms' ICT adoption (e.g., hiring of computer experts, online banking, online credit applications, ICT for managerial and administrative efficiency and the use extranets). While, in order to measure 108 Canadian SMEs' ICT adoption, [Raymond et al. \(2005\)](#) consider the purpose and the use of Internet, Web and e-business assimilation. They also suggest that the basic level of ICT adoption could be approximated whether firm uses ICTs or not, while the next level deals with the extent of use. With this in mind, following [Raymond et al. \(2005\)](#), we consider SMEs' ICT adoption whether they use Internet related technologies or not. Because SMEs in Pakistan are recently exploring the new ways to reach out to their clients and to improve the internal efficiency. Besides, this study borrows WBES data, thus it relies on the measures collected by that survey. For this reason, the WBES categorizes firms' ICT indicators as "Innovation and Technology". In this study, we consider following information to proxy firms' ICT adoption, (i) Technology license from a foreign company; (ii) whether firm maintains business Web site and finally (iii) does firm use email/mobile phone to interact with clients/suppliers..

5.3.1.3. Other firm-level variables

Besides ICT and access to finance, this study also uses other firm related indicators such as age, size, region, employee training and gender of the manager. Firms are divided into two groups (young and mature) based on the year of establishment of the business. The young firms category includes those firms with (less than 10 years of operations) and mature (more than 10 years), (see, for instance, (Rajan & Zingales, 1998)). Furthermore, firms are divided into four groups based on the number of employees (micro, small, medium and large). Firms are classified as micro (less than 5 employees), small (less than 20 and more than 5), medium (20-100) and larger firms are those that have more than 100 full time workers (for more detail about firm size, see, for instance, Beck & Demirguc-Kunt (2006), Beck *et al.* (2008)). The region of the firm is divided into five categories based on the province of the firms' head office. These five regions are, (i) Punjab; (ii) Sindh; (iii) KPK; (iv) Balochistan and (v) Islamabad Capital Territory. Analogous to the firm size, the regional classification is based on the official enterprise survey stratification. Ozturk & Mrkaic (2014) find positive association of firm size and region with access to finance for SMEs the Euro Area.

5.3.2. Exploratory Data Analysis (EDA)

We begin the data analysis with the EDA approach. In this section, we intend to describe the recent status of access to finance by households, SMEs and smallholder farmers in Pakistan and the initiatives of the Government of Pakistan (GOP) to advance financial inclusion under NFIS by 2020. The EDA technique is largely based on visual inspection of the data. We proceed further with a famous quote which indicates how valuable an image could be to describe a given phenomenon.⁶

“A Picture Is Worth a Thousand Words” –Frederick R. Barnard, 1921.

6. For the purpose of visual analysis, we mainly used R programming along with its packages such as ggplot, ggmosaic, DescTools and rpivotTable.

5.3.2.1. Universal Financial Access 2020 (UFA) & Pakistan

In an effort to bring unbanked population (2 billion) to regulated formal financial markets (1 billion) until 2020, the World Bank along with IFC steps in to help governments of the poor countries. To achieve UFA 2020 goals, various public private partnerships across developing world are underway. In addition, ICT infrastructure development also captivates significant attraction due to its role in advancing financial inclusion. Pakistan is one of the important (25) countries of this project, as it accounts for over 100 million unbanked population (5% of world's financially excluded). Whereas, the percentage of people who do not have an account slightly declined from (90%) in 2011 to (87%) in 2014. Similarly, financial inclusion by females is also very low in Pakistan as it marginally increased from a level of (3%) in 2011 to (5%) in 2014. Under the platform of UFA 2020, in May 2015 Pakistan launched National Financial Inclusion Strategy (NFIS) with an objective to bring half of its adult population into formal banking system. This strategy also aims to enhance access to finance for MSMEs to (15%) which is only (7%) in 2014.⁷

According to the Global Microscope 2015, the environment to promote financial inclusion is conducive in Pakistan as compared to other countries with similar level of development. The report further went on to document that GOP has introduced "Asaan Account", a bank account that can be opened with as low as PKR.100 (95 US cents), this account also has no minimum balance requirement. On the other hand, Pakistan leads South Asia in the use of digital finance, which is growing with the help of joint initiatives with private sector. Similarly, figure 5.1 shows the trends in credit expansion (PKR billion) for different sectors in Pakistan during 2011-2015. This period witnesses the rapid growth of Islamic finance in Pakistan followed by the growth in microfinance and agricultural credit. As the assets of Islamic financial markets grew from (560 PKR billion) in 2011 to (1495 PKR billion) in 2015. This indicates a booming opportunity for Islamic and microfinance sectors in Pakistan. However, trends in SME and Housing finance are discouraging in figure 5.1. The amount of outstanding SME

7. These statistics are from, Global Findex 2014. Furthermore, the UFA2020 follow up information can be found at: <http://ufa.worldbank.org/country-progress/pakistan>

finance varies between (271-261) with a sharp decline to (234) in 2013. Similarly, growth rate of SME borrowers from 2011-2015 is negligible as it moves from (157) to (158). With this in mind, one can establish the poor access to finance for SMEs in Pakistan. Therefore, it is essential to formulate a transparent and efficient policy framework and fair implementation of plans in order to scale up MSMEs' access to finance by 2020 to 15%.

[Figure 5.1 here]

In order to help the poorest and impoverished people of Pakistan, recently World Bank has approved a package of US \$ 450 million. Out of total amount, a huge share of (US \$300 million) is devoted to raise financial access and to the development of inclusive and transparent financial sector in Pakistan. Figure 5.2 shows the total approved amount for three main projects, where (FGDP) is most relevant to this study.⁸ Rows on the top show total package and its distribution, while columns in the bottom outline 2020 goals. Pakistan has witnessed declining trends in financial inclusion indicators of SMEs between 2007 and 2013, as shown in figure 5.3. A considerable amount dedicated to promote financial inclusion both at household and firm-level by 2020. Targets set by the GoP to achieve financial inclusion by 2020 requires full commitment, teamwork and transparency. Development of basic infrastructure and injection of electricity into the system would also help achieve these goals. Moreover, the handling of projects and to invest in identified priority areas requires a great deal of supervisory control.

[Figure 5.2 here]

In addition to this package, the Asian Development Bank (ADB) has recently approved a loan to expand financial access particularly for MSMEs in Pakistan. An amount of \$20 million provided to Pakistan's largest microfinance bank "Khushhali Microfinance Bank Limited (KMBL)" that targets MSMEs, small farmers and poor households. The objective of this loan is to enhance financial access to 30,000 MSMEs from 5,700 by 2020. In addition, this project focuses on the inclusion of women entrepreneurs that would make up 25% of the recipients.

8. Note: \LaTeX codes written by Gonzalo Medina as Arrow table, can be found at: [Texample](#), we modified those codes to serve our purpose.

5.3.2.2. SMEs' Access to Finance and ICT in Pakistan

Industrial sector in any economy contributes heavily to aggregate GDP. In Pakistan industrial sector accounts for nearly 24% of country's GDP, while this sector is concentrated to manufacturing of textile which has a share of approximately 66% in export, 18.5% in GDP and 40% in employed labor force.⁹ Whereas, less focus of the GoP towards SME sector is guiding this sector to worsening situation. Despite the fact its considerable 40% contribution in country's GDP and 80% in non-agriculture labor force, this sector continues to remain neglected (Pakistan Bureau of Statistics). On the other hand, electricity breakage, corruption and political instability are the major barriers reported by SMEs in Pakistan (WBES).

The last decade turned up as provider of uncondusive atmosphere for the growth of SME in Pakistan. That compelled various manufacturers to relocate their businesses to other neighboring countries such as India and Bangladesh. A major share of textile industry from Pakistan has been shifted to Bangladesh over the last 15 years. It also witnessed a decline in new foreign investment in SME manufacturing sector. Hence, the overlooked SME sector which is thought to have the ability to provide employment and accelerate economic growth is on its own. In addition, 13.2% of SMEs reported access to finance a barrier in Pakistan. However, this number is encouraging as compared to the South Asian and World's average 28.4% and 28.7% respectively (WBES Pakistan 2013-14). While, the other aforementioned major reported obstacles are also higher in Pakistan compared with the other peer countries.

Persistent languishing condition of SMEs can be noticed from the figure 5.3. Based on the WBES 2007 & 2013, we plot the trends in SMEs' financial access and ICT related indicators. We notice a substantial decline in the bank account from (64.7%) to (58.1%) during 2007 and 2013. Similarly, all other indicators of financial inclusion such as percentage of line of credit reduced to (6.7%) from (8.6%), investments financed by banks reached at (8.1%) from an initial level of (9.7%). However, percentage of working capital financed by banks marches upwards from (4.6%) in 2007 to (8.6%) in 2013. These facts indicate that the SMEs in Pakistan are willingly less relying on bank

9. These statistics are based on the report by: Pakistan Bureau of Statistics (PBS) 2010.

credit or due to financial constraints like unavailability or costly credit. Because the cost of debit is also higher at net interest margin (4.44%) compared with India (2.85%) and Bangladesh (1.40%) (GFDD 2014). This further illustrates the fact that majority of entrepreneurs lack trust on banking sector and instead rely on informal borrowings from friends and family.

[Figure 5.3 here]

By contrast, SMEs in Pakistan show auspicious evidence in adapting state of the art modern technology. Selected ICT related indicators of SMEs exhibit promising patterns. Figure 5.3 demonstrates a sizable hike in the percentage of firms that have maintained their business web site from (16.6%) in first round of survey in 2007 to (46.6%) in second survey of 2013. The other indicators of ICT have also witnessed a significant increase during 2007 and 2013. The number of firms that uses technology licensed from foreign companies has also increased from (2.7%) to (22.1%). Similarly, use of email raised to (54.4%) from (26.8%). Rising infiltration of modern technology also reflects rapid development of ICT infrastructure in Pakistan.

5.3.2.3. ICT and Financial Inclusion: A Comparison

As discussed earlier the unconducive business environment in Pakistan compelled a large number of manufacturer to relocate their businesses to India and Bangladesh. Textile and cotton industries in particular and other manufacturing industries in general suffered severely from power shortage in Pakistan. Furthermore, corruption and limited enforcement led to straightforward relocation decisions. Remaining enterprises in Pakistan still face these obstacles. According to the recent WBES, electricity and corruption remain major obstacles for SMEs in Pakistan. This situation also discouraged foreign and local investors to invest in SMEs in Pakistan. In previous figure we observe declining trends in firms' financial inclusion in Pakistan. Figures 5.4 and 5.5 illustrate a comparative analysis of access to finance and ICT related technologies. SMEs in Pakistan are leaving behind South Asian counterparts when it comes to the use of ICT related technologies. However, greater disparities can be seen among small, medium and larger enterprises, where the latter have comparative advantage over formers in

terms of resources. On the other hand, with respect to access to finance indicators, SMEs in Pakistan underperformed compared with the other neighboring and countries with similar economic growth. Again, small firms in Pakistan report lowest percentage of holding a bank account around (44%) as compared to medium (62.2%) and large enterprises (77.3%). This implies lower access of small and micro enterprises to the formal financial markets in Pakistan. Consequently, these firms have to rely on equity financing (informal borrowings) or borrowing from moneylenders at higher interest rates. Moreover, lack of sufficient knowledge about banking and financial products also inhibit these small entrepreneurs' access to finance.

[Figures 5.4 and 5.5 here]

5.3.2.4. Financial Constraints and Financial Inclusion 2020

In this section, we attempt to visualize where and what size of firms confront financial constraints in Pakistan. As seen earlier, the greater financial exclusion corresponds to relatively young and small firms. Figure 5.6 displays financial constraints by firm size on the left and by region on the right side.

[Figure 5.6 here]

This figure is produced using marginal distributions by row, where rows represent constraints. This survey includes a total of (1247) firms across Pakistan, (641) firms from Punjab, (203) Sindh, (196) KPK, (59) Balochistan and (106) from Islamabad region. We notice that, out of total firms that reported major obstacle (46%) are micro and small enterprises combined. Accordingly, these two categories account for nearly (60%) for those credit access is very severe obstacle. In contrast, as we move upward from micro to large categories, coordinates toward severe and major get smaller. Similarly, a greater portion is held by small enterprises out of those firms who reported access to finance is major and moderate obstacle. Interestingly, those who have no or minor obstacle in accessing finance also come from small and medium firms, this may be correspond to the fact that they never applied for bank loan or they don't need. Consequently, they no longer consider access to finance as constraint. Finally, larger firms have least representation in groups who have reported access to finance as major or severe problem.

By acknowledging this result one can fairly say that larger firms face minor or no constraints when it comes to acquiring credit from financial markets. Conversely, smaller firms are the main victims of financial exclusion followed by medium sized enterprises. Furthermore, left side circle map shows financial constraints by region. According to the World Bank survey firms are divided based on geographic location in Pakistan, mainly into five categories. Where, Punjab is the largest province of Pakistan in terms of population and economic activity. Thus it is also a favorite place for SMEs, due to its greater representation in sample size figure shows that SMEs in Punjab held larger share in reporting no-severe obstacle to obtain credit. SMEs in Sindh and Islamabad regions surfaced to report financial constraint as major and severe obstacle. On the contrary SMEs in KPK and Balochistan are less likely to face credit constraint compared with the other regions. In conclusion, these images illustrates an important indication for policy makers to ease financial constraints particularly for small and medium-sized enterprises. In the same way, polices must be directed towards building an inclusive financial sector across all regions of the country in order to achieve 2020 financial inclusion goals.

To further glean our evidence regarding geographical financial disparities and constraints. Following figure 5.7 demonstrates an eminent association among firms size, region and loan application outcome. Region of the firms is along the x-axis, whereas two blocks on y-axis represent whether loan application was approved or rejected. Colors are based on size of the firm e.g., micro, small, medium and large. This plot largely projects the conclusions analogous to figure 5.6, for instance SMEs in Punjab predominantly retain a huge share of this figure. Small enterprises in Punjab, KPK, Islamabad and Baluchistan are more likely to report a rejection of loan application. However medium and large firms in KPK, Islamabad and Baluchistan and medium sized firms in Sindh have refusals from banks. The rejected block portrays least representation of large firms. While small firms dominate this block followed by medium enterprises. Thus, on the basis of this result it might be possible to conclude that size of the firm is the strongest predictor of financial market participation in Pakistan.

[Figure 5.7 here]

Upper block of the figure 5.7 corresponds to SMEs in different regions whose recent

loan application was approved. Our results suggest that larger firms evidently face less financial constraints, though score of large firms did not even bother to respond to this question. SMEs in Punjab and Sindh illustrate alike patterns, however approval rate in other provinces exhibits varying trends according to firm size. With this in mind, one can notice drastic and uneven financial conditions for small and medium enterprises in Pakistan. Therefore, in order to get over the line of 2020 financial inclusion goals, emphasize to provide level plying field in the financial market is indispensable.

In the next step, we examine what type of financial institutions stipulate collaterals and whether this depends upon the size of firm. As mentioned earlier, 13.2% firms in Pakistan consider access to finance as biggest constraint. In addition, nearly 82% of firms reported to have provided collaterals against loans. We assume that collateral requirement varies by type of financial institution and size of the firm. Furthermore, state owned banks usually promote small and medium industries under various national level programs. However, figure 5.8 furnishes divergent glimpses of what is generally believed. It is clear from the figure, that majority of firms provided collaterals to secure loans. We could not notice variation in collaterals based on firm size and type of financial institution. As all firms are equally represented in the middle column with light blue color. Moreover, there is no difference in the requirement of collaterals by private commercial and state owned commercial banks in Pakistan. They all require collaterals indiscriminately, whereas a few number of firms reported to access non banking financial institutions (NBFIs) and other types of organizations.

[Figure 5.8 here]

It can also be noticed that private commercial banks are main credit providers to the SMEs in Pakistan. While, state owned banking institutions treat all firms indiscriminately as tiny red lines originating from state to (No) collateral block cross through small and medium enterprises categories. State owned banks mainly deal with small and medium enterprises, as can be seen from the figure. Private commercial banking institutions also following alike patterns where red coordinates originating from the left block crossing through middle block representing small, medium and large (SML) enterprises. These coordinates show decreasing patterns for SML respectively. Which

indicates private banks are less likely to demand collaterals from large firms. Finally, NBFIs and other type of financial institutions provide credit to very few surveyed firms, yet they equally require collateral irrespective of firm size, given the fact only small and medium firms approach these types of financial institutions. Hence, this evidence reiterates effective intervention of state level institutions and policy making to lax financial constraints for SMEs in particularly to encourage private banking sector to extend credit to small and medium enterprises. With financial inclusion 2020 goals in mind, State involvement is essential that can also promote competition between private financial institutions that eventually leads to an inclusive financial sector.

5.3.2.5. Financial Access Gap in Pakistan

In this section we show actual and Pakistan's financial inclusion goals 2020 in figure 5.9. This figure mainly portrays actual level of financial access and gap in each indicator to its 2020 target.¹⁰ First bar of the figure included to show the depth and outreach of financial institutions and its desired level. In order to achieve financial inclusion 2020 goals under NFIS, the (GOP) is committed to increase the bank access points to half a million from (0.35 million), whereas, it has to fill the gap of (0.15 million). Secondly, it eyes at enhancing formal financial inclusion to almost (50%) of adults which recently stood at (13%), this task seems paramount for the government as it requires to include (35%) more adults to fill this gap. In addition, female participation in formal financial markets in Pakistan is very low, only (5%) women hold formal bank account, where the 2020 target is to increase this number to (25%) by bridging the huge and challenging gap of (20%). Microfinance on the other hand is growing in Pakistan and it held an influential strategy partner's position to attain financial inclusion 2020 targets. Currently, the number of active borrowers across Pakistan is (3.6 million). The GOP is engaged with microfinance sector to increase this number to (10 million) including (4 million females) by 2020. Finally, it has also set a target to enhance access to credit for (15%) of MSMEs by 2020 from (7%). This would fill in the gap of (8%). A very small number of micro and small enterprises are financially included as compared to

10. This figure is produced using State Bank of Pakistan's official statistics about financial inclusion and 2020 goals.

other peer countries. However, the set goals once achieved or somewhere near to them could turn the situation favorable for MSMEs in Pakistan.

[Figure 5.9 here]

Financial inclusion 2020 goals are challenging for the present government to achieve, however not impossible. All indicators of financial inclusion are equally important, whereas expanding access to credit to SMEs could lead to increased growth, lower unemployment and boost in exports. Thus, exclusive emphasize must be given to diminish financial constraints for SMEs and to overcome the supervisory challenges of financial inclusion in the country to promote overall economic growth.

5.3.2.6. Smallholders Financial Diaries in Pakistan

This section explains financial patterns of smallholder farmers in Pakistan and compares with the other countries. Data are borrowed from the World Bank and CGAP survey, this survey is conducted to collect more detailed information about the smallholders (Smallholder Diaries) in three countries namely Mozambique, Tanzania, and Pakistan. It provides deeper insights about the smallholder households' financial inclusion and spending patterns over time. However we only stick to the information regarding the use of ICTs and financial behaviors such as access to and use of mobile phone, mode of savings and credit instruments. In Pakistan this survey was started in April 2014 and finished in June 2015. Smallholders were interviewed every two weeks for about an hour, a total of 60 weeks. Over 60% of the population in Pakistan lives in rural areas with insufficient basic infrastructure. Financial access points are also not available easily for rural population. Majority of the rural population involved in "Agricultural" and in "Micro" and Small enterprises. Lack of timely and accessible credit is a big hurdle for these far remote communities, however fintech initiatives along with government's priority focus could include them into the financial system. On the other hand, these people are strongly connected to traditional values where they volitionally don't access to financial markets due to i) forbidden interest rates dealings or ii) insufficient knowledge about financial markets. Resultantly, they rely on traditional money lenders or family and friends borrowings. According to Smallholder Diaries 2016, 99% of the participants

have borrowed from friends and family. Unbanked people usually save at their homes that also poses risks of theft and lost of interest earnings. It further states that 85% of the smallholders households in Pakistan save at house, while only 16% of them hold checking account at bank.

On the other hand, rich class of Pakistan also prefers to save cash at home. According to the “Standard Chartered World Affluent Report 2017”, over 50% of Pakistan’s emerging affluents store cash at home. Lower interest rates by financial institutions turned out to be the main obstacle to save at bank with an average of 30% which is 20% in Pakistan. While top savings priority in Pakistan was to save for the children’s education. Meanwhile, this report also highlights that digital savvy people more likely to save than those who are unaware of digital technologies.

[Figure 5.10 here]

Figure 5.10 exhibits patterns in access to mobile phone, mobile money, self reported capability and finance in three countries. Data for this figure gathered from the smallholder financial diaries 2016. The sub-figure on the left displays three variables such as, ownership of mobile, sim card and use of mobile money. It can be seen higher bars for Pakistan, as it leaves behind in terms of access to and use of mobile phone, however there is no reported evidence about the use of mobile money. The centered sub-figure demonstrates self reported capability regarding the use of mobile phone, we divided this into three categories for simplification. Where, “Low” group represents who can only receive calls, “Moderate” level is for those smallholder farmers who can receive and dial calls, thirdly, “High” category shows smallholders who can write (send) and read (receive) SMS in addition to calls.

This figure indicates moderate to higher capability with mobile phones in Pakistan. However, higher capability is reported by the smallholder farmers in Tanzania. In addition, the sub-figure on the right displays financial portfolios of the smallholders. As can be noticed Pakistan leads in the use of financial instruments with a total of (18). Smallholders in Pakistan also high in credit instrument, whereas it stands in the middle when it comes to savings. Overall this figure describes that higher capability corresponds to greater likelihood of mobile money (as noticed in Tanzania). Moreover,

higher access to ICTs in Pakistan witnessed greater number of financial instruments. This evidence highlights the importance of ICTs and capabilities for financial inclusion. Educating people about financial markets and basic financial concepts could increase financial inclusion. Consequently, savings under the mattresses could become profitable once deposited in the bank. Moreover, ICT development can also contribute to expand financial inclusion through mobile money.

5.3.3. Correlation Analysis

The World bank enterprise surveys mainly collect qualitative data from SMEs around the world. Some quantitative information also been gathered by these surveys such as, sales, value of losses, costs etc. With this in mind we proceed to analyze qualitative data by considering appropriate techniques. We begin with the application of tetrachoric correlation from polychoric correlations family, that is useful to observe the association between two ordinal variables. Next we move to Canonical correlation analysis, a multivariate correlation approach. These two techniques are discussed and applied in the following subsections to examine the association among underlying variables.

5.3.3.1. Tetrachoric Correlation

To further strengthen the validity of these findings, we applied tetrachoric correlation in order to explore the association between access to finance and firm-level characteristics. This method is useful in case of dichotomous variable ideally having bivariate normal distribution, more detail available in (Kirk, 1973) and (Hattie, 1985). Table 5.1 presents the results of tetrachoric correlation among, firm age, size, region, ICT and financial access indicators.¹¹ All these variables are binary, for instance Micro is denoted if firm falls into the category of micro according to the World Bank and zero otherwise. Same procedure is followed for the other variables of size. Region variable tells in which province firm is located, it has five categories including Islamabad. Moreover, firms are divided into two groups i.e., young (less than 10 years of operations) and mature (more than 10 years). ICT variables such as use of email, mobile phone and maintenance of

11. We mainly used two R-package to apply tetrachoric correlation such as polycor and psych.

own website are also transformed to binary indicators. In addition, financial access of the firms approximated by bank checking/saving account, whether firm avails overdraft facility, does firm have a line of credit at bank and percentage of working capital financed by the bank.

All variables are transformed to dichotomous for the purpose of tetrachoric correlation and the results are reported in table 5.1. From this table we can notice weak to moderate clues of correlations between firm characteristics and access to finance. Micro enterprise dummy shows negative coefficients with small (-0.30), medium (-0.027) and large (0.23) firms. Small (-0.39) and medium (-0.37) enterprise dummies also indicate moderate negative correlation with larger firms. It implies that greater presence of larger firms might be less beneficial for micro and smaller firms. Micro level firms are more likely to be present in Sindh, KPK and Balochistan, for small firms KPK is the favorite province. While medium and larger firms are more likely to operate from Punjab and Islamabad regions.¹² Similarly, negative correlation of micro and small firms with ICT indicators can be observed, whereas medium sized firms show weak positive association. Conversely, larger firms are positively associated to ICT related indicators i.e., use of email (0.51) and having own website (0.52), while correlation for mobile remains weak and negative (-0.21), due to the fact that larger firms mainly use fixed official telephone or email to contact their suppliers/clients. This evidence about the size of firm and use of ICT also substantiates that larger firms are more adaptive towards new technologies due to their competitive advantage over the others. Evidence also suggests that small firms have weak positive with young and weak negative correlation with mature firms. Meaning that small firms are relatively young with less than 10 years of operation. Medium and large firms also denote negative association with younger categories and more likely to fall in mature/older firm group. This result confirms that micro and small firms are younger than the medium and larger firms.

[Table 5.1 here]

Empirical evidence suggests that SMEs differ significantly in access to finance (see,

12. Punjab is the largest province in Pakistan with respect to population and its largest share in country's GDP, it is also considered as bread and butter of Pakistan. Islamabad is the capital of Pakistan.

for instance, (Rajan & Zingales, 1998)). Here we used four indicators of firms' access to finance in Pakistan and notice negative association of all these indicators with micro and small firms. Likewise, medium enterprises show positive negligible correlation with financial access indicators. In contrast, larger enterprises reveal moderate association with bank account (0.26), bank overdraft facility (0.48), line of credit (0.20) and working capital percentage 40-60% (0.22), 80-100% (0.20). Thus, our evidence further strengthens the fact that micro and small firms are financially constrained in Pakistan.

Furthermore, findings indicate association between region and access to ICT related technologies. In Pakistan, Sindh province found to be genial for firms in terms of firm's technological advancement. Besides, firms located in Islamabad are highly likely to maintain their own business website (0.24) but are less inclined towards the use of mobile phone (-0.55). More importantly, moderate positive correlation is noticed between ICT and access to finance indicators. Likewise, within correlation among the set of these indicators is almost analogous to between correlation. Use of email with bank account (0.29), overdraft (0.43), line of credit (0.36) and with working capital percentage 40-60% (0.39), 80-100% (0.36). In the same way, correlation of website with bank account (0.30), overdraft (0.45), line of credit (0.36) and with working capital percentage 40-60% (0.45), 80-100% (0.28). Contrarily, association of mobile phone is insignificant with any of the access to finance indicators except line of credit (0.15). Similarly, mature/older firms in Pakistan are more likely to participate in financial markets. Therefore, our evidence largely supports the hypothesis that larger enterprises have greater participation in the financial markets, they are more innovative and adaptive to the new technologies. Consequently, the access and use of new technologies lead them to financial access and vice versa. For robustness of this result and to examine within and between correlations of underlying variables in more detail, next section applies canonical correlation analysis.

5.3.3.2. Canonical correlation analysis

In the previous section, we found moderate association between a set of ICT and financial access indicators along with other firm-level characteristics. However, this section intends to determine within and between correlations (ICT) or (financial access)

set of variables. It will give us a sense about how our selected indicators of each variable are connected. Canonical correlation analysis (CCA) is somewhat similar to the traditional Principle Component method (PCM), which is used to reduce the dimensionality of data. Whereas, CCA usually provides the association between two sets of variables. In this part of analysis, we are interested to examine that how access to finance indicators are related to ICT and size of the firm.

In their article [Hamid *et al.* \(2011\)](#) applied this version of correlation on a set of continuous and discrete variables. Canonical correlation chiefly used in medical and behavioral studies however, [Fornell & Larcker \(1980\)](#) suggested its application in accounting and financial research. More recently, [Loureiro \(2014\)](#) applied this version of correlation to financial data.

Empirical evidence indicates that firm level innovation indicators are strongly related to the access to finance (see, for example, ([Lee *et al.*, 2015](#))). The CCA provides plenty of results, however the most important output is reported here in tables [5.2](#) and [5.3](#).¹³ Where table [5.2](#) presents the results of canonical dimensions and contains canonical correlation coefficient, f-stats, degree of freedom and probability value. We can notice from the column of canonical correlation that dimension one and two are significant in all considered dimensions. As they have (0.41) and (0.15) canonical correlations between two sets of underlying variables, this result also confirms the finding of tetrachoric correlation. Dimension (3) and (4) continue to remain insignificant with nominal insignificant correlations.

[Table [5.2](#) here]

Moreover, F-stat with a value of (17), tests whether dimensions altogether are significant, second row (F=3) which tests the significance of remaining dimensions except (1). Dimension (3) attempts to verify whether (3) and (4) combined are significant, while (4) tests its significance itself. It exhibits intra indicator correlation in the upper left (ICT) and upper right (access to finance) figures and inter correlations between two sets of variables. Correlation within ICT related indicators seems moderate to strong

13. We mainly followed the approach suggested by [González *et al.* \(2008\)](#), and their R-codes using CCA package with some modifications to serve our purpose.

in most of the cases, however within access to finance variables it mostly lies within weak to moderate regime. Moreover, figure at the bottom displays correlation between two underlying sets of variables. In this image green color is the predominate, which indicates the lower inter correlation between these two variables. However some signs of weak to moderate relationship can be observed.

[Table 5.3 and figure 5.11 here]

Up next, table 5.3 provides standardized canonical coefficients. This table reports coefficients for only three dimensions for our two sets of variables. In the first set of variables, size of the firm (0.53) is the major contributor followed by (Website, 0.39) to first dimension. In the second set, bank overdraft is the influential indicator in dimension (1) with a coefficient of (0.78). Similarly, dimension (2) is greatly influenced by mobile (0.81) followed by size (0.41). Whereas, bank overdraft (0.66) consistently contributing to dimension (2) followed by the contribution of working capital (0.64). First two dimensions were seen as significant from the previous table, again dimension (3) is strongly influenced by size (0.87) and mobile (0.58). In canonical dimension (3) bank account has considerable contribution (0.85) followed by working capital (0.37). This suggests that both sets of indicators are well connected and have strong association that can be noticed from figure 5.11 too.

5.3.4. Multiple Correspondence Analysis

In this section we turn our attention to describe systematic patterns of variation between SMEs' access to finance and ICT indicators by applying multivariate technique (MCA). It is an extension of simple correspondence analysis (for more detail, see section 4 of the chapter 4). The intention behind using this approach comes from the fact that our concerned data is qualitative and (MCA) has been one the best choices to determine association among qualitative variables. This data analysis technique introduced by French statistician (Benzécri, 1973). Researchers from variety of disciplines acknowledged this multivariate approach and used it for categorical data analysis. Although, it has been the foremost pick for the medical science research (see, for instance, (Costa *et al.*, 2013)) and (Ayele *et al.*, 2014), it is equally applicable in social science research Greenacre

(2007). This study utilizes (MCA) to investigate the association and to describe the variations between access to finance and ICT related indicators of SMEs in Pakistan. An indicator or Burt matrix of qualitative variables requires to do the same, for more detail discussion on correspondence analysis (see also Greenacre (2007)).

The MCA furnishes numerous analytic and visual output, however in this section we straight away presented factor maps by supplementary qualitative variables and active variables with ellipses.¹⁴ Figure 5.12 is the output of several qualitative active variables in reduced dimensional space, representing access to finance and ICT level of SMEs. Following (Ayele *et al.*, 2014), only first two dimensions are considered in this visual representation, as they account for maximum percentage of explained inertia. Access to finance variables such as, having a bank account, overdraft facility, line of credit, share of working capital and investment financed by bank (transformed into different categories e.g., less than or equal to 20, 20-50, 50-80, and above 80). Similarly, set of ICT and innovation indicators as suggested by the WBES includes, quality certification such as ISO 9000 etc. international license, use of email, maintenance of business website, audited financial statements and employee training.

In addition, to examine whether firms are different in access and use of finance and ICT by size and age we include these two indicators in the active indicators analysis. Whereas, region of the establishment and an indicator of firm's top management (whether top manager is female or not) are used as supplementary variable to note how distinguishable firms are based on underlying dimensions.

We predicted coordinates of "region" and "female" variables through extracted dimensions of MCA.¹⁵ Figure 5.12 (left) reveals that ICT and access to finance indicators are not significantly different across regions in Pakistan. As the confidence ellipses are overlapping for all provinces and the points are centered except some exceptions. While, the image on the right exhibits two categories e.g., if the top manager of firm is female (Yes) or not (No). Two distinct yet overlapping ellipses can be noticed from the

14. For an application of MCA, we used R-packages i.e., FactoMineR and ade4, also JLutils provided by J.Lamarange. Available at: <http://larmarange.github.io/analyse-R/analyse-des-correspondances-multiples.html>

15. Supplementary variables are not part of the analysis, however after performing MCA they can be predicted using obtained results.

figure, that could fairly lead to a conclusion that having a female top manager does not significantly differentiate the firm in terms of access to finance and ICT adoption.

[Figure 5.12 here]

In addition figure 5.13 presents biplot for each variable included in the MCA. The most left to right graphs correspond to the size and age of the firm, where size of the firm confirms that small and medium enterprises (green and blue) responded differently compared to the larger firms (in red). The proximity among young and mature firms is also not too apparent, whereas distinct patterns can be observed on the basis of certification and license, that is whether firm has international certification and license or not.

Similarly, firms could be distinguished on the basis of their use of email and website, audited financial statements and conducting a training, as can be noticed from the orthogonal direction of the clouds. All these indicators depict alike results. It can be inferred that firms are dissimilar in access and use of ICT/innovation technologies. Moreover, we marginally notice a similar pattern when access to finance represented as account, whereas on the basis of overdraft and line of credit, firms can be distinguished significantly. As can be seen two distinct clouds red and blue in both cases. This implies that a larger number of firms have access to basic bank account, but when it comes to an overdraft facility and maintaining a line of credit, small and sometimes medium enterprises fall short.

[Figure 5.13 here]

Finally, two transformed variables such as working capital and investment financed by bank reveal interesting variation patterns. Where zero represents those firms that have zero investment or working capital financed through banks, these firms are significantly different compared with the others. However, proximity between those with bank financed fixed assets and working capital is very close and lie towards first dimension. Conversely, non-overlapping ellipses and closely placed clouds also indicate the association between our underlying categorical variables. Further, significant distance of zero and financing from bank can be seen in these images. This reasserts the association between ICT

and financial inclusion indicators and assures the validity of selected dimensions for each variable. These results substantiate the findings of previous sections, also provide the directions for further research with the application of multivariate data analysis approach. Furthermore, we also show distribution of each axis and its indicators using box plot in figures 5.14a and 5.14b, while figure 5.15 shows the distribution of factorial design through histogram.

[Figures 5.14a, 5.14b and 5.15 here]

5.3.5. Probit Analysis

Although declining trends in financial access and upward movements of ICT indicators are self-explanatory in figures 5.4 and 5.5. Yet one may want to delve into numbers to quantify the magnitude of association between these important indicators of firm. To examine the determinants of SMEs' financial inclusion in Pakistan, a probit model is used by considering a range of firm-level characteristics. In this part of the analysis, we included two variables namely bank account and line of credit to approximate firms' access to finance, inline with the World Bank definition of firms' financial inclusion. Table 5.4 furnishes marginal effects of probit model. In columns (1-3) bank account served as dependent variable, it denotes whether firm holds an account at bank or not. We find positive and significant coefficient of firm age on the probability of holding bank account with a value of around (0.003) in first three columns. Consistent with the previous literature this result indicates that, as firms get older their probability of financial market participation increases. Next predictor "female" represents 1 if the top manager of firm is female, 0 otherwise. It remains insignificant across all columns. Thus, it can be inferred that firms having female managers are not different in access to finance than those of managed by men.

Next, we enter region as a potential predictor of firms' access to finance. Regional dummies correspond to the firms' geographic location in one of the five administrative provinces. Punjab is the base category in regional dummy variables, coefficients for Sindh and KPK are found to be insignificant while firms in Baluchistan (0.183) and Islamabad (-0.112) regions significantly different than the firms in Punjab in terms of

financial access. In addition, size of the firm comprised of four categories, where micro firm category serves as base group. At the same time, we notice that SMEs are more likely to hold a bank account compared with micro enterprises. Next predictor employee training engaged to proxy firm's dynamism. It shows that firms that have organized training sessions for its employees they have 10% more chances to hold bank account than those who did not. More importantly our main variables of concern ICT related technologies such as use of email, own website and use of mobile phone are individually included in columns (1-3). We suspect that firms that are innovative, adaptive to new technologies have more information about financial markets. Further, they need more money to finance their innovative projects. Thus they are more likely to engage in financial markets to fulfill their financial needs. The coefficient of mobile phone stays insignificant for bank account whereas it is significantly associated to the line of credit.¹⁶

[Figure 5.4 here]

Moving forward, line of credit at bank is taken as outcome variable to measure SMEs' financial inclusion and the results are presented in columns (4-6) of table 5.4. Except some of the coefficients, at large these results are analogous to what we have found for bank account. Age variable is still positive and significant with nominal coefficient except column (4). Regional category evolved in these columns, where firms in Sindh are less likely to have line of credit than Punjab. None of the other category is significantly different in these equations. Next, we notice varying coefficients for size of the firms, where larger firms are significantly different in terms of having line of credit with positive significant coefficient ranging between (12.7-17.1%). Employee training on the other hand, appeared with an insignificant coefficient across all columns.

Finally, all indicators of ICT turned up to be important predictor of SMEs' line of credit with marginal effects of email (8%), website (9%) and mobile phone (7%). These results suggest that age of the firm, size of the establishment and ICT related indicators are strong predictors of SMEs' access to finance. In addition, up to certain extent geographic location of the SMEs also play role in access to finance. It is however important to note that the results obtained are sensitive to the indicator of SMEs'

16. We could not notice significant role of mobile phone in our previous analyses, (MCA and CCA).

financial inclusion. Results obtained through probit model largely complements the findings of correlation analysis (such as tetrachoric and canonical correlations). In addition, the probit model also provides various diagnostic tests that are shown at the bottom of table 5.4. Evidence regarding firm's age, size and access to finance presented in this study are consistent with those of Beck *et al.* (2008) and the results regarding ICT adoption and probability of financial access are similar to the results of Dalla Pellegrina *et al.* (2017).

5.4. Conclusion

This study intends to present empirical evidence on SMEs' access to finance and ICT adoption in an emerging economy Pakistan. This study also attempts to highlight the current status of financial inclusion in Pakistan and country's progress towards UFA 2020 goals. With this in mind, we analyzed World Bank enterprise survey (WBES) data and other official sources of the Government of Pakistan, using battery of most relevant econometrics techniques. In the first part of data analysis we mainly utilized Exploratory Data Analysis (EDA) approach, whereas the second part involves probit model. The EDA technique is based on visualization of underlying variables and their association. It suggests increasing patterns of credit access indicators in all sectors except SME finance.

In addition, we also observed greater ICT adoption rate and lower growth in SMEs' access to finance in Pakistan since 2007. On the one hand, SMEs' ICT adoption in Pakistan is higher relative to South Asia and other lower middle income countries with similar level of economic growth. While on the other, Pakistani SMEs depict lowest financial inclusion compared to other regional counterparts. We find that the age of the firm, size and ICT related indicators are strong predictors of SMEs' access to finance in Pakistan. To extent results of all approaches used in this study are complementary, for instance probit model suggests that ICT related indicators are greatly associated with SMEs' access to finance. Likewise, tetrachoric and canonical correlation indicate moderate association between these underlying variables. This implies that firms with greater access to and use of new technologies are more likely to benefit from financial markets and vice versa. Further, results of Multiple Correspondence analysis (MCA) also

indicate the association between ICT adoption and SMEs' access to finance. Evidence presented by this vary study are largely consistent with those of [Greenwood & Jovanovic \(1990\)](#), [Beck *et al.* \(2008\)](#), [Dalla Pellegrina *et al.* \(2017\)](#).

In sum, policies directed towards inclusive and transparent financial sector and ICT infrastructure development can help achieve financial inclusion 2020 goals. That could eventually reduce poverty and promote economic growth by flourishing SME sector. Further research might be undertaken by considering multivariate data analysis approaches suggested by this study. It might also be interesting to examine the importance of ICTs and SMEs' human capital for credit access.

5.5. Appendices

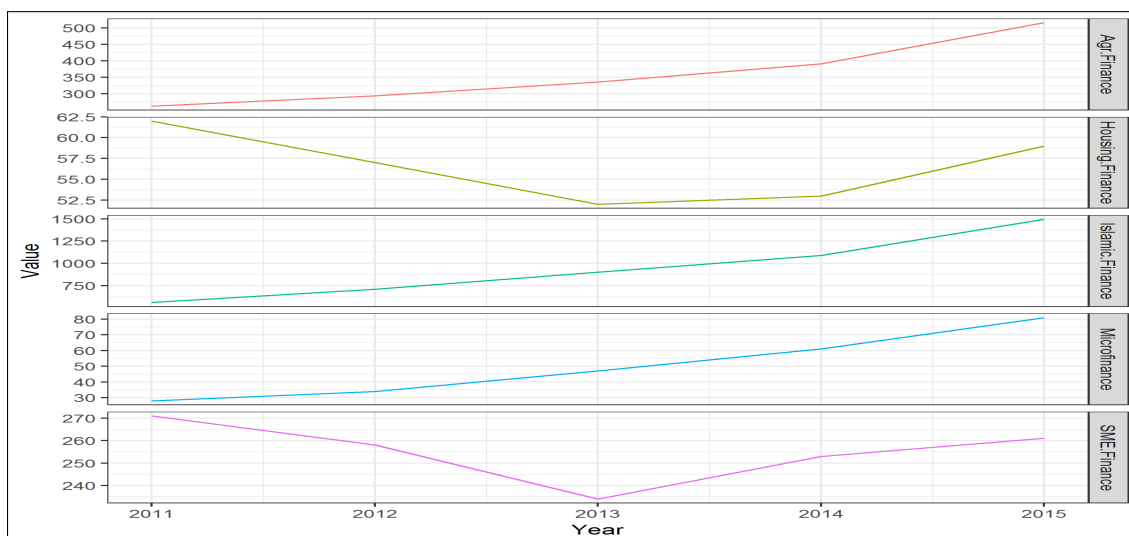


Figure 5.1 – Credit Access Indicators in Pakistan

Source: Author’s calculations, Financial Inclusion Country Paper-Pakistan

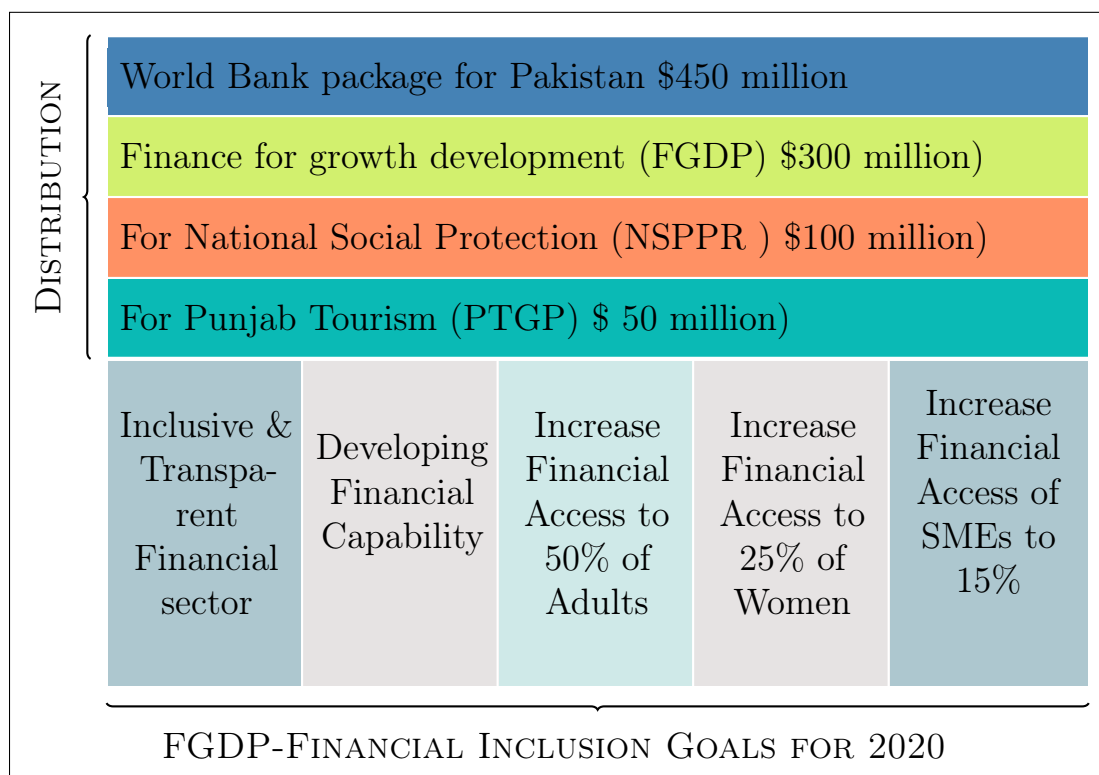


Figure 5.2 – Distribution of World Bank Package for Pakistan, May 17, 2017

Source: World Bank, Author’s compilation

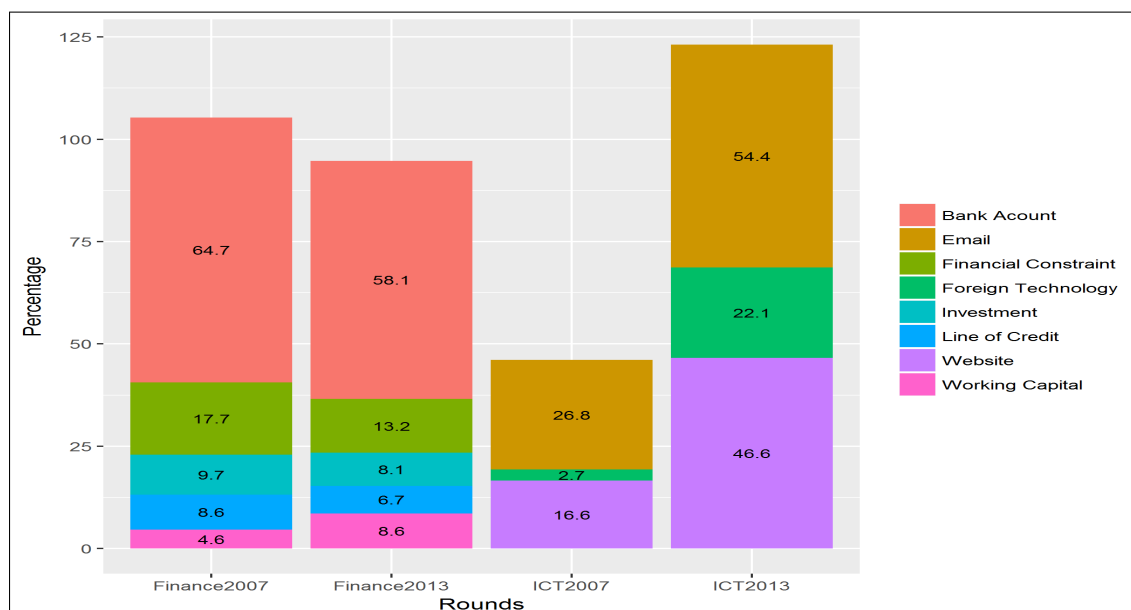


Figure 5.3 – Access to and use of Finance and ICT in Pakistan

Source: Author’s compilation, using WBES Pakistan-2007 & 2013

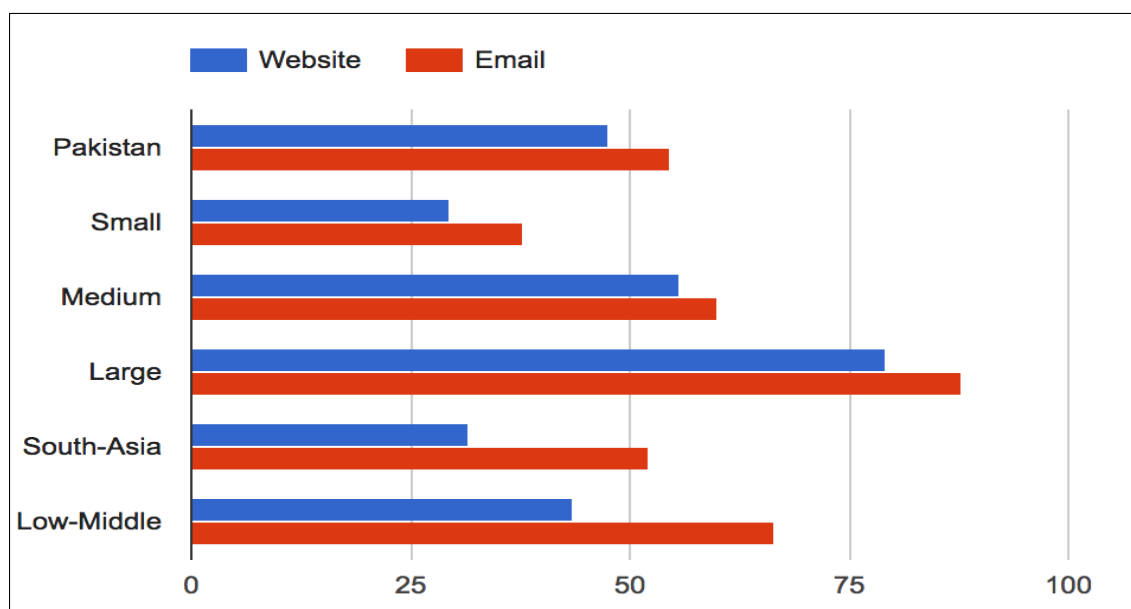


Figure 5.4 – Comparative Analysis of ICT

Source: Author’s compilation, using WBES Pakistan-2013

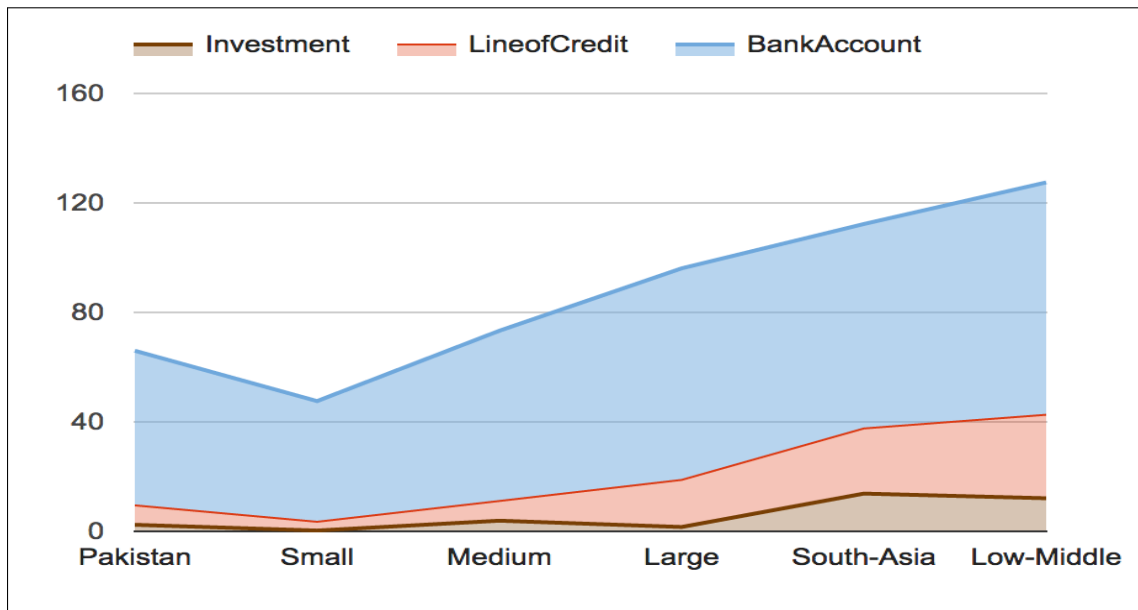


Figure 5.5 – Comparative Analysis of Financial Inclusion

Source: Author’s compilation, using WBES Pakistan-2013.

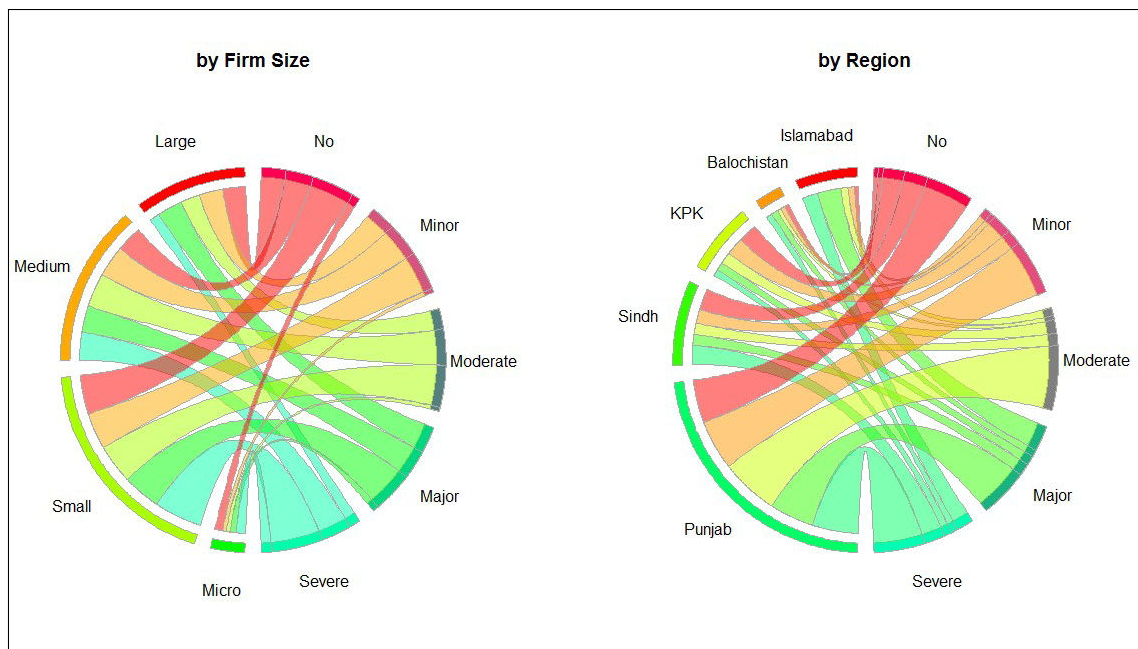


Figure 5.6 – Access to Finance Constraints

Source: Author’s calculations, using WBES Pakistan-2013

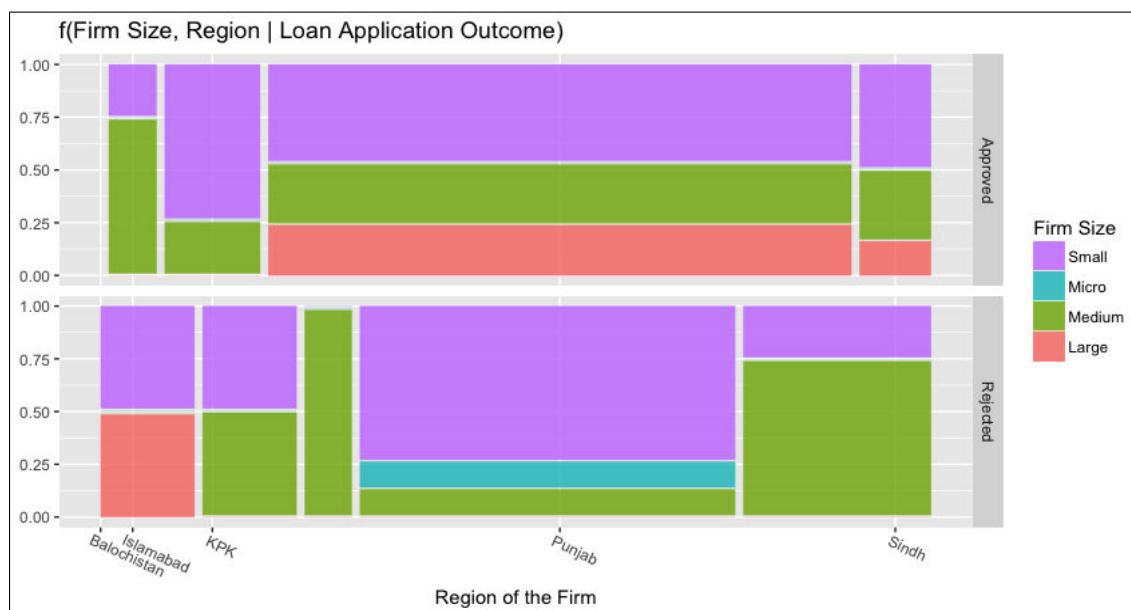


Figure 5.7 – Loan Application Outcome

Source: Author’s calculations, using WBES Pakistan-2013

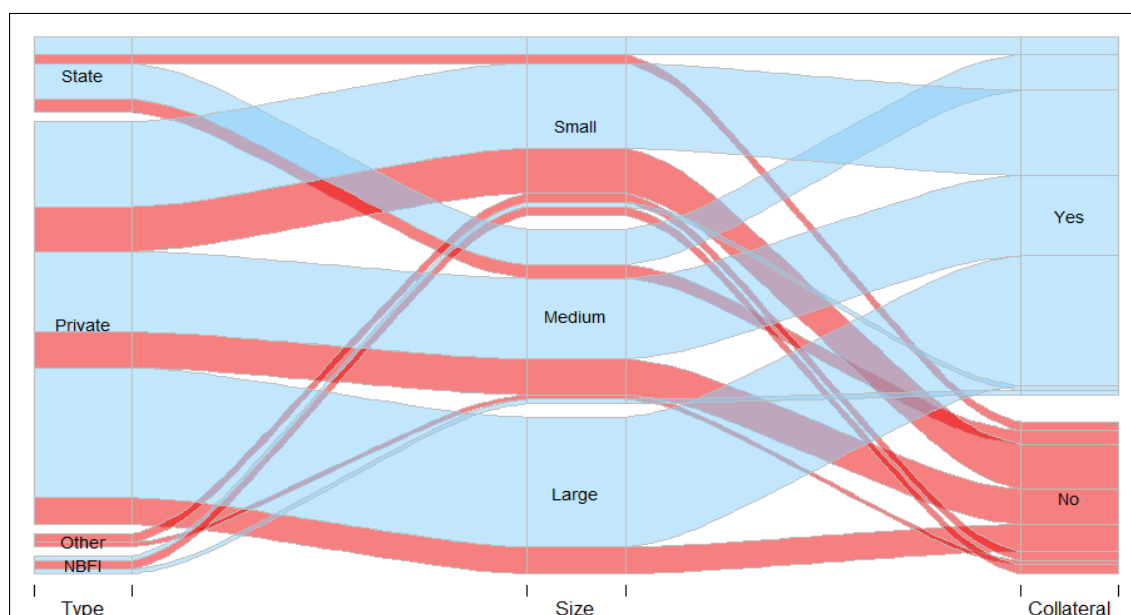


Figure 5.8 – Type of Financial Institution, Firm Size and Collateral

Source: Author’s calculations, using WBES Pakistan-2013

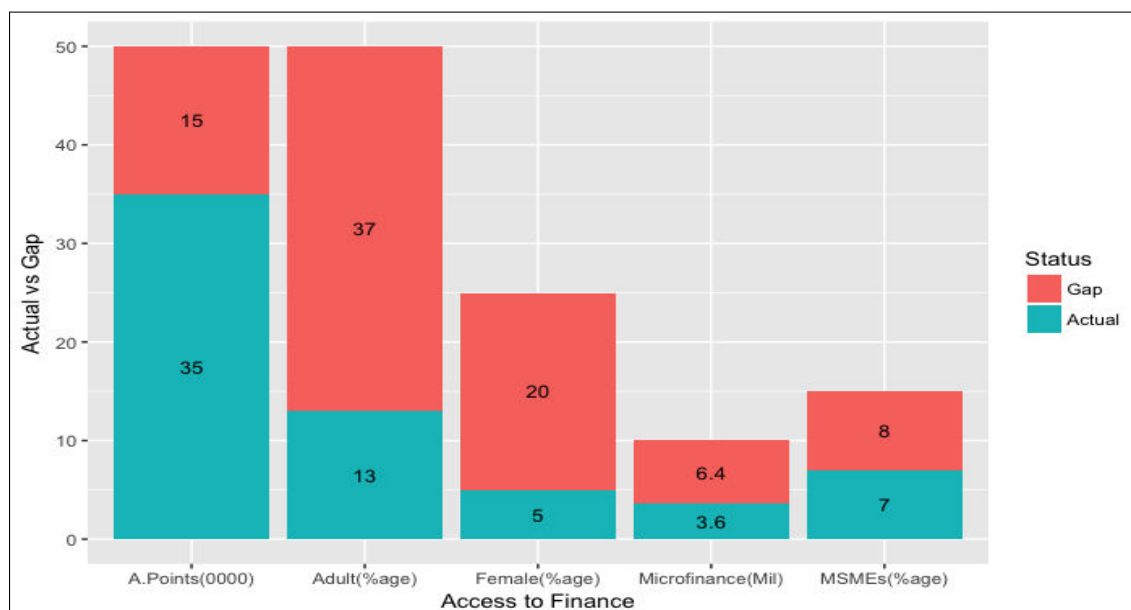


Figure 5.9 – Access to Finance and Gap

Source: Author’s calculations

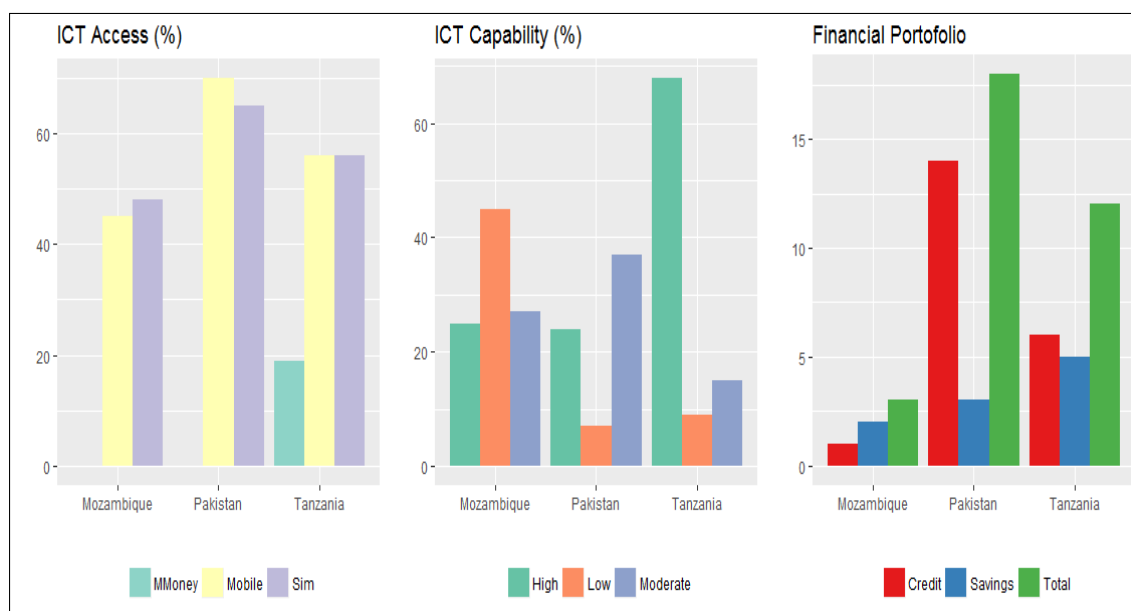


Figure 5.10 – Smallholders Access to Finance and ICT

Source: Data from Smallholder Diaries 2016

Table 5.1 – Tetrachoric Correlation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Micro	1.00																		
Small	-0.30	1.00																	
Medium	-0.27	-0.41	1.00																
Large	-0.23	-0.39	-0.37	1.00															
Punjab	-0.19	0.09	0.14	-0.11	1.00														
Sindh	0.20	-0.16	-0.08	0.16	-0.34	1.00													
KPK	0.10	0.19	-0.02	-0.28	-0.36	-0.27	1.00												
Balochistan	0.12	-0.01	-0.18	0.13	-0.31	-0.16	-0.17	1.00											
Islamabad	-0.16	-0.23	0.05	0.29	-0.32	-0.19	-0.20	-0.07	1.00										
Email	-0.22	-0.41	0.12	0.51	-0.12	0.32	-0.20	0.06	0.09	1.00									
Website	-0.23	-0.39	0.07	0.52	-0.14	0.24	-0.29	0.11	0.24	0.88	1.00								
Mobile	-0.01	0.09	0.13	-0.21	0.09	0.31	0.10	-0.06	-0.55	0.28	0.06	1.00							
Young	0.02	0.17	-0.15	-0.05	-0.11	-0.06	0.07	-0.05	0.26	-0.07	-0.03	-0.15	1.00						
Mature	0.03	-0.20	0.10	0.13	0.15	0.17	-0.26	-0.03	-0.10	0.22	0.09	0.02	-0.60	1.00					
Bank	-0.17	-0.13	0.00	0.26	-0.05	0.12	-0.11	0.19	-0.09	0.29	0.30	0.07	-0.05	0.24	1.00				
Overdraft	-0.25	-0.26	-0.04	0.48	-0.10	-0.02	-0.15	0.17	0.31	0.43	0.45	-0.16	-0.07	0.10	0.42	1.00			
Line of Credit	-0.31	-0.07	0.09	0.20	0.12	-0.03	-0.10	-0.07	0.13	0.36	0.36	0.15	-0.03	0.14	0.09	0.43	1.00		
Working Cap60	-0.02	-0.27	0.04	0.22	0.38	-0.18	-0.18	0.03	-0.04	0.39	0.45	0.09	-0.02	-0.02	-0.02	0.30	0.63	1.00	
Working Cap80	0.07	-0.14	0.10	0.00	0.22	-0.12	-0.12	0.09	0.03	0.02	-0.13	-0.04	0.11	-0.03	-0.42	0.33	0.41	0.44	1.00
Working Cap100	0.07	-0.14	-0.06	0.20	-0.22	0.23	-0.10	0.27	0.04	0.36	0.28	-0.02	0.10	-0.04	0.07	0.21	0.57	0.45	0.49

Table 5.2 – Tests of Canonical Dimensions

Dimension	Can. Corr	F	df1	df2	p
1	0.41	17.17	16	3785.85	0.0000
2	0.15	3.48	9	3017.98	0.0003
3	0.04	0.42	4	2482	0.79
4	0.00	0.00	1	1242	0.95

Table 5.3 – Standardized Canonical Coefficients

ICT	Dimensions		
	(1)	(2)	(3)
Size	-0.5376	0.4108	0.8799
Email	-0.2981	-0.1485	-0.2787
Website	-0.3973	-0.363	-0.5653
Mobile	0.0942	-0.8198	0.5847
Financial			
Bank Account	-0.3119	-0.5126	0.849
Bank Overdraft	-0.7814	0.6617	-0.2607
Bank Line of Credit	-0.1888	-0.3603	-0.2101
Bank Working Capital	-0.1097	-0.6406	-0.3777

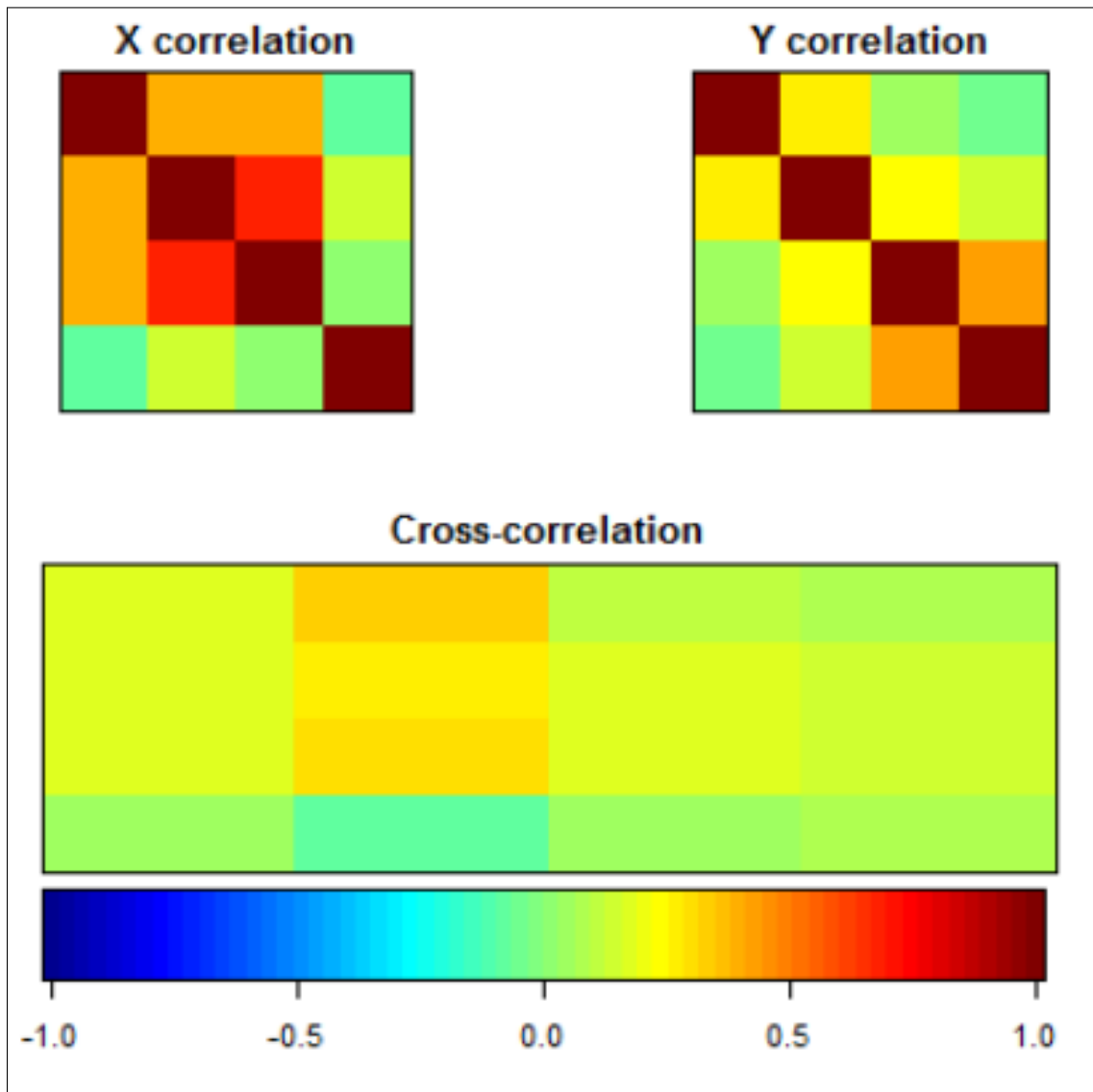


Figure 5.11 – Canonical correlation plot

Source: Author's calculations, using WBES Pakistan-2013

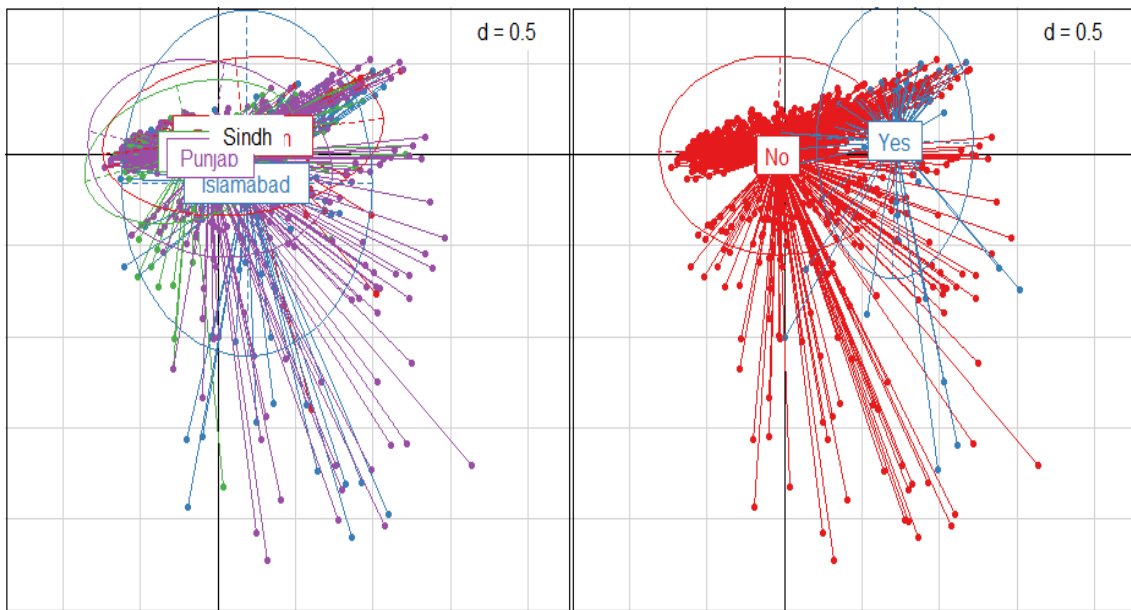


Figure 5.12 – Factor Maps by supplementary variables

Source: Author's calculations, using WBES Pakistan-2013

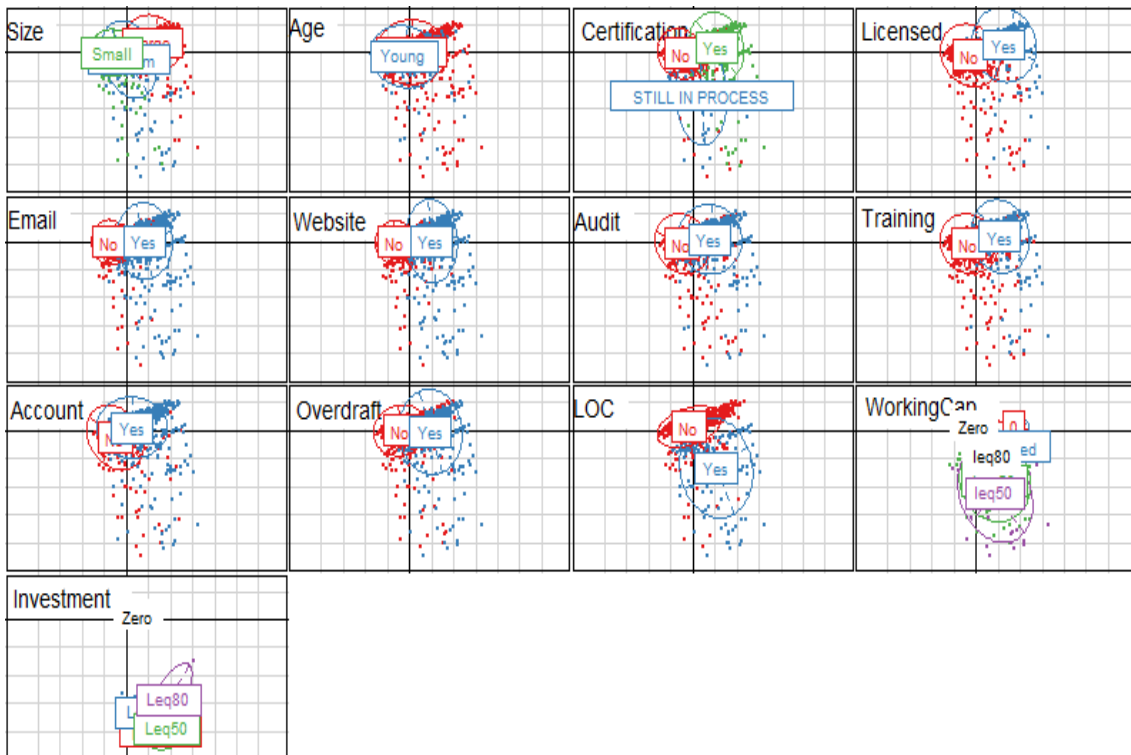


Figure 5.13 – Confidence ellipses plot

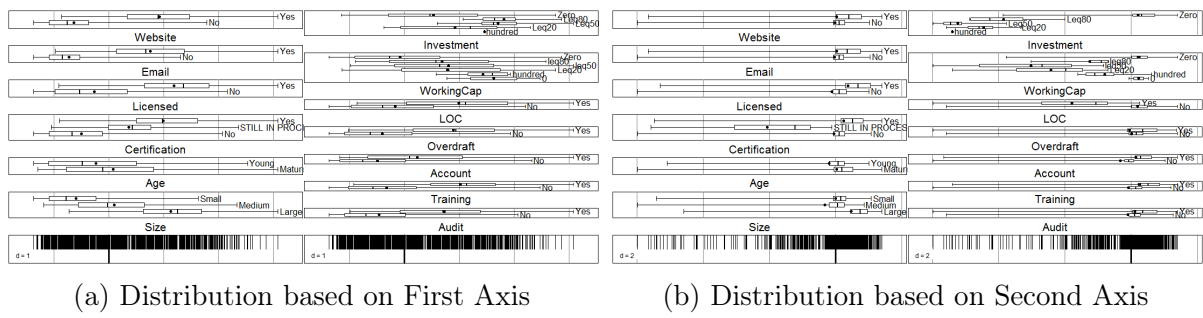


Figure 5.14 – Box plots

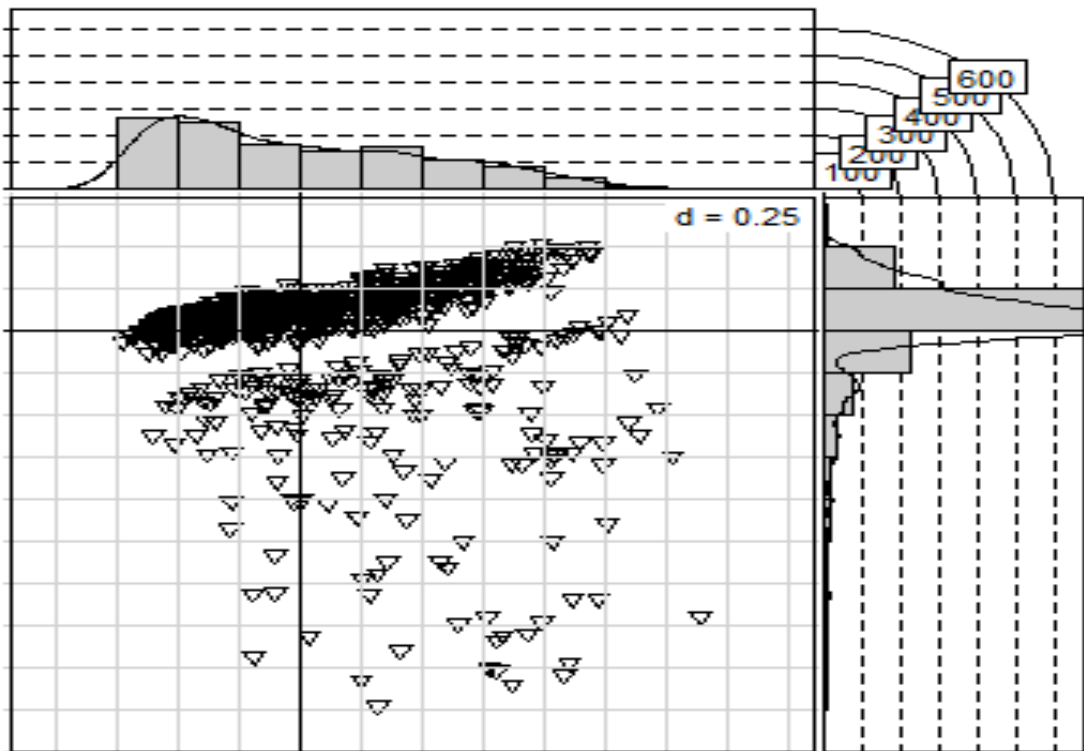


Figure 5.15 – Distribution of individuals based on Factorial Plane

Table 5.4 – Probit Marginal Effects

	Bank Account			Line of Credit		
	(1)	(2)	(3)	(4)	(5)	(6)
Firm Age	0.003** (0.001)	0.003** (0.001)	0.003** (0.001)	0.001 (0.001)	0.001* (0.001)	0.001* (0.001)
Female	0.045 (0.075)	0.033 (0.075)	0.060 (0.075)	0.011 (0.033)	0.002 (0.033)	0.015 (0.035)
Base Group: Punjab						
Sindh	0.030 (0.042)	0.034 (0.042)	0.039 (0.042)	-0.056* (0.024)	-0.053* (0.024)	-0.050* (0.025)
Khyber-Pakhtunkhwa	-0.004 (0.039)	0.003 (0.039)	-0.007 (0.039)	-0.027 (0.024)	-0.023 (0.024)	-0.032 (0.025)
Balochistan	0.183* (0.073)	0.178* (0.073)	0.188** (0.073)	-0.056 (0.042)	-0.068 (0.042)	-0.054 (0.043)
Islamabad	-0.112* (0.056)	-0.122* (0.056)	-0.100 (0.058)	0.018 (0.029)	0.003 (0.029)	0.035 (0.032)
Base Group: Micro						
Small	0.125* (0.058)	0.125* (0.058)	0.128* (0.058)	0.115 (0.062)	0.115 (0.062)	0.126 (0.065)
Medium	0.143* (0.060)	0.146* (0.060)	0.161** (0.060)	0.117 (0.063)	0.121 (0.063)	0.145* (0.066)
Large	0.252*** (0.065)	0.253*** (0.065)	0.288*** (0.064)	0.127* (0.063)	0.126* (0.063)	0.171** (0.066)
Employee Training	0.109** (0.038)	0.097* (0.038)	0.125*** (0.037)	0.015 (0.019)	0.008 (0.020)	0.031 (0.020)
E-mail	0.081** (0.031)			0.083*** (0.018)		
Business Website		0.094** (0.033)			0.087*** (0.018)	
Cellular			0.041 (0.049)			0.070* (0.035)
(Intercept)	-0.139* (0.061)	-0.139* (0.061)	-0.162* (0.074)	-0.372*** (0.063)	-0.368*** (0.063)	-0.431*** (0.073)
McFadden R-sq.	0.1	0.1	0.1	0.1	0.1	0.0
Cox-Snell R-sq.	0.1	0.1	0.1	0.0	0.0	0.0
Nagelkerke R-sq.	0.1	0.1	0.1	0.1	0.1	0.1
Likelihood-ratio	95.7	97.0	89.6	55.0	57.1	39.2
p	0.0	0.0	0.0	0.0	0.0	0.0
Log-likelihood	-766.4	-765.8	-769.5	-382.9	-381.9	-390.8
Deviance	1532.9	1531.6	1538.9	765.8	763.7	781.6
AIC	1556.9	1555.6	1562.9	787.8	785.7	805.6
BIC	1618.4	1617.1	1624.5	844.2	842.1	867.2
N	1247	1247	1247	1247	1247	1247

Notes: Table presents the results of probit marginal effects, in columns (1-3) a binary outcome that is bank account. While columns (4-6) contain binary outcome variable line of credit. Age of the firm is in years, female is whether top manager of the firm is female zero otherwise. Region category includes four provinces, Punjab (base category), Sindh, KPK, Balochistan and capital territory of Islamabad. Firms are classified into four categories on the basis of number of full time permanent employees, Micro, Small, Medium and Large. Employee training is a binary variable, whether firm has arranged a training session for its employees in last two years or not. Email, Business website and Cellular are also dichotomous variables that represent firms' ICT adoption.

General Conclusion

Finance growth relationship has always been at the heart of the investigation of development economists. The arguments of [Bagehot \(1873\)](#) and [Schumpeter \(1911\)](#) ignited the recurrent debate over the financial market implication for real economy. The assessment of this pressing phenomenon attracts renewed attention with the development of new econometrics approaches, changing landscape of financial markets, intricate economic systems and technological innovations. Contemporary research in this underlying issue goes beyond conventional finance-growth nexus and highlights the importance of financial development for consumption smoothing, capital accumulation, foreign direct investment, income distribution, poverty reduction, infrastructure development and facilitation of the technological and innovation process. This dissertation undertakes the established theoretical ground and builds on the existing literature by considering new developments in the financial and technological sectors and their implications for the poverty and inequality. This study explores relatively understudied dimensions that are potentially linked to the financial inclusion and household welfare in particular for Pakistan and in general for lower middle income countries.

According to the World Bank, over 2 billion people are unbanked worldwide; without access to formal financial services. Third chapter explores the role of new technologies in promoting financial inclusion and poverty reduction in middle and low income countries. Based on cross country data it also presents evidence on digital finance and new technologies. This paper takes into account several fresh dimensions of financial inclusion and ICT. The results support the idea that new technologies such as access to and use of mobile phone and Internet promote financial inclusion and reduce poverty. Moreover, improved access to finance turned out to be an imperative factor in poverty

and inequality reduction. This chapter also highlights the association between the rise of digital financial services and mobile phone penetration.

Fourth chapter of the thesis reveals demand side of the financial inclusion in Pakistan. This indicates the importance of financial literacy for effective financial market participation. This chapter strives to determine whether financial literacy and access to and use of ICT help to expand financial inclusion among low and middle income groups in Pakistan. In addition, this chapter also attempts to figure out the role of financial literacy in retirement planning. The results show that financial savvy individuals are more likely to hold bank accounts. However, we did not find evidence in favor of the association between basic financial literacy and financial inclusion. Similarly, the access to and use of ICT increases the probability of having a formal bank account. Furthermore, it also puts forth that financial literate individuals are weak at retirement planning and household budgeting. In brief, this paper finds that financial literacy accompanied by effective financial inclusion yields household welfare.

Finally, the fifth chapter unveils the association between new technologies and firm's access to finance in Pakistan. This chapter also focuses on the overall access to finance in Pakistan, recent trends and initiatives to expand financial access in light with the Universal Financial Access 2020. Exploratory data analysis indicates the efforts in achieving financial inclusion goals by 2020, which seem distant in the present scenario. Although, financial access has shown encouraging numbers over the last decade, still a huge number of adult population and SME sector is unbanked and without access to formal credit. This chapter also finds that large and older firms are more likely to have access to credit than the small and younger firms. Furthermore, results show that SMEs with greater access to and use of ICT are more likely to engage in financial market and possess line of credit.

Appendix A

Appendix to Thesis

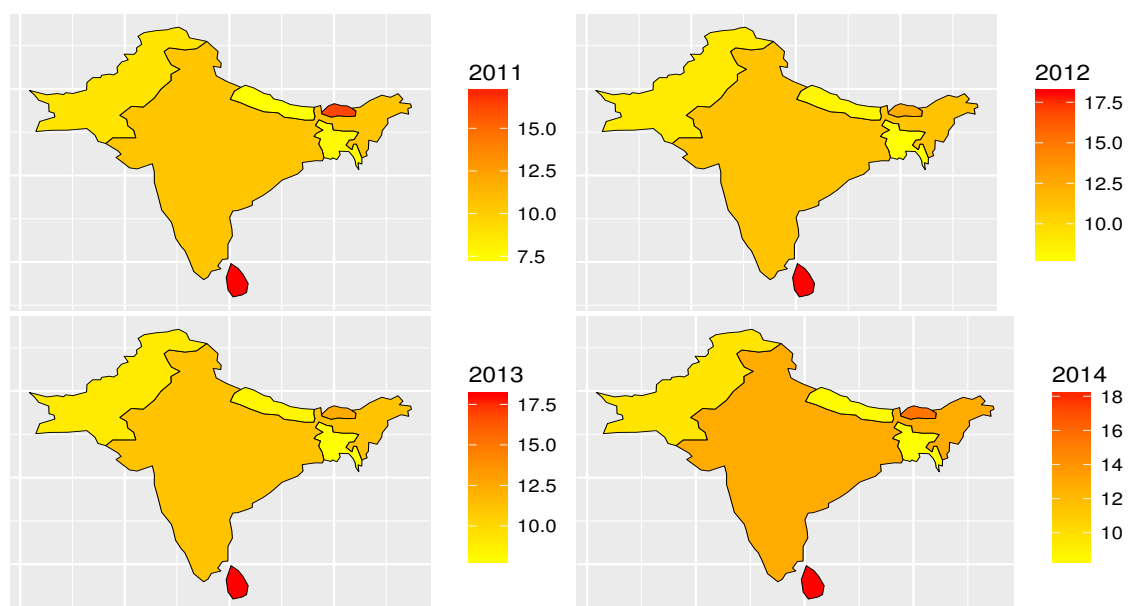
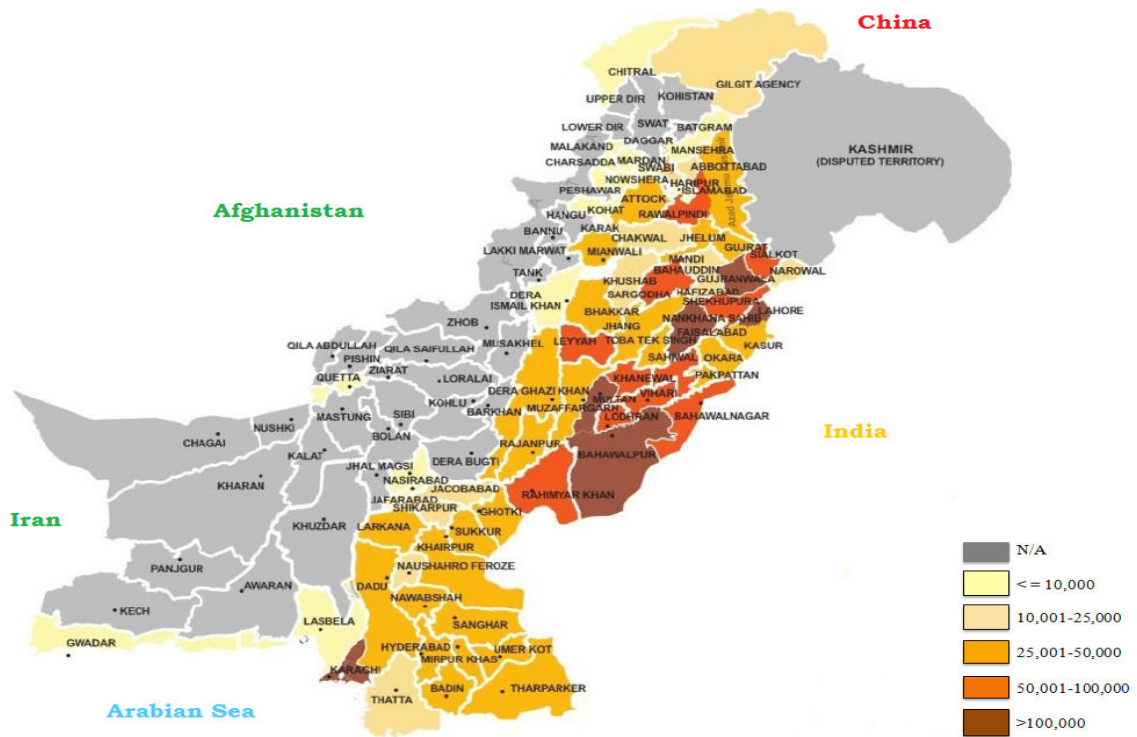


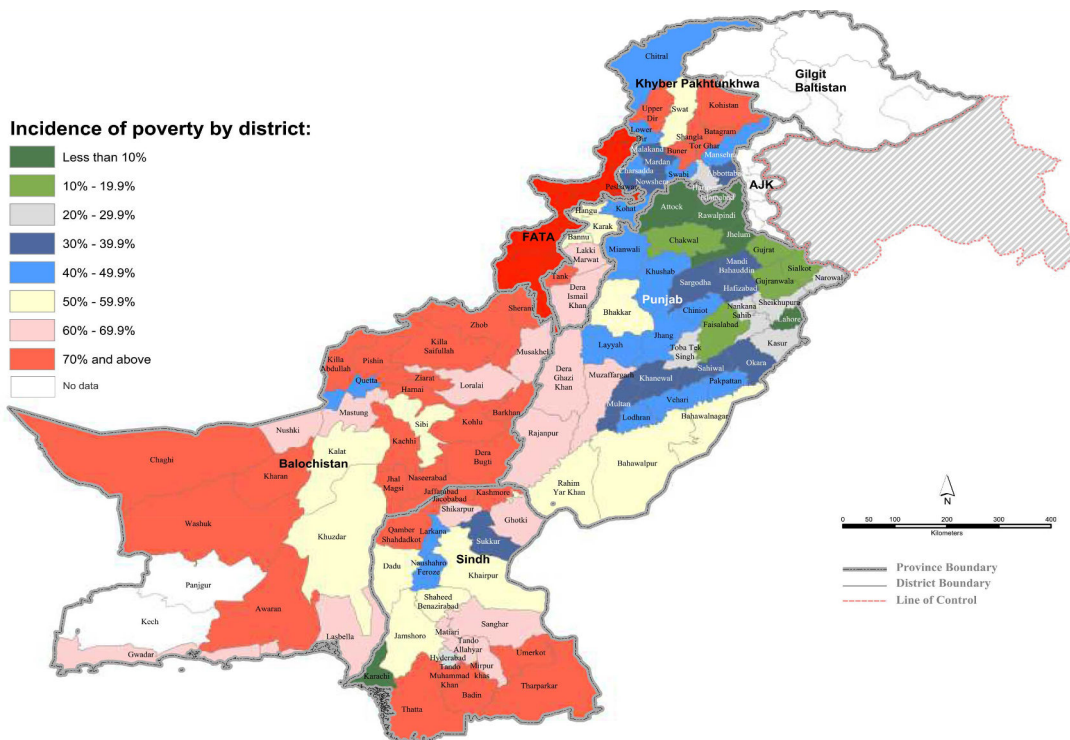
Figure A.1 – Commercial bank branches per 100 000 adults in South Asia

Source: Financial Access Survey (FAS), Own calculations



(a) District Wise Distribution of Active Microfinance Borrowers in Pakistan.

Source: Microwatch, Issue 41 Quarter 3, 2016.



(b) District Wise Incidence of Poverty in Pakistan 2014-15.

Source: Multidimensional Poverty in Pakistan, Chapter-4.

Figure A.2 – Geographical Distribution of Microfinance and Poverty in Pakistan

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Résumé

L'objectif de cette thèse est d'examiner à la fois les dimensions de l'offre et de la demande relatives à l'inclusion financière. Cette recherche présente un ensemble complet de preuves empiriques concernant l'accès aux services financiers, aux niveaux macro et micro-économiques. Le troisième chapitre fournit une exploration de cette hypothèse essentielle. En utilisant des données structurelles par pays, il montre les effets de l'inclusion financière sur la réduction de la pauvreté et des inégalités. En outre, il montre les effets bénéfiques des nouvelles technologies sur l'extension de l'inclusion financière et la réduction de la pauvreté. Le quatrième chapitre soutient que la culture financière est un déterminant important de l'inclusion financière des ménages et du bien-être. Basé sur des données d'enquête, il suggère en outre que l'accès aux nouvelles technologies et leur utilisation augmente la probabilité de l'inclusion financière. L'objectif du cinquième chapitre est de déterminer si l'adoption des nouvelles technologies favorise l'inclusion financière des PME au Pakistan. L'analyse révèle une association entre l'adoption des NTIC et l'accès de la firme aux services financiers, ce qui implique que les firmes qui ont un meilleur accès ou une utilisation plus intense des nouvelles technologies sont susceptibles de tirer de plus grands avantages des marchés financiers que les autres. Cette recherche contribue à la littérature sur l'accès aux services financiers en étendant l'examen de plusieurs dimensions significatives et complémente les études sur l'impact de la profondeur financière, de la stabilité financière et de la culture financière.

Mots clés : Inclusion Financière, Culture financière, NTIC, Développement, Accès aux services financière.

Abstract

The aim of this PhD dissertation is to examine both the supply and demand side of financial inclusion. This research presents a comprehensive set of evidence regarding financial access at macro and micro levels. This thesis blends three essays where the third chapter provides insights on the crucial linkages between new technologies, financial inclusion and poverty. Findings have shown poverty and inequality reducing effects of financial inclusion based on cross country data. Moreover, it shows beneficial effects of new technologies in expansion of financial inclusion and poverty reduction. Fourth chapter argues that financial literacy is an important determinant of households' financial inclusion and welfare. Based on primary data it further suggests that the access to and use of new technologies increase the likelihood of financial inclusion. The objective of fifth chapter is to determine whether the adoption of new technologies promotes financial inclusion for SMEs in Pakistan. The analysis indicates the association between information and communication technologies (ICT) adoption and firm's access to finance, implying that firms with greater access to and use of new technologies are more likely to benefit from financial markets compared with the others. This research contributes to the literature on access to finance in a more extensive way by examining relatively modern dimensions such as ICTs, digital finance and mobile money. Moreover, this dissertation concentrates on the effects of financial development and ICT on poverty and inequality which is understudied branch in conventional finance-growth nexus.

Keywords : Financial Inclusion, Financial Literacy, ICT, Development.