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THÈSE DE DOCTORAT

Le rôle de l'économie numérique dans
la financiarisation et l'intégration
optimale du secteur informel, dans un
contexte de développement
économique

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Le rôle de l'économie numérique dans la financiarisation et l'intégration optimale du secteur informel, dans un contexte de développement économique

Résumé

La représentation de données au moyen de chiffres traitables par des dispositifs informatiques continue de participer à l'allocation optimale des ressources. D'un côté, elle a tendance à rapprocher les individus pour des raisons personnelles et professionnelles. Elle est aussi indispensable dans les centres de décision. De l'autre côté, elle crée de nouvelles fractures qui sont liées à sa plus ou moins bonne diffusion. Cette thèse analyse ses apports, notamment ceux du m-paiement, dans les pays en développement. Elle s'est particulièrement intéressée aux propriétés de ce dispositif en matière d'inclusion financière et de régulation du secteur informel. Cette thèse a recouru à diverses méthodes : descriptive, théorique et statistique. Le premier chapitre a analysé les nouvelles considérations dans la régulation du secteur informel. Le deuxième chapitre a examiné la contribution de l'argent mobile à l'atténuation des lacunes de la microfinance traditionnelle. Le troisième chapitre a construit un modèle qui analyse différentes options pour contrôler la taille du secteur informel. Le quatrième chapitre a étudié la question de l'interopérabilité internationale des dispositifs de m-paiement dans une région. Les résultats indiquent que la régulation du secteur informel devrait passer par la création d'incitations compatibles et indirectes ; l'argent mobile atténue certaines lacunes de la microfinance traditionnelle ; le m-paiement associé aux nouvelles formes de microcrédit augmente à la fois la taille du secteur formel et le niveau de bien-être ; le marché du m-paiement dans la région considérée peut être totalement interconnecté. Compte tenu de la contribution de la financiarisation et de l'intégration du secteur informel au développement économique, les résultats de cette thèse ont des implications pour les organisations internationales, privées et publiques.

Mots-clés : bien-être, coûts de transaction, développement économique, économie numérique, externalité, fiscalité optimale, incitation économique, inclusion financière, innovation, interopérabilité, m-paiement, microfinance, régulation économique, réseau, secteur informel, TIC.

The role of the digital economy in the financialisation and optimal integration of the informal sector, in a context of economic development

Abstract

The representation of data by computer-readable numbers continues to contribute to the optimal allocation of resources. On the one hand, it tends to bring economic agents closer. It is also indispensable in decision centers. On the other hand, it creates new fractures that are more or less linked to its good distribution. This thesis analyzes its contributions, particularly those of m-payment, in developing countries. It is particularly interested in the properties of this device in terms of financial inclusion and regulation of the informal sector. This thesis uses various methods: descriptive, theoretical and statistical. The first chapter analyzed new considerations in the regulation of the informal sector. The second chapter examined the contribution of mobile money to mitigating the shortcomings of traditional microfinance. The third chapter has built a model that analyzes different options for controlling the size of the informal sector. The fourth chapter explored the issue of international interoperability of m-payment devices in a region. The results indicate that regulation of the informal sector should go through the creation of compatible and indirect incentives; mobile money mitigates some of the shortcomings of traditional microfinance; m-payment associated with new forms of microcredit increases both the size of the formal sector and welfare; the m-payment market in the region can be fully interconnected. Given the contribution of financialization and the integration of the informal sector to economic development, the results of this thesis have implications for international, public and private organizations.

Keywords: digital economy, economic development, economic regulation, economic incentive, externality, financial inclusion, ICT, informal sector, innovation, interoperability, m-payment, microfinance, network, optimal taxation, transaction costs, welfare.

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Summary

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Introduction générale

La représentation de données au moyen de chiffres traitables par des dispositifs informatiques continue de participer à l'allocation optimale des ressources. D'un côté, elle a tendance à rapprocher les individus pour des raisons personnelles et professionnelles. Elle est aussi indispensable dans les centres de décision. De l'autre côté, elle crée de nouvelles fractures qui sont liées à sa plus ou moins bonne diffusion. Ces fractures sont visibles dans les économies développées, notamment en Europe. Elle portent sur la question du travail. En effet, le numérique a refondu les métiers. L'intermédiaire économique traditionnel est en phase de disparaître. De cette façon, sur de nombreux marchés, le travail de trading devient un trading haute fréquence. Par ailleurs, surtout dans le secteur tertiaire, certaines activités sont passées dans le domaine de l'informel. De cette manière, après la mise en relation, des transactions sont effectuées hors des plates-formes numériques. Dès lors, la nécessité de trouver de nouvelles règles s'impose.

Ainsi, dans de nombreuses économies développées, les États sont en train de réguler ces dérives du numérique. Ces dérives contrastent avec les apports contigus du numérique, notamment du m-paiement, dans les économies en développement. En effet, ce dispositif joue un rôle économique non négligeable dans la région, notamment en terme de financiarisation. Aussi, la numérisation a donné une nouvelle dynamique à une question qui se pose depuis une quarantaine d'années : l'intégration du secteur informel. D'une part, le secteur informel s'est approprié les dispositifs numériques - une grande majorité des produits informatiques sont vendus de façon informelle - d'autre part, ces dispositifs peuvent contribuer à l'intégration de ce secteur. Ils offrent de grandes opportunités de gouvernance. Ils peuvent notamment diminuer le coût des services publics, augmenter leur transparence et améliorer la qualité de la prise de décision. Cependant, l'implémentation d'un gouvernement en ligne fait face à des problèmes de ressource. Le m-paiement permet de dépasser ses limites dans la mesure où il nécessite que peu de ressources. Il est en train de constituer le principal moyen de transaction formelle des UPI. Dès lors, les États ont une option d'intégration du secteur informel. Cette thèse se concentre ainsi sur les apports du numérique, notamment du m-paiement, à la régulation du secteur informel et à l'inclusion financière dans un contexte de

développement économique. Parce que la résolution des questions de la régulation du secteur informel et de l'inclusion financière nécessite une analyse des parties prenantes, tout au long de cette thèse, une réflexion est menée sur la contribution de tous les agents économiques. Pour ce faire, cette thèse s'articule autour de quatre chapitres distincts en fonction du renouveau des questions posées et du degré d'implication des agents économiques. Auparavant, il convient de revenir sur la diffusion du numérique ainsi que ses enjeux mondiaux.

Les innovations du numérique

Le développement d'une nouvelle forme de codage

Le codage a toujours consisté à faire passer dans le registre du visible et à stabiliser dans le temps ce qui circulait autrefois sous la forme du langage. Des tables d'argile aux tablettes tactiles, il y a eu une longue histoire de codage. Jusqu'en 1000 AEC, prévalait l'idéogramme - une écriture qui représente des idées. À partir de cette date s'est manifesté un codage qui retranscrit la langue et les mots. Cette évolution du codage s'est accompagnée d'une augmentation des signes avec l'apparition des formes alphabétiques. Quelques siècles plus tard, le codage prend de nouveaux virages. Dans les années 1910, une nouvelle forme de codage apparaît avec les machines à calculer : le numérique. Ce codage se fait sous forme de chiffre (Bomsel, 2007). À partir des années 1940, le codage numérique devient électronique. Cette évolution permet la mise en forme et la gestion de signaux électriques. À partir de là, naissent les dispositifs informatiques qui permettent grâce à des machines de mémoriser, de traiter et de transférer l'information. Ces machines auront d'abord des applications militaires et scientifiques, puis seront déployées dans la grande industrie et dans les foyers. Avec leur grande mémoire et des processeurs plus puissants, les dispositifs informatiques sont devenus plus performants que l'homme. Et c'est là une des grandes révolutions du numérique. Ces dispositifs vont devenir de plus en plus puissants comme en atteste la loi de Moore (cf. figure 1). Cette loi indique que la puissance des dispositifs informatiques doubleront tous les deux ans. Cette loi est vérifiée avec l'augmentation du nombre de transistors par puce et des fréquences d'horloge.

Le déploiement du réseau des réseaux

Parallèlement à son électronisation, un nouvel élément apparaît dans l'écosystème du numérique : Internet. L'ancêtre récent d'Internet est l'Arpanet. Ce dispositif lancé en 1969 est le premier réseau fermé numérique de transferts des données. Par la suite, Internet sera ouvert aux scientifiques. Mais il restera un ensemble

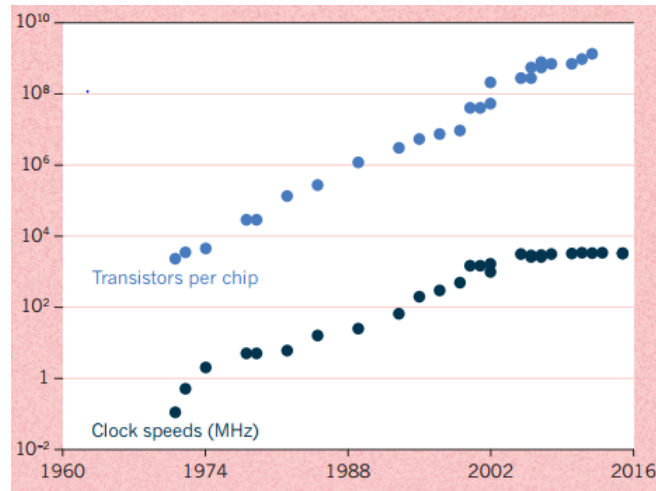


Figure 1: La loi empirique de Moore
 Source: Waldrop (2016)

de réseaux fermés hétérogènes jusqu'en 1988 où l'interconnexion entre les réseaux privés scientifiques sera mise en place (Brousseau et Curien, 2001 ; Bomsel, 2007). Et il faudra attendre le milieu des années 1990 pour qu'Internet soit ouvert à toute l'économie et devenir ainsi le réseau des réseaux. Pour ce faire, à partir de 1995, une politique de transfert d'internet vers le grand public sera mise en place avec des applications industrielles et commerciales. Le secteur privé sera ainsi incité à investir dans Internet, ce qui donna naissance à la bulle technologique - une bulle financière en relation avec le numérique qui connaîtra son apogée au début des années 2000. Le numérique s'est aussi diffusé grâce à aux économies d'échelle, aux effets de réseau positifs et de standardisation et à la subvention primaire.

L'essor de nouvelles économies

Avec leur numérisation, les économies changent. Certaines caractéristiques de l'économie traditionnelle sont renforcées, tandis que d'autres sont atténuées. En effet, nous sommes désormais dans une économie intensive en connaissance. Dans cette économie, la part des emplois intensifs en connaissance s'est considérablement accrue, le poids économique des secteurs d'information est devenu déterminant et la part du capital intangible a dépassé celle du capital tangible dans le stock réel des firmes (Foray, 2000; OECD, 2013). Ainsi, le numérique a accru le poids du savoir dans nos économies à l'instar des États-Unis (cf. figure 2) et nécessite des emplois où les travailleurs ont déjà un niveau de connaissance assez conséquent. On a ainsi une polarisation de l'emploi (Huws, 2014). L'économie de la connais-

sance a aussi donné naissance à la prosommation. Dans l'ère du numérique, les consommateurs se confondent avec les producteurs. De cette façon, de par et à la suite de leur utilisation, les consommateurs produisent des ressources. Les fournisseurs tiennent compte de ces ressources pour personnaliser leurs offres. Les consommateurs sont donc beaucoup plus intégrés dans le processus de création de ressources. Ainsi, la création de ressources se fait grâce une interaction plus forte entre tous les agents économiques. Et à l'économie de la production de masse s'est mixée une économie de la personnalisation de masse. Par ailleurs, nous sommes aussi dans une économie de l'immédiateté. En effet, étant plus informés, les besoins des consommateurs changent prestement. Ils veulent satisfaire rapidement ces besoins et ce à moindre coût. Ainsi, les organisations ont adopté le numérique pour s'adapter facilement à la demande. Cette adoption a entraîné une molécularisation des structures organisationnelles traditionnelles. Ainsi, au modèle de l'organisation fonctionnelle classique du travail, s'est ajouté une organisation par projet (Tapscott, 1996). Ceci a permis un environnement de travail plus flexible avec moins de coût hiérarchique. L'immédiateté a aussi intensifié la désintermédiation et l'automatisation de l'économie. Sur les plate-formes numériques, les utilisateurs sont directement connectés aux fournisseurs. Quant à l'automatisation, elle nécessite de moins en moins une intervention humaine. Tout ceci a permis une diminution considérable de temps entre la manifestation d'un besoin et sa satisfaction¹. Enfin, tous ces changements ont donné naissance à une économie de la convergence et de la divergence. En effet, le numérique a entraîné une convergence vers le modèle de création de ressource des plates-formes numériques. Des produits sont ainsi proposés à prix attractif (Nurvala, 2015). Et les fournisseurs qui contrôlent ces plates-formes sont ainsi devenus des firmes mondiales. Cependant, l'économie des plates-formes crée une désutilité pour ceux qui ne l'adoptent pas. De cette façon, les agents qui ne participent pas à cette économie ne pourront pas interagir avec la masse critique. Aussi, les firmes traditionnelles font face à la concurrence de ces plates-formes. L'adoption de ces agents est limitée par le coût d'accès à la technique. Les consommateurs traditionnels manquent de moyens financiers et de culture numérique. Aussi, il se peut qu'ils n'aient pas pu amortir leur investissement antérieur. Les firmes traditionnelles font face aux mêmes difficultés. Elles ont aussi des coûts supplémentaires en raison du décalage des réglementations entre leurs activités et celles liées au numérique.

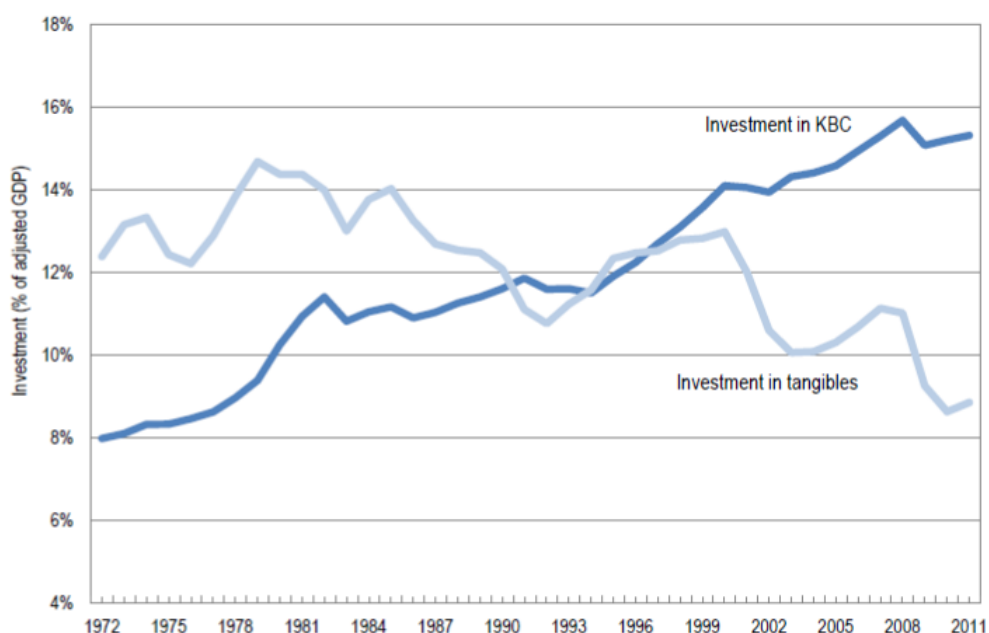


Figure 2: Investissements des firmes dans le KBC et dans le capital tangible, États-Unis, 1972-2011 (% du PIB)
Source: OECD (2013)

Les enjeux régionaux de la digitalisation de l'économie

La protection du travail et la régulation des plates-formes numériques dans les économies développées

L'impact de la numérisation sur le travail suscite un débat dans les économies développées. En effet, d'une part, elle crée de l'activité à l'instar d'Uber qui a rendu plus accessible le transport de personnes. Grâce à une plateforme numérique, cette firme met en relation les voyageurs et les véhicules de tourisme avec chauffeur. Aussi, Uber a une externalité positive sur l'industrie automobile. Les chauffeurs Ubr remplacent leurs voitures trois fois plus que les particuliers (Ahmad et al., 2017). Nous avons aussi le cas d'AirBnB. Cette plate-forme permet la location de logements de particulier. Elle procure ainsi des revenus supplémentaires aux propriétaires de ces logements. En outre, l'économie numérique demande du travail hautement qualifié : les agents avec des compétences pluridisciplinaires; les experts en cybercriminalité et du droit de la robotique; la surveillance humaine des plates-formes (Teboul, 2016). D'autre part, la numérisation raréfie le travail. Déjà, Ubr et Abn éclipsent, respectivement, les taxis et les hôtels traditionnels.

Notons que si pour le moment les plates-formes numériques ont un impact positif net sur le travail², la robotisation risque de renverser cette tendance (*ibid.*). Par exemple, aux Etats-Unis, le trading haute fréquence a dépassé le trading humain et l'Europe se rapproche de la parité (cf. figure 3). Ainsi, Teboul (2016) considère que la théorie de la destruction créatrice (Josef Alois Schumpeter, 1883-1950) est désormais obsolète. Cette théorie indique que dans les économies se produit de façon continue et simultanée une disparition de secteurs d'activité économique conjointement à la création de nouveaux secteurs. Avec la robotisation, le mécanisme qui est à l'oeuvre serait plutôt la disruption destructrice. Ce concept lie la destruction d'emploi à celui de la technique de rupture. De cette manière, les machines remplacent le travail. Par ailleurs, ces plates-formes sont à la limite de l'optimisation fiscale et favorisent les activités informelles. De cette façon, après la mise en relation, des transactions sont effectuées hors des plates-formes numériques (Guttentag, 2015; Williams et Horodnic, 2017). Dès lors, la nécessité de trouver de nouvelles règles s'impose. Ainsi, les États sont en train de réguler ces dérives du numérique. Par exemple, récemment, en France, il y a eu un rapprochement des réglementations entre VTC et taxis³. Aussi, en Angleterre, à Londres, Uber risque de perdre sa licence⁴.

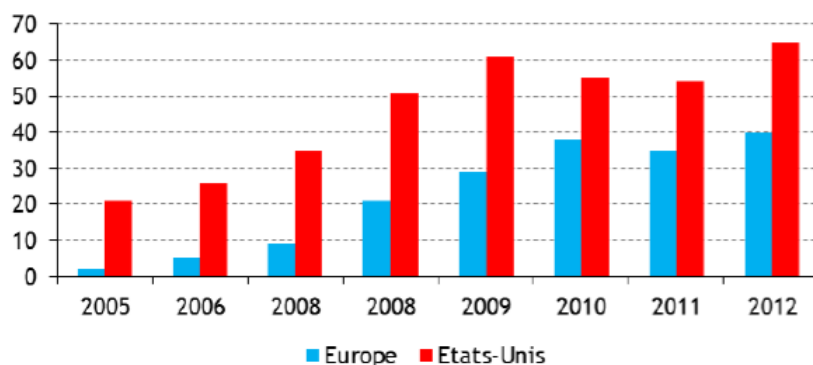


Figure 3: Part du trading haute fréquence sur les marchés actions (en %) Source: Teboul (2016)

La financiarisation et l'intégration du secteur informel dans les économies en développement

Dans les économies en développement, les apports du numérique contrastent avec les questions qu'il pose dans les économies développées. Le m-paiement y connaît notamment une forte adoption. Cette innovation frugale a ainsi contribué

à l'inclusion financière institutionnelle même si leur niveau de bancarisation reste relativement faible. Au-delà de l'inclusion financière, le numérique a donné une nouvelle dynamique à une question qui se pose depuis une quarantaine d'années : l'intégration du secteur informel. Depuis l'origine du concept dans les années 1970, le secteur informel continue d'être une réalité. On retrouve les UPI notamment dans le secteur tertiaire⁵. Quarante-cinq pourcents des UPI exercent dans le commerce (Cheneau-Loquay, 2013). Ces UPI ont des externalités négatives sur l'État et les firmes du secteur formel. Pour l'État, une partie des dépenses publiques est improductive. En effet, les UPI ne contribuent pas à ces dépenses. Les firmes réglementées, notamment quand elles sont contribuables, ont ainsi une incitation à converger vers le secteur informel. Le corollaire est le retardement de l'autonomie financière des États.

Le numérique a donné une nouvelle dynamique à la question de l'intégration du secteur informel parce qu'il entretient une relation ambiguë avec ce secteur. En effet, dans un premier temps, le numérique a favorisé le développement du secteur informel (*Ibid.*). L'introduction du numérique dans les économies en développement a amplement transité par ce secteur. Ainsi, une grande majorité des produits informatiques (ordinateurs, téléphones portables et leurs accessoires, cartes prépayées téléphoniques) sont vendus de façon informelle. Dans un second temps, ces dispositifs peuvent contribuer à la régulation de ce secteur. En effet, ils offrent de grandes opportunités de gouvernance. Ils peuvent notamment diminuer le coût des services publics, augmenter leur transparence et améliorer la qualité de la prise de décision (Ndou, 2004). Cependant, l'implémentation d'un gouvernement en ligne fait face à des problèmes de ressource. Le m-paiement permet de dépasser ses limites dans la mesure où il nécessite que peu de ressources (Dahlberg et al. 2015). Il est en train de constituer le principal moyen de transaction formelle des UPI (Deen-Swarray et al., 2013; WB, 2018b). Les États ont ainsi une option d'intégration du secteur informel.

Problématique

L'objet de cette thèse est donc d'envisager les propriétés du m-paiement en matière de financiarisation et d'intégration du secteur informel dans un contexte de développement économique. Le travail s'appuie sur les connaissances établies et sur les expériences plus récentes du secteur informel et de la microfinance. L'existence d'un trade-off entre les apports du m-paiement en matière d'inclusion financière et de régulation du secteur informel et ses préjudices en matière d'expansion du secteur informel servira de fil conducteur à cette thèse.

Cette thèse se structure autour de quatre chapitres distincts analysant succes-

sivement :

- la régulation du secteur informel dans les économies en développement, en tenant compte de ses examens actuels dans la littérature académique;
- la contribution de l'argent mobile à l'inclusion financière;
- les possibilités offertes par le m-paiement dans l'obtention d'une taille optimale du secteur informel;
- l'implémentation de l'interopérabilité internationale des dispositifs de m-paiement

Chapitre 1

La corrélation négative entre la taille du secteur informel et le niveau de développement économique a été établie. Néanmoins, le secteur informel continue d'être une réalité dans les économies en développement avec un tiers du PIB de ces économies. Le secteur informel peut-il encore être régulé ? Dans ce chapitre, nous essayons de répondre à cette question. Le problème de la régulation actuelle du secteur informel soulève d'autres questions: le secteur informel a-t-il vraiment évolué ? Ces évolutions sont-elles susceptibles d'amener à considérer la régulation du secteur informel sous un autre angle ? Pour répondre à ces questions, nous analysons la littérature académique ancienne et récente⁶ sur le secteur informel. Nous contribuons à la littérature en menant une analyse à double sens sur la régulation du secteur informel. D'abord, la régulation est induite par la défaillance du marché. Elle porte sur les externalités négatives tels que l'inexactitude du système de comptabilité nationale, le problème des free-rider et le retardement de l'autonomie financière de l'État. Ce chapitre examine aussi les actions de l'État. Par ailleurs, l'implication publique de ce chapitre est aussi importante au vu de la primauté des désavantages du secteur pour l'intérêt général.

Chapitre 2

Tous les neuf ans, la campagne internationale d'inclusion financière du MSC, est évaluée. Lors du premier sommet en 1997, la tâche de l'inclusion financière fut confiée à des institutions financières spécialisées : les MFI. Les différentes campagnes n'ont pas vraiment été des succès francs. Parallèlement au lancement de la dernière campagne, en 2005, un nouveau dispositif financier s'est développé dans l'écosystème de la microfinance: l'argent mobile. Ce dispositif a des implications en matière de coût de transaction. L'argent mobile atténue-t-il les lacunes de la microfinance traditionnelle dans l'inclusion financière ? Dans ce chapitre, nous

essayons de répondre à cette question. Pour ce faire, nous prenons comme référence les objectifs de la dernière campagne d'inclusion financière. À partir de là, nous analysons les caractéristiques, les résultats et les limites des deux dispositifs. Nous contribuons à la littérature en étendant notre analyse au-delà des produits de base de ces deux dispositifs à savoir le microcrédit et le m-paiement. Ce chapitre explore, aussi, l'existence de différences régionales dans la portée des dispositifs. Il s'intéresse également aux groupes d'individus qui ne sont pas particulièrement inclus dans la finance formelle.

Chapitre 3

Les états choisissent généralement de tolérer le secteur informel, tant qu'il n'est pas trop développé et n'empêche pas les firmes efficaces de rejoindre le secteur formel. Il existe cependant peu de moyens économiques pour contrôler la taille du secteur informel. Le renforcement de la taxation, les opérations d'éviction, ont tout le désavantage d'augmenter l'inactivité et le chômage sans augmenter substantiellement la taille du secteur formel. Une politique d'inclusion des activités informelles a l'effet inverse. Ces politiques accommodantes réduisent le chômage mais aussi la taille du secteur formel et augmentent la dépendance fiscale de l'État. Les solutions que nous analysons dans ce chapitre⁷ sont différentes. Elles considèrent le rôle du m-paiement, et du microcrédit, non seulement pour ce dernier dans sa forme traditionnelle mais aussi comme un produit commun associé aux dispositifs de m-paiement. Le m-paiement et le microcrédit sont-ils capables de contrôler la taille du secteur informel, afin de maintenir des niveaux d'activité et de revenus moyens suffisants? Ce chapitre répond à cette question. Ainsi, nous développons un modèle de référence dans lequel nous introduisons alternativement le microcrédit traditionnel, le m-paiement, et les nouvelles formes de microcrédit associé au m-paiement. Les résultats indiquent que le microcrédit sous sa forme traditionnelle augmente le niveau d'activité mais réduit à la fois la taille du secteur formel et l'utilité des personnes inactives. Les facilités de m-paiement augmentent la taille du secteur formel et réduisent l'inactivité lorsqu'elles sont adoptées par les membres du secteur informel. Lorsque, en outre, le microcrédit est mis à la disposition des membres du secteur informel en ligne, le nombre de personnes inactives diminue encore plus, mais la taille du secteur formel diminue également lorsque la comparaison est faite avec le m-paiement mais sans microcrédit. Cependant, ces résultats supposent un schisme entre les secteurs actifs. Nos résultats signalent le rôle positif du m-paiement comme moyen de réguler le secteur informel, globalement dans le cas des interactions entre ces secteurs.

Chapitre 4

Le m-paiement a encore un rôle à jouer dans la financiarisation formelle en SSA. L'analyse des usages des souscripteurs montre qu'en particulier le paiement international est le service le moins utilisé. Et pourtant, la région, notamment l'espace UEMOA, offre des inputs. Dans le but d'assurer une intégration économique et sociale dans la région, l'UEMOA regroupe huit économies liées par le traité modifié du 29 janvier 2003. Elles ont une monnaie unique. En outre, le m-paiement occupe d'ores et déjà une place importante dans le niveau de bancarisation de la région. Par ailleurs, la région connaît une forte migration interne. De par la structure oligopolistique et non coopérative du secteur du m-paiement dans la région, le développement du paiement international nécessite l'interopérabilité entre les différents dispositifs. L'autorité de régulation dans la région considère que ce manque de coopération entre les ORM limite le développement du m-paiement. Elle envisage actuellement son rôle dans la facilitation de l'interopérabilité dans la région. Cependant, l'implémentation de l'interopérabilité doit tenir compte de la maturité de chaque marché. Dans l'espace UEMOA, doit-on se diriger d'un marché du m-paiement partiellement ouvert vers un marché totalement interconnecté ? Ce chapitre répond à cette question. Ainsi, nous analysons de façon générale l'impact économique de l'interopérabilité sur les parties prenantes au m-paiement. Ensuite, nous établissons les implications pour l'espace UEMOA. La contribution de ce chapitre à la littérature est qu'il pose les inputs pour l'inclusion stratégique d'une innovation pour l'État et les entreprises.

Chapter 1

Evolution and regulation of the informal sector

1.1 Introduction

Since the origin of the concept of informality in the 1970s, the issue of its regulation has been continuously debated in developing economies. Its conceptualization is due to the joint observation of the urban explosion, the limited creation of wage employment, and apparent or disguised registered unemployment which increased only marginally (Hugon, 2014). If we put it in context, the 1970s marked the end of the thirty glorious years. Restrictive policies begin to be applied around the world. Unlike the rest of the world, developing economies (Hart, 1973; De Soto, 1989), had a low level of unemployment, despite a large migration to the cities. The argument given was that due to the inability of the regulated labor market to absorb new entrants, informal economic activities have developed.

Given these observations, three approaches have been successively developed. First, the dualists considers the informal sector as a survival marginal sector that has no relation to the formal sector. Structuralists, then, see the informal sector as a sector subordinate to the formal sector. From this point of view, informal sector maintains the competitiveness of the formal sector through subcontracting at a lower cost. These first two approaches do not address the regulation of the informal sector because of its marginal nature (Loayza, 1996; Gerxhani, 2004; Schneider and al., 2010). Since the 1980s, a third approach, the legalistic approach, has developed and remains the mainstream. The informal sector is therefore considered a sector that does not comply with the law. The correlation between the size of the informal sector and the level of economic development has also been established. Nevertheless, the informal sector continues to be a reality in developing economies

with 30% of their GDP.

Can the informal sector still be regulated in developing economies? In this chapter, we try to answer this question. The objective of this chapter is to propose new forms of regulation of the informal sector, taking into account its current developments in the academic literature. The problem of the current regulation of the informal sector gives rise to other questions: has the informal sector really evolved? Are these developments likely to lead to consider the regulation of the informal sector from another angle?

We contribute to the literature by conducting a two-way analysis on the regulation of the informal sector. First, regulation is induced by market failure. It relates to negative externalities such as the inaccuracy of the system of national accounts, the problem of free-rider and the delay of the financial autonomy of the state. This chapter also examines the actions of the state. Moreover, public implication of this analysis is also important in view of the primacy of this sector's disadvantages for the general interest.

The rest of the chapter is structured around four sections. The second section analyses the current features and the environment of the informal sector. This section presents UPI and their relationship to employment; distinguishes the informal sector from other underground sectors; observes the importance of the network in this sector and its relations with the formal sector. The third section study the persistence of the informal sector. This section shows the disparities of the informal sector size across economies. It also specifies the role of each stakeholder in the persistence of the informal sector. The fourth section considers the current litterature on the regulation the informal sector. The fifth section makes proposals and sixth section concludes.

1.2 The current features

Until 1990s, there was no consensus on the features of the informal sector. From the seventeenth International Conferences of Labor Statisticians (ICLS) in 1993, UPI features are officially recognized. From there, UPI refer to private unincorporated firms. They are owned by single individuals or households without legal personality. It is not possible to know the financial statement (Husmanns, 2004) of these companies insofar as they do not keep accounts. Also, part of the production of this sector is for barter. UPI are also considered as unregulated small firms in non-agricultural sectors. Indeed, they are small in size, usually no more than five individuals. And the activities and jobs of these firms are not regulated

with the state. And such firms are engaged in non-agricultural activities, even in the agricultural sector.

Beginning in 2003, the definition of the sector has further evolved. Since the International Conference of Labor Statisticians (ICLS) in 2003, the informal sector employment is a part of informal employment. Therefore, International Labor Organization (ILO) distinguishes informal employment in the informal sector from informal employment outside the informal sector. Employment in the informal sector includes all employment in UPI (Chen, 2012; Charmes, 2012). As for informal employment outside the informal sector, it includes unprotected employees in regulated firms. Note also employment in the informal sector dominates informal employment and self-employment exceeds wage labor.

In its nature, informal sector activities are different from other underground activities. Depending on their compliance with the law, four types of UPI can be listed: firms that should be regulated and do not comply; those that are outside the regulations (Kanbur, 2009); and those under-reporting their activities to get out of the regulatory framework. Moreover, economic activities can be distinguished according to whether they are a-legal, illegal, illegitimate (Hugon, 2014). A-legal activities are activities that are not provided by law and often considered illegal. Illegal activities are contrary to the law. Illegitimate activities are those that have no ethical and moral justification. Informal activities are illegal, a-legal, but legitimate for questions of survival. Informal activities may therefore be legitimate in themselves but illegal in their operation. This is usually production crafts (furniture, tools, clothing, building construction, etc.), small fixed or mobile commerce, personal services (repair, pawn shops, clothing care, housekeepers, utilities (transport, tontines), small intermediaries to the markets and waste collectors.

More than before, entry into the informal sector is characterized by barriers. These barriers are financial and non-financial. Local rents, high circulating capital, machinery costs and street lighting are traditional financial barriers for an UPI. Non-financial barriers refer to the difficulties of prospering in this sector if one is not a member of a social group of common reference (Lautier, 2004). With their communities, individuals have access to the means of production and the network of their community. Besides, it is now common to see eviction operations (Bouquet and Kassi-Djodjo, 2014) of small UPI with a view to better control of the development of cities. Some of the capital of informal micro-firms is destroyed.

Over the years, partnership between the informal and formal sectors has strengthened. If before the partnership was about the subcontracting, professional mobility and informal finance, today they also relate to formal finance. In the context

of subcontracting, the informal entities undertake assembly and finishing activities for the industrial sector and retail sales. Note that the UPI that are in partnership with the formal sector are larger in size and more modern. With regard to occupational mobility, the informal sector is considered as sector of transition to the formal sector (Marfaing and Sow, 1998; Moreno-Monroy and al., 2012; Cling, 2014). As a transitional sector, individuals acquire technical and business knowledge, network and capital. Thereafter, they integrate the formal sector. As a result, firms that are in difficulties and individuals who do not find formal jobs turn to the informal sector. However, we note that most of the regulated firms started their business by being regulated (cf. table 1.1). Thus, few UPI leave their

Regions	% of regulated firms
EAP	85.96
ECA	97.81
LAC	87.45
MENA	86.97
SA	86.84
SSA	84.53

Table 1.1: Firms that started their activities by being regulated

sector. The financial relationship between the informal and formal sectors is linked to lending. The two sectors finance each other. For example, most users of MFI products are in the informal sector.

If relation between sectors has strengthened, they differ in many other respects. Table (1.2) reflects them.

1.3 From the last resort employer to a attractive sector

Over the years, many empirical studies have estimated the size of the informal sector. Sato (1989) is one of the first global estimates of the informal sector. However, at the time, the informal sector was not clearly defined. In particular, the agricultural sector was not excluded from the informal sector. Loayza (1996) also estimated the size of the informal sector. But the study covered only the LAC. Then, Schneider and al. (2010, table 1.3) estimates, worldwide, the size of the informal sector. We subtract the following overviews:

Feature	UPI	Regulated firms
Employment	Self-employment	Wage labor
Work condition	Unprotected by law	Protected
Economic sector	Non-agricultural sectors	All economic sectors
Skills	Skills passed on by informal apprenticeships	High-level skills from formal training institutions
Factor of production	Labor intensive	Automated production
Legality of activities	A-legal, illegal	Legal
Workplace stability	Instable	Stable
Selling price	Affordable	Expensive
Flexibility	Adapts well to market conditions	Difficult to adapt

Table 1.2: Juxtaposition of UPI and regulated firms

Regions	% of GDP
EAP	17.5
ECA	36.5
LAC	34.7
MENA	27.3
SA	25.1
SSA	38.4

Table 1.3: Average informality weighted by total GDP
Source: Schneider and al. (2010)

- The global size of the informal sector. The world average size of the informal sector weighted by GDP is 17.2%. The size of the informal sector in developing economies is 30%.
- The regional size of the informal sector in developing economies. The weighted average size of the informal sector is 17.5% in EAP, 36.5% in ECA, 34.7% in LAC, 27.3% in MENA, 25.1% in SA, 38.4% in SSA.

- The ranking of developing economies according to the size of the informal sector. The five economies that are the largest size of the informal sector are: Bolivia (66.6%), Panama (63.5%), Peru (58.7%), Tanzania (56.8%), Nigeria (56.2%). The five economies with the smallest size of the informal sector are: China (12.8%), Singapore (13.0%), Vietnam (15.2%), Mongolia (17.9%), Bahrain (18%).

The size of the informal sector of developing economies is therefore not negligible. Compared to the world average, developing economies have a larger informal sector size. The informal sector continues to account for 30% of resource created. Moreover, there is a great disparity between regions and between economies. While, overall, SSA has the highest level of the informal sector, the economy with the large size of the informal sector is in LAC. Finally, as regards its evolution, informal jobs increased by 2.4 percentage points between 2000 and 2010 (cf. table 1.4). There is therefore a persistence of informal activities.

Regions	2000-2004	2005-2010
LAC	55.9	57.7
MENA	47.3	58.4
SA	69.7	69.7
SSA	65.9	65.9
TE	20.7	22.6
WA	43.2	43.2

Table 1.4: Share of employment (%) in the informal economy in total non-agricultural employment by 5-Year Period and by region
Source: Charmes (2012)

Early work on the informal sector considered lack of formal employment and inadequate wages as the causes of the emergence of the informal sector. Hart (1973) expressed it in these words: “[...] insufficient wages and a growing surplus for the needs of the urban labor market have led to a high degree of informality”. From this point of view, informal sector is considered as a employer of last resort. It is increasingly argued that entry into the informal sector is also motivated by an attractive job opportunity. In this regard, Günther and Launov (2012) conducted an empirical study in Ivory Coast. The objective was to determine whether the

informal sector is the result of opportunistic behavior or survival strategy. The results point out that involuntary informal work is 45% of all the informal sector. It is therefore an attractive sector.

Since the early 1990s, many documents have indicated that the primary determinant of the informal sector is the tax rate (Gerxhani, 2004); in the late 1990s, the ability to escape was also debated. These causes are partly the responsibility of the state. Loayza (1997) demonstrated that the size of the informal sector depends positively on the tax burden and on the quality of public administration. And its empirical results show it in LAC. Schneider (2010) also observe these relations around the world (cf. Appendix 1). For the tax, the problem is to find an optimal level.

As for the relationship between the level of informality and the quality of public administration, it refers to tax enforcement system. Lautier (2004) considers that too administrative burdensome procedures favor the informal sector. Moreover, it mentions the capacity to regulate activities when the territory is vast. It considers that the structural inability of the state to regulate certain economic activities has no economic relevance insofar as the cost of the tax audit is always lower than tax revenue. The tolerance of the state in relation to informality can thus come from the will of the state to contain social discontent, especially when the income generated is negligible. Also, the only eviction operations of the UPI are not effective. On the contrary, these operations give rise to the sale of goods on the sly. Moreover, there are activities for which there is not yet a regulatory framework such as these sellers on the sly.

1.4 New considerations in regulation

The regulation of the informal sector is mainly reasoned by its negative correlation with the economic development. From Loayza (1996), the long-term economic growth rate (γ) is expressed as follows:

$$\gamma = \frac{1}{\Theta} [A(1 - \tau)\tau^\alpha][\eta(\lambda, q)[1 - I(\lambda, \tau, \delta, \alpha)]^\alpha - \rho]$$

where the instantaneous utility function has a constant intertemporal elasticity of substitution equal to $\frac{1}{\Theta}$, A is an exogenous productivity parameter, τ is the tax rate, α measures the productivity of public services relative to private services, τ^α is the utility of agents from using public services, $\eta(\cdot)$ is the fraction of tax revenues available for the provision of public services, $(1-\eta(\cdot))$ is the fraction of tax revenues which is in part wasted and in part used to finance the enforcement system, λ is the enforcement system strength, q is the quality of state institution, 1 is the economy, I is the relative size of the informal sector, δ is the fraction

of public services unavailable to regulated firms, ρ is the constant rate of time preference. We note that the rate of growth of the economy depends positively on three terms. The informal sector, by acting negatively on these terms, has an inverse relationship with the growth rate of the economy. The first term refers to the productivity of the economy, for example scientific production in universities. There is a dual relationship between the productivity parameter and the tax level. On the one hand, τ contributes to A . On the other hand, a high level of τ favors I . This informal production does not contribute to tax, and thus does not finance the productivity of the economy. The second term concerns the financing of public services. A robust λ mobilizes resources, and thus decreases the funding available for other public services. Contrariwise, an efficient q , such as fast processing of business regulation applications, increases the financing of public services. The third term expresses the size of the formal sector. I depends directly on four parameters. A robust λ decreases I , thus increasing the size of the formal sector. A high τ reduces the attractiveness of the formal sector. A high δ does create incitation to register. α generates surpluses which is profitable to 1. For example, companies will register because they will have access to grants. In sum, a high level of informal sector, diminishes the productive financing of the state, and thus decreases the rate of growth of the economy.

It should also be noted that the informal sector is not legally protected. The non-regulation of the informal sector excludes it from social protection. Thus, informal workers face high levels of insecurity and vulnerability (Andrews and al., 2011). Owners of UPI do not have access to retirement pensions or health insurance. Unless the children take over, they do not have income security in old age. Furthermore, because informal work is not legally protected, informal employees may have many problems that will be difficult to solve, such as long hours of unpaid work and unfair dismissal.

Consider now the informal sector according to the angle of the theory of economic regulation. The regulation of an economic sector follows on from observation of the market failure. Regulation in such cases is justified because an uncontrolled market will not produce result in the public interest (cf. Appendix 1). The market failure linked to informal sector is about negative externalities such as the inaccuracy of the national accounting system, the problem of textit free-rider and the delay of the financial autonomy of the state. Indeed, there is an asymmetry of information between the state and the informal sector. The state is not aware of informal economic activities. The consequence is the inaccuracy of the national accounting system data. And yet, national accounting is an important tool for policy makers. Accurate figures on GDP and unemployment make it possible for policy makers to be in tune with the economic realities of the population as a

whole. Moreover, UPI are free-riders. This creates negative externalities for both the state and the formal sector. For the state, part of the public expenditure is not productive. On the one hand, UPI do not contribute to the tax. On the other hand, there is a congestion of public services. Regulated firms can find all this unfair and go into the informal sector. About that, the majority of regulated firms in developing economies report competing with UPI (cf. table 1.5). Industrial products of the formal sector are particularly imitated in the informal sector (De Beer and al., 2013). Moreover, a high degree of informality may result in a snowball effect. An increase in the UPI has a positive effect on unproductive public expenditure. And, a high degree of informality reduces individuals's confidence in state institutions. The corollary is that, the formal sector being the main source of funding for the state, if there is no formal sector, there is no more state.

It has already been shown that the informal sector helps contain social discontent. Indeed, the informal sector provides employment. Near 53% of non-agricultural employment in developing economies is filled by the informal sector (cf. table 1.4).

More recently, there are new considerations on the informal sector. These considerations relate to the issue of innovation. Konte and Dong (2012) analyzed the innovation process in the informal sector of ICT in Senegal. The main innovation is social innovation. Social innovation is an innovation that adapts to a social situation in order to improve the living conditions of low-income individuals. Traditional and modern microfinance respectively inspired by informal tontines and payments fall within this framework (Pairault and al., 2005; Hughes and Lonnie, 2007). Also, it considers that the organization of informal work is not based on classical theories of work organization. It is based on social factors and values such as hospitality and sharing. For innovative products proposed by the informal sector, De Beer and al. (2013) considers that it is rather an innovation of adaptation and imitation rather than of original creation. Most of this involves the adaptation of industrial equipment. However, every innovation has its share of imitation. We therefore consider that the regulation of the informal sector should be about its support and its control by monitoring, organizing and integrating it into development policies.

1.5 Proposals

By weighing the pros and cons of the informal sector, last ones prevail. However, the only eviction operations of UPI are not productive. Given the limited financial resources of the developing economies and the negative externalities of informal activities, an effective strategy of regulation describes in a structured and

Regions	% of Regulated firms
EAP	53.2
ECA	39.9
LAC	62.0
MENA	42.6
SA	41.1
SSA	67.4

Table 1.5: Regulated firms competing with UPI

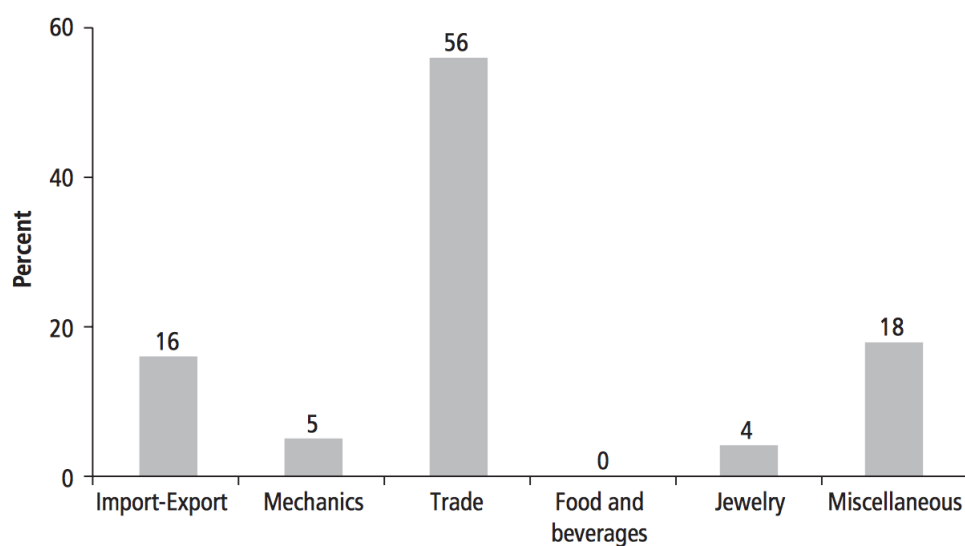


Figure 1.1: Proportion of firms in Senegal for which imports exceed sales, by industry

Source: Benjamin and Mbaye (2012)

coherent way of how economic policy decisions are made to achieve a desirable level of the informal sector.

The first step is to analyse informal sector scope and depth. To do so, there are three methods of estimating the informal sector: direct approach, indirect method and model-approach. Each of these methods has its advantages

and disadvantages (Schneider, 2002, 2010; ILO, 2013). The direct approach is a microeconomic approach. It is based on surveys. The main disadvantage of this method is that its veracity depends on the respondents' willingness to cooperate. The advantage is that it provides detailed information on the informal sector. The indirect approach is generally a macroeconomic approach. This approach makes it possible to measure the development of the economic sector by considering the discrepancies between the economic indicators: the gap between income and consumer spending in the economy; the difference between the active labor force and the total population; the gap between GNP and the total volume of transactions; increased demand for physical money; the difference between the electric consumption attributed to the official GDP and the total electricity consumption. The problem with the informal sector macroeconomic indicators is that they can be biased. For example, the decrease in electricity consumption may also be due to the use of less energy-intensive products. The model-based approach is the MIMIC model. It considers the size of the informal sector as a latent variable that has multiple causes for which several indicators can be found. A mix of these different methods adapted to each economy or region would be able to better inform public decisions.

Knowing its extent, we know that regulation is not synonymous with sanctions. Depending on their performance, there are three types of UPI: high-yield firms, medium-yield firms and survivors (cf. table 1.6.).

Type of UPI	Feature
Top performers	Better-off, growth-oriented firms with high capital stock and medium to high return
Constrained gazelles	Share many features with top performers, including high capital returns. Yet they face low capital stocks and constrained growth
Survivalists	Share little or no features with top performers but face low capital stock and low return

Table 1.6: Typology of firms in the informal sector in West Africa
Source: De Beer and al. (2013)

High-yielding firms are those that should contribute to state revenues. The turnover of large UPI is similar to that of regulated firms. Often these large UPI are passed on to small regulated firms. As such, they often pay a synthetic flat

tax corresponding to small regulated firms. Benjamin and Mbaye (2012) compared the turnover and imports of these firms in Senegal. It shows that 41% of the firms considered have a lower level of turnover than their imports. And it concerns many sectors (cf. figure 1.1). In the case of small and medium-sized UPI, they will have to be regulated and relocated to the appropriate premises. This is much more productive than eviction operations. On the one hand, the capital of these firms will not be destroyed. On the other hand, the funds that would have been mobilized for these operations could be invested in premises for small and medium-sized firms that, once taxable, can contribute.

Indirect regulation of the informal sector is also needed. In order to facilitate the transition to the informal sector, the constraints faced by UPI should be taken into account. Access to finance is the major constraint of UPI (OECD, 2007; Heintz, 2012; Appendix 1). Access to financing favors the development of activities. Activities, which will have to be regulated even in part to continue to prosper (Paula and Scheinkman, 2007). Also, innovation in the informal sector needs to be supported. The prevalence of imitation in the informal sector may be due to the difficulty of appropriating benefits through formal protection mechanisms (De Beer and al., 2013). In this context, mechanisms for the protection of innovation should be put in place. The protection of innovation promotes original creation. It also gives incentives for firms to register. In this regard, an analysis of the strategic aspect of the firms to register is revealing (Nelson and Bruijn, 2005). Firms regulated voluntarily because of legal recognition of the company; the exclusivity of its brand and profit prospects; intellectual property rights; pride in being honest and participate in the economic prosperity.

States should also increase the quality of their institutions. In the Nelson and Bruijn study (2005), participants expressed the view that the informal payment of officials discouraged them from registering. Benjamin and Mbaye (2012) consider that some large UPI benefit from the indulgence of public authorities. Webb and al. (2013) lists elements which are the responsibility of the state and which promotes the informal sector: the extent to which policy changes are radical; the bureaucracy; the ambiguous competence and conflicting interests between institutional centers; the fact that informally perceived costs are minimal compared to the institutional advantages; lack of access to legitimate means; mistrust of individuals to formal institutions. Ncube and al. (2012) shows that business regulation is limited by the difficulty of obtaining information and regulation fees. Therefore, to overcome its limitations will promote the formalization of the economy.

Regulation will require expenses. But the challenge is worth the candle. An empirical study on Ivory Coast, Kenya, Nigeria and Senegal (Ncube and al. 2012) estimated that only 5% of companies that have registered in these economies be-

come informal again. Moreover, the new firms regulated have a formal labor productivity 43% higher than those who remained in the informal sector. Note also that the probability of firms regulation is positively impacted by access to finance.

1.6 Concluding remarks

This chapter has analyzed the evolution of the informal sector in developing economies in order to reconsider its regulation. These developments concern the concept, persistence and regulation of the informal sector. Regarding the concept, the informal sector is no longer composed only of marginal firms. Some UPI generate resources similar to those in the formal sector. Also, large UPI, by under-reporting their activities, pose as small firms in the formal sector. In addition, relations between sectors have strengthened. UPI now make up the bulk of users of some financial institution services. As for persistence, it is mainly the responsibility of the public administration. These are tax burdens not suited to all firms; lack of a regulatory framework for some activities and lack of control over informal activities. Regarding regulation, there is now a risk of state collapse. This is due by the increase of the size of this sector, which does not contribute to public expenditure.

Regulating the informal sector should be viewed differently. The only eviction operations showed their limits. Studies should first be conducted to understand the scope and depth of the informal sector in each economy. From there, regulation will not be synonymous with sanction. And each state will be informed of the specific constraints that limit the regulation of UPI. Note that this chapter has already intersected some positive input to regulation. These are access to information, the protection of innovation, the end of informal payments and last but not least, access to finance. It should be brought to the attention of UPI the disadvantages of their activity for the general interest. Also, regulatory procedures should be simplified and widely disseminated. As for the protection of innovation, it favors original creation. And a protected innovation is an innovation that can be exported. With regard to informal payments, they discourage registration. Finally, access to financing favors the development of activities. Activities, which will have to be regulated even in part to continue to prosper. Regulating the informal sector should therefore involve creating compatible and indirect incentives.

Chapter 2

Mobile money and financial inclusion

2.1 Introduction

Every nine years, international financial inclusion campaign of the MSC is evaluated. These campaigns concern nearly 77% of individuals below the poverty line and 59% of individuals in developing economies (WB, 2012). At the first summit in 1997, the task of financial inclusion was entrusted to specialized financial institutions: MFI. These are village-based savings and credit associations, non-governmental organizations, bank subsidiaries and independent financial institutions. By 2005, the objective was to reach 100 million households below the poverty line (Lelart 2006; Servet, 2006; Reed 2015). This objective has not really been achieved. It are nonetheless resumed and expanded in three ways. By 2015, in addition to micro-credit, 600 million individuals are expected to be reached by different financial products. At the same time, 100 million households should be above the poverty line. These objectives have not been achieved as well.

In parallel with the launch of the last financial inclusion campaign, a new device has developed in the microfinance ecosystem: mobile money (Brack, 2016, Jack and Suri, 2016). It differs from traditional microfinance in term of transaction costs. And it is designed to make financial products accessible to unbanked individuals.

Is mobile money mitigating the shortcomings of traditional microfinance in the financial inclusion of developing economies? In this chapter, we try to answer this question. To do this, we take as a reference the objectives of the last financial inclusion campaign. From there, we analyze the features, the results and the shortcomings of the two devices. The purpose of this chapter is to review the literature to analyze in breadth and depth the contribution of mobile money to

financial inclusion.

We contribute to the literature by extending our analysis beyond the basic products of these two devices namely microcredit and m-payment. This chapter also explores the existence of regional differences in the scope of devices. It is also interested in groups of individuals who are not particularly included in formal finance.

The rest of the chapter is structured around four sections. The second section points-out the failures of traditional microfinance. It analyses the features of traditional microfinance products beyond their small amounts. And it explores the gaps between supply and demand for these products. The third section points-out the performances of mobile money. It analyzes the features of mobile money products and discusses the underdevelopment of some of them. The fourth section focuses on the impact of mobile money on SSA groups of individuals particularly concerned about financial inclusion. The fifth section concludes.

2.2 The failures of traditional microfinance

The institutionalization of the traditional concept of microfinance is rooted in the practical work of a research team led by economist Muhammad Yunus (born 1940). In the 1970s, the team conducted a series of experiments to alleviate poverty in the young state of Bangladesh. The findings of these studies have shaped microfinance in its traditional form, finance for low-income individuals.

In 1972, Bangladesh was experiencing extreme poverty. To address this, in the village of Jorba and surrounding areas, Yunus research team encouraged small firms to plant high-yielding grains and organize themselves into a cooperative. This led to the increase of their income. But the poorest of them experienced a smaller income increase. If they could afford to buy the rice field, their productivity would be quadrupled. Moreover, in the absence of a financial institution for micro-firms (Lelart, 2006; Yunus, 2007; Copestake and al., 2016), an informal usurious lending system has developed. Indeed, many firms producing wooden chairs stools borrowed from merchants. The loan is then used to purchase the raw material. As loan repayment, the stools are sold back to the merchants. In the process, the gain per producer was only two cents a day. Note that, in order to autonomously develop their activities, 42 of these firms needed only \$27. This pilot population was funded. And it was solvent. Subsequently, the MFI Grameen Bank was founded in 1983. Then, due to the fast development of the institution in Bangladesh rural areas and the recognition of SME as key agents in economic

development, many MFI have emerged in developing economies.

At first glance, we are tempted to say that microfinance is just micro-finance, a device that would replicate finance at “reduced” size. However, microfinance products have specific features. First, the two types of microfinance loans, individual lending and peer group lending, differs from classic bank loan. A bank loan specifies the amount, interest rate, term and loan guarantee. It is the amount and the guarantee that differentiates individual microcredit. Indeed, the amount of individual microcredit is relatively low. This is micro-credit. But it is mostly the absence of the guarantee that most characterizes individual microcredit. Before granting a loan, banks usually require collateral. However, the majority of micro-firms have neither income nor property. And even when they do, it usually happens in an informal setting. MFI require little or no guarantee (Dellien and al., 2005; Armendáriz and Morduch, 2010; Fall, 2011). As for the peer group lending, it is a type of loan where a group of firms, collectively, borrows and agrees to repay. It usually operates according to “2:2:1 staggering” (Morduch 1998; Lelart, 2006). In that configuration, loans are first granted to two members of the group. If all repayments are made on time, the initial loans are followed by loans to two other members and then by a loan to the group leader. We note that, here, the guarantee comes from joint liability. This encourage ones to ensure the proper repayment of others - the mechanism of peer monitoring. And during the process, the group meets periodically an MFI officer to solve issues. Moreover, microsavings is an indirect insurance product. In contrast to bank saving, traditional microsavings is often linked to other financial services: lending and insurance. Some MFI only lend to customers who have saved. In other MFI, a fraction of the loan is automatically saved. For example, some Grameen-style programs require borrowers to contribute to an “emergency fund” equal to 0.5 percent of the amount of each loan. This emergency fund provides insurance in case of insolvency and unforeseen expenses. These savings can be withdrawn upon their departure, but only after the bank has withdrawn what it is due. This type of savings is therefore an insurance device for customers, but also for the MFI. Thus, the configurations of traditional microfinance mean that what is, conventionally, the onus of the institution is provided by its customers.

While traditional microfinance has generated a lot of hope in its early years, current results are not up to par. Indeed, the most recent aggregate data indicates 205,314,502 MFI customers, including 137,547,441 low-income individuals (Maes and Reed, 2012). Low-income individuals are 66% of the MFI customers. This is not sufficient. In terms of reaching 600 million low-income individuals, we have an achievement rate of 22.9%. Regarding the different financial products, 56% of

the MFI borrowers are low-income individuals. And since 2010, this proportion has been declining steadily (cf. figure 2.1). Other products are not giving better

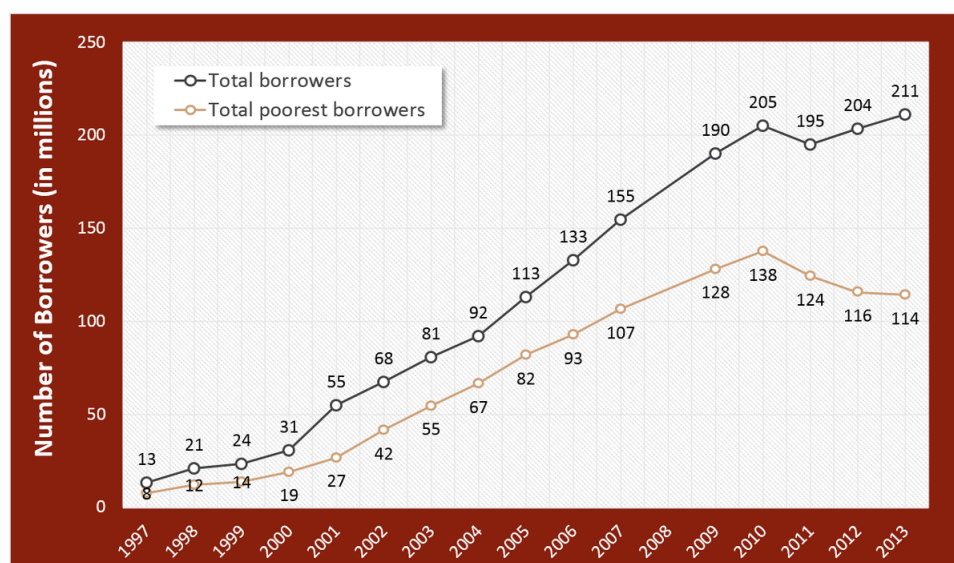


Figure 2.1: Growth of MFI borrowers and of low-income borrowers

results. Savings of the low-income individuals are much more stored in the informal sector (Collins and al., 2009; CGAP, 2017). The MiN (2014, 2015, 2016) does not report low-income customers among the 29 million insured in MFI. One study also indicates that there is no demand for microinsurance (Banerjee and al., 2014). Transfers of funds are either done informally (Ledgerwood, 2013) or done through other financial devices. Regarding poverty eradication, some studies report that microfinance products have no impact on household income (Angelucci and al., 2014, Bateman 2014, Augsburg and al., 2015, Banerjee and al., 2015, Crépon and al., 2015). Other conclude to their positive indirect effect on poverty. Rooyen and al. (2012) point-out a positive contribution to health expenditure. Beaman and al. (2014) and Banerjee and al. (2015) indicate a beneficial impact on investment in existing firms. Atanasio and al. (2015) report a favourable effect on consumption expenditure. But poverty eradication of 100 million households has not been established. However, it should be noted that these results contrast with the relative achievements of traditional microfinance in some developing economies in SA. The regional analysis indicates that this region counts for 91.3% of low-income customers (cf. figure 2.1). A positive impact of microfinance on income is also reported in the region. In Bangladesh, 1.8 million (Reed, 2011) customers have crossed the \$1.25 a day poverty line. In India, the same observation (Maes and Reed, 2012) occurred for 9 million customers. In all, despite these regional

Region	Number of programs reporting	Number of total clients in 2009	Number of total clients in 2010	Number of poorest clients in 2009	Number of poorest clients in 2010	Number of poorest women clients in 2009	Number of poorest women clients in 2010
Sub-Saharan Africa	1,009	10,776,726	12,692,579	6,360,861	7,248,732	3,935,808	4,783,256
Asia & the Pacific	1,746	156,403,658	169,125,878	117,178,142	125,530,437	97,385,541	104,752,430
Latin America & the Caribbean	647	12,257,181	13,847,987	2,834,742	2,919,646	1,935,685	2,363,100
Middle East & North Africa	91	4,552,387	4,290,735	1,492,322	1,680,181	1,217,113	1,165,358
Developing World Totals	3,493	183,989,952	199,957,179	127,866,067	137,378,996	104,474,146	113,064,144
North America & Western Europe	86	148,628	155,254	109,318	41,809	56,651	12,214
Eastern Europe & Central Asia	73	5,996,500	5,202,069	233,810	126,636	163,318	62,294
Industrialized World Totals	159	6,145,128	5,357,323	343,128	168,445	219,969	74,508
Global Totals	3,652	190,135,080	205,314,502	128,209,195	137,547,441	104,694,115	113,138,652

Table 2.1: Regional data on traditional microfinance

differences, the objectives of the financial inclusion campaign are not achieved.

There are several analyzes of the failures of traditional microfinance. Based on their income level, Robinson (2001) lists groups of individuals concerned in poverty alleviation through Financial services (cf. figure 2.2). It considers that individuals below the poverty line do not need microfinance products but rather subsidized programs for poverty alleviation. These are access to basic needs programs, vocational training and jobs. Moreover, on the side of the MFI, there is one for whom it is not their aim. This divergence leads us to introduce the schism in microfinance (Brau and Woller, 2004; Berguiga, 2009). On the one hand, welfarists consider that MFI can be sustainable without achieving financial self-sufficiency. In this case, donors are considered socially responsible fund investors that are interested in an intrinsic return from not investing in firms they find “offensive”. On the other hand, the mainstream, the institutionalists, consider that MFI must first and foremost aim for financial autonomy. The point is that subsidies are not unlimited and the return-risk pair does not work in lending. Indeed, consider the loan supply as investment. Investors are willing to take more risk only in exchange for higher expected returns. However, it turns out that the increase in interest

Income level	Commercial financial services	Subsidized poverty alleviation programs
Lower middle income	Standard commercial bank loans and full range of savings services	
Economically active poor	Commercial microloans	
	Interest-bearing savings accounts for small savers	
	----- Official poverty line -----	
Extremely poor		Poverty programs for such purposes as food and water, medicine and nutrition, employment generation, skills training, and relocation

Table 2.2: Financial services in the poverty alleviation toolbox
Source: Robinson (2001)

rate is limited to its legal level. This performance requirement could be tempered if loan is collateralized. Except that the low-income individuals have little or no guarantee to offer. Some MFI therefore require collaterals, that only the wealthiest can provide. For example, Banco Sol - a Bolivian MFI - has 28% guaranteed portfolio beyond the joint liability (Morduch, 1999). And when MFI are growing, they are focusing on wealthier customers (Hermes and Lensik, 2007). The traditional microfinance products have also their limits. The group loan involves transaction costs. These costs are magnified in areas where borrowers are not close. Frequent repayment schedules (Armendáriz and Morduch, 2010) are also hardly bearable for highly seasonal firms. In China, Kapoor and al. (2007) reports that a microfinance initiative closed due to the high costs of group meetings. In India, Banerjee (2013) points-out cases of entrepreneurs allegedly driven to suicide by microlenders.

2.3 The performances of mobile money

Following the launch of the mobile payment product M-Ps, in 2007, in Kenya, mobile money has spread widely in developing economies. Some findings preceded the development of the device. Indeed, as of mid-2005, only 26.4% of the 18-year-old individuals had access to institutional finance (FSDK, 2007). At the same time, Sfc - the dominant MNO in Kenya - was researching innovative products

for their customers, and the UK's Department for International Development was interested in developing products for unbanked populations. The latter financed Sfc. Subsequently, Sfc has experimented with access to financial products through mobile phones. The system was primarily designed for standard loan repayments (Hughes and Lonnie, 2007). In addition to this service, the transfer of funds has been proposed. The results of the pilot project indicate that: loans were transferred to other individuals who are often outside the pilot population; individuals repaid the loans of others in exchange for services; firms used the device to make payments and to store funds. Ten years later, M-Ps has become the dominant mobile money service in developing economies with a presence in a dozen economies⁸. The service has also diversified to incorporate lending, savings, insurance, and international transfer of funds. Along with the fast adoption of M-Ps - a million mobile money accounts registered after one year launch - other mobile money devices have developed.

Mobile money device differs from financial devices requiring a strong presence of bricks and mortar agencies. They differ in terms of transaction costs. Indeed, mobile money has reduced fund transfer costs. For example, while the average bank transfer cost is 11.18% of the total amount of funds (WB, 2017), mobile money charge 2.87%. It is six times cheaper. It also decreases indirect transaction costs. Directly on their mobile, customers can see their financial situation and make transactions (Chandran, 2014). Mobile money providers also save costs. Saving in particular administrative costs and premises, digitization have reduced the cost of providing financial services from 80 to 90% (Berry and al., 2016). Moreover, note that one product of the device acts as savings product and insurance: mobile payment. Indeed, after having credited their mobile wallet (Beck and al., 2016), users do not have to make immediate transactions. In Kenya, 76% of households use the device as a savings product (Jack and Suri, 2011). The device also allows a fast reply to unforeseen events. For example, in Cambodia (Fang, Russell and Singh, 2014), the device is used to pay for emergency medical care. Furthermore, the device has a greater reach. It reaches areas that do not yet have access to bank. Low-income individuals, especially in rural areas, are beyond the reach of bank branch networks. And their low individual transaction does not bring banks. Thus, these individuals do not make formal transactions. This is partly addressed by mobile money (Donovan 2012; Islam, 2013; Klapper and Singer 2014). For example, M-Ps reaches the majority of unbanked and rural populations in Kenya. In addition, the device is likely to increase transfers and decrease informal savings (Batista and Vicente, 2013). It has also increased the reach of other financial service providers. For example, the Kilimo Salama program (Manfre and Nordehn, 2013) - a microinsurance service in case of drought or excessive rainfall in Kenya

- operates through the device. In sum, the use of mobile money implies lower transaction costs.

Mobile money products are designed to make financial services available for the unbanked. Consider that the objectives of traditional microfinance are assigned to mobile money. The most recent aggregate data indicates 555.7 million mobile money account, including 252.4 millions of low-income individuals⁹. Forty-five percent of mobile money users are low-income individuals. They are not the majority of mobile money users. But in terms of reaching 600 million low-income individuals, we have an achievement rate of 42%. Regarding the different financial products, mobile payment being the pivotal product of mobile money device, the previous results are to his credit. And since 2013, mobile payment users has steadily increased (cf. table 2.3). As for the other products, 52.7 million insurance

Region	2013	2016
EAP	23.7	36.6
ECA	1.5	10.4
LAC	8.3	23.0
MENA	35.8	44.1
SA	35.5	164.2
SSA	98.3	277.4

Table 2.3: Regional data on mobile money

contracts (Granryd, 2017) are issued through mobile. There are 32 million savings accounts (GSMA, 2015) and 2.8 million borrowers (Cook and McKay, 2015). Regarding poverty eradication, Granryd (2017) reports a positive contribution to mobile money agents income. The study point-out that of the \$1.2 billion receipts, US \$650 million is refunded to about 925,000 agents. In addition, Berry and al. (2016) indicates that the widespread use of digital finance could increase the annual GDP of developing economies by \$3.7 trillion by 2025, an GDP increase of 6%. Most of this increase would come from increased productivity of financial and non-financial corporations and governments due to digital payments. The rest would come from the additional investment of SME. As a result, this additional GDP could create 95 million jobs in all economic sectors. But the eradication of poverty from 100 million households is not yet established. However, it should be

noted that mobile device does not evenly spread in developing economies. The regional analysis indicates that SSA counts for 55.4 of its low-income users. Also, all the 13 economies with an mobile money account penetration of 10% or more are in this region (cf. figure 2.2). The device positive impact on income is also

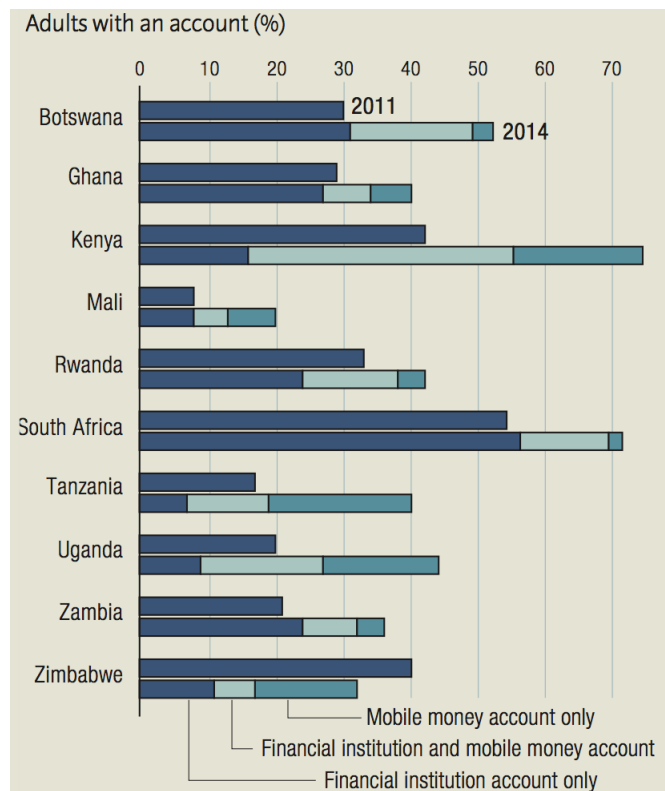


Figure 2.2: Account penetration in economies with mobile money account penetration of 10 percent or more
Source: Demirgüç-Kunt and al. (2015)

reported in the region. In Kenya, 194,000 users have crossed the poverty line. Despite its greater impact on financial inclusion in general¹⁰, mobile money also has its shortcomings. Suitable products problems of traditional microfinance also apply to mobile money, even if they are mitigated. Individuals below the poverty line may need to receive payments (Scharwatt and Williams, 2015). Moreover, ORM are rather institutionalists. In addition, low-income individuals are even more intested with peer group products such as savings group and lending. While group saving is much provided (Bhandar, 2015; Osei-Assibey 2015), group loan is less. Musoni (Omwansa and Waema, 2013) is one of the few examples of mobile money group loan.

2.4 Mobile money and groups of individuals particularly unbanked in SSA

SME, female, rural population and migrants are not particularly included in formal finance. They are beyond the reach of bank branch networks. Also, their individual transaction level and their involvement in the informal sector do not bring banks. However, the financial inclusion of these groups of individuals contributes to economic development (Demirgüç-Kunt and Klapper, 2012; Deen-Swararay and al., 2013; Della Peruta, 2015; Darmon and al., 2016). Economies in which some groups of individuals have financial barriers are losing growth by limiting ability of part of the population to pursue self-employment opportunities. Moreover, female reinvest 90% (Scharwatt, 2016) of their income back into their household and relatives (30 to 40% for male), which increases the income and the formation of future generations.

SSA is particularly concerned with the financial inclusion of these groups (cf. table 2.4). But is also the region where mobile money is most developed. Consider

Regions	EAP	ECA	LAC	MENA	SA	SSA
Population, age 15-64, billion	1.448	0.281	0.408	0.237	1.15	0.558
Account, % age 15+	68	51	51		46	34
Rural, population %	46	34	20	39	66	61
Average informality, GDP %	17.5	36.5	34.7	23.7	25.1	38.4
Net Migration, million	-3,4	1,2	-1,7	-3,2	-6,6	-1.9
Urban population growth, annual %	2.5	0.8	1.4	2.2	2.5	4.1
Population density, individuals per sq. km of land area	128	18	31	43	370	43

Table 2.4: Regional data on populations particularly unbanked
Source: Schneider and al. (2010)

its impact on these groups. Over the period 2011-2014, female account ownership increased by 3.8 percentage points (cf. table 2.5). This increase is mainly driven by mobile money. This increase is even greater in economies where the device penetration is 10% or more. In these economies, female account ownership increased by 8.8 percentage points. Mobile money is also achieving gender parity. For example, in Ivory Coast and Kenya (Demirgüç-Kunt and al., 2015), for mobile

Economies	2011	2014
Botswana	28.4	45.9
Ghana	27.1	34.9
Kenya	39.2	51.9
Mali	6.9	10.5
Rwanda	28.2	30.5
South Africa	51.0	68.8
Tanzania	13.8	17.1
Uganda	15.1	23.1
Zambia	23.3	29.7
SSA	21.3	25.1

Table 2.5: Female mobile account penetration in SSA economies with mobile account penetration of 10 percent or more (%15+)

money ownership only, there is no statistically significant gender gap. As for the rural group, by overcoming the distance barrier of banks and relaxing documentation requirements, mobile money could increase their account ownership by 23 percentage points (Demirgüç-Kunt and Klapper, 2012). The device is also much more effective in delivering public transfer program in Niger (Aker and al., 2014). It has also generated positive externalities for other industries, notably by providing some products to rural areas (cf. table 2.6). For example, in Kenya 500,000

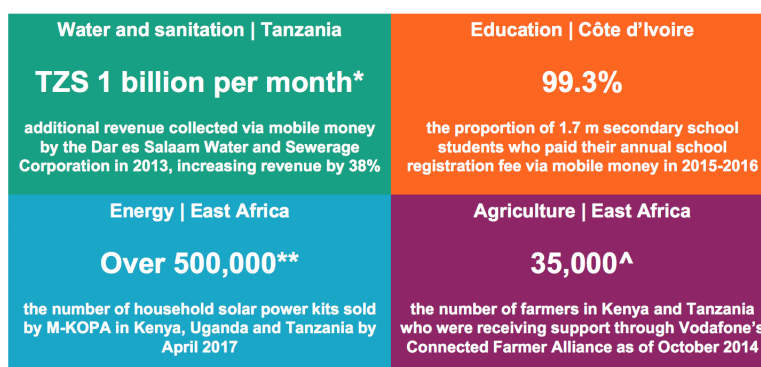


Table 2.6: Externalities of mobile money for other industries in rural areas

solar home energy kits are sold at lower cost through M-Kp - a device accessible through M-Ps that offers the possibility to rent solar power kits and eventually own them. As to SME, their mobile payments increased by 2.4% in value and 4.1% in volume. Finally, mobile payment is now the main device of payment of informal

firms (Deen-Swarray and al., 2013) in some SSA economies. This is particularly the case, in Kenya and Uganda. Note that international remittance is the least developed product. Over the period 2011 and 2016, its share in total mobile payments stagnated at 1.1% in value and 0.1% in volume (cf. figure 2.3)

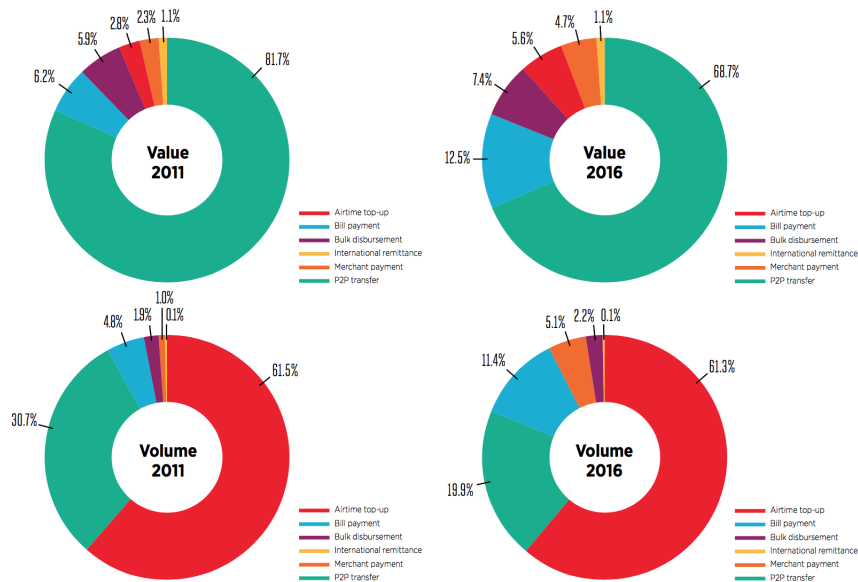


Figure 2.3: Growth of mobile money products

2.5 Concluding remarks

This chapter established the contribution of mobile money in mitigating the shortcomings of traditional microfinance in the last financial inclusion campaign in developing economies : by 2015, reaching 600 millions of low-income individuals with microfinance; at the same time, ensure that 100 households are above the poverty line. Traditional microfinance has reached only 137.5 millions of low-income individuals with products that boil down to microcredit. This device did not put 100 million households above the poverty line. Mobile money has reach 252.4 millions of low-income individuals with range of produts. This device does not put 100 million households above the poverty line. Aggregate data indicates that the devices reached 389.9 million low-income individuals, 65% achievement rate of the objective of reaching 600 million low-income individuals. Therefore, mobile money is mitigating some shortcomings of traditional microfinance.

We note that, depending on the devices considered, SA and SSA have superior results. SA counts for 91.3% of low-income customers of MFI. In the region, a positive impact of the device on income is also reported. As for SSA, it counts for 55.4% of low-income users of mobile money. In the region, a positive impact of the device on income is also reported. These results qualify our overall observations. These results also indicate that traditional microfinance and mobile money meet different needs. Traditional microfinance is tailored to a region with a high density of population such as SA. As for mobile money, it is much more tailored to a region with a high mobility of population such as SSA. Finally, note that there, mobile money contributes to the financial inclusion of individuals particularly unbanked, namely SME, female, rural population, and to a lesser extent, migrants.

Chapter 3

Microfinance and optimal level of expansion of the informal sector

3.1 Introduction

The role of informal sector in developing economies is a challenged subject. This sector can be considered as an obstacle to the access of these economies to efficient forms of development. It limits government revenues, increases their dependence from external financing and their capacity to develop infrastructures or to contribute to an adequate redistribution of wealth by ambitious public expenses. There are other reasons to limit the extension of this sector: it is generally composed by small firms, individual producers, craftsmen or storekeepers who could hardly integrate efficient productive or trading technologies and then slow down the modernization of the economy. Last but not least, when important, this sector generates a sensation of injustice from members of the formal sector who can consider state inertia of informality as unfair. This attitude can encourage tax evasion.

There are however several advantages to condone informal sector development. Many informal firms could not survive formally: they have obsolete technologies, low productivity, provide low revenues, etc. However, maintaining a sub-efficient informal sector also enhances national level of activity, provides resources to individuals who would remain inactive without it, is a way to struggle against poverty, and generates induced revenues for other components of the economy. To some extent, some degree of tolerance for the informal sector is also considered as a way for state to help low-income individuals to adapt gradually to the current fiscal and regulatory requirements of formalism.

Given these balanced arguments, states generally choose to condone informal

sector, as long as it is not too developed and do not deter efficient companies to join informal sector. There are however few economic means to control the size of informal sector. Taxes, monitoring, eviction, have all the disadvantage to increase inactivity and unemployment without increasing substantially the size of the formal sector. A policy of inclusion of informal activities has the opposite effect. These accommodative policies reduce unemployment but also the size of the formal sector, and increase fiscal dependency of state. The solutions we analyze in this chapter are different. They consider the role of m-payment, and of microcredit, not only for this last in its traditional form but also as a joint service associated with m-payment devices. Are m-payment and microcredit able to control the size of informal sector but also to make it not too small, in order to maintain sufficient levels of activity and of average revenue? This chapter answers this question. The second section reviews different options considered by literature to reduce the size of the informal sector in developing economies. It also discusses the way m-payment and microcredit in its traditional form as monitoring devices of this sector. The third section presents the benchmark model which is developed in the fourth section with the introduction of microcredit. Then, we introduce m-payment in the fifth section, and microcredit in its new form, associated to m-payment, in the sixth section. We consider interactions between the active sectors in the seventh section. Our results point out the positive role of m-payment as a way to regulate the size of the informal sector, overall in the case of interactions between sectors. The eighth section concludes.

3.2 The options to reduce the size of the informal sector in developing economies

The informal sector counts for 30% of the official GDP of developing economies (Schneider et al., 2010). Many policies have been formulated and often applied to regulate it. However, over the 2000-2010 period, informal jobs increased by 2.4 percentage points (Charmes, 2012). This opens the field to other experiments.

A reduction of the size of the informal sector is generally considered as a convenient initiative in a perspective of growth and economic development. Empirical literature generally report that the size of the informal sector is negatively correlated to the level of economic growth. Compared to formal sector agents - households and firms -, members of the informal sector are less productive (De Paula and Scheinkman, 2007; Benjamin and Mbaye, 2012). They also do not contribute to government expenditures (Loayza, 1997; Elbadawi and Loayza 2008;

Benjamin, 2014). This leads to an unproductive use of government expenditures and threatens the financial autonomy of states. Moreover, informal sector workers do not have access to pension and health insurance systems, which generate forward complex situations of dependency. Younger members of this sector also support their parents to maintain a sufficient level of efficiency of this sector, do not attend school and slow down national growth of human capital. These limits are undermining the human and economic development by delaying the modernization of the economy. However, informal sector is the only source of income for some populations (Gaarxhani 2004; Lautier, 2004; Jaaatting and Laiglesia, 2009). It avoids for many unemployment and poverty. One of the fundamental origins of the existence of the informal sector is indeed the lack of formal jobs, particularly in the private sector, and for various reasons (legal environment, access to finance, etc.). Note also that the informal sector provides relatively cheaper goods and services, enabling its customers to postpone their spending on other goods and improve this way their welfare.

The informal sector is essentially a scourge when it is overextended, but might also be a asset for the economie, when its size remains marginal and controlled. To control the size of the informal sector, there are public solutions (mitigation the level of taxes, increasing control and evictions, etc). In the subsequent subsection, we review the tax-based option before considering the private option provided by m-payment and microcredit associated with m-payment.

3.2.1 The tax-based option

The policies around the world on the informal sector have in common the simulating reach of these following objectives: the promotion of formal employment, the regulation of the informal sector size and the protection of informal employment (Bruhn, 2012; ILO, 2013). Macroeconomics policies can facilitating formal employment such as government recruitment. Reduction of transition cost for the transition from informality to formality is also a possible policy: for instance, public campaigns can develop the advantages to being “formal”. In terms of promotion of informal employment, there are the social protection for all, the promotion of the organization of this sector as cooperative, the setting up of minimum wage and the help of initiatives of social economics. Among all these policies, it is assumed that active members of a population are encouraged to formally register if they receive something in return (Nachi, 2004; Levi, 2006). The cost of formalization, including taxation, is the main obstacle to the passage from the informal to the formal sector (Günther and Launov, 2011; La Porta and Shleifer, 2014; Ulyssey, 2014). Indeed, informal sector agents consider, usually rightly, they do not create enough value to pay these costs. Lower taxes could be a solution if this decrease

of taxes do not reduce significantly financial independence of government. An optimal level of taxation probably exists, for any given structure of the productive sector; conversely, that level of taxation depends on the structure, that is to say that the size of the informal sector and the optimal level of taxation are inter-related. The tax-based solution can potentially control the size of the informal sector. But many developing economies have substantial budget constraints.

3.2.2 The traditional microcredit option

The formal microcredit has been long acclaimed as bearer of development. An economy where most of the population cannot accumulate sufficient capital, will continue to accuse low productivity and low income. Investment is needed to break this vicious circle of poverty (Soubbotina and Sheram, 2000). Moreover, the more informal agents income increases, the more these agents tend to choose the formal sector (De Paula and Scheinkman, 2007; De Mel and al., 2012). Assuming that microcredit encourages investment, it should also increase income. Microcredit beneficiaries should therefore move into the formal sector. However, the reality is slightly different: microcredit borrowers are and remain mainly in the informal sector (Farazi, 2014; Beck, 2015), possibly with an increased income (Crépon and al., 2014; Banerjee and al., 2015), even if this point is challenged by literature (Bateman, 2014; Angelucci and al., 2015). The relative skepticism on the effect of microcredit solutions is based in part on these ambiguous observations. Not only the microcredit does not contribute to control the size of the informal sector, but it seems to maintain or make it inclusive. Cooperation between microcredit institutions and state could contribute to regulate the informal sector. But this will only concern to the amount of lending. Microcredit institutions are mainly interested in loan repayment. And contractors' income are not necessarily deposited.

3.2.3 The mobile microfinance option : the m-payment and the mobile microcredit

M-payment services have been proposed these last years in many African and Asian developing economies. However, they did not developed uniformly: in Eastern Africa, their success is exceptional; elsewhere, it could be more reasonable and in some places it adoption failed. The lack of competition with a previously developed credit card network seems an advantage to its adoption. Developing economies receive remittance services because of the support of the migrants to their families. This is a source of immaterial means of payment, which could also help remittances recipients to adopt more rapidly immaterial means of payment for local use. Companies also need to make small professional frequent transactions

(Mas and Radcliffe, 2010; Beck, 2015). Compared to others means of payment m-payment services are more advantageous; they save transaction and holding costs, decrease the risk of lost for distant transactions (Attali, 2015; Chaix and Torre, 2015). The story is also important. Leaders in m-payment in Africa, like M-Ps and Org mny, have been introduced by leaders telecommunications operators alone, Sfc and Org. Several studies start to address new questions about m-payment in developing economies. Among them, there are the implication of m-payment for economic development and the welfare of low-income users (Ledgerwood and al., 2013). Others consider the diversify customer usage and the interest of m-payments in rural areas (Granryd, 2015). And potential of m-payment to allow informal businesses to have formal financial services (Deen-Swarray and al., 2013).

Beyond that, m-payment proves to be a factor of financialization of economies, especially when there are differentiated services of m-payment (Chaix and Torre, 2015). Could it help to regulate the informal sector? Registration is required for mobile operators. Furthermore, users are necessarily active to make significant transaction. In this regard, m-payment uses is increasing in developing economies (Deen-Swarray and al., 2013; WB, 2018b). M-payment is also mainly used by informal businesses to pay wholesalers - those last being members of formal or informal sector - and receiving payments from customers. M-payment service providers in partnership with banks, have also introduced microcredit by mobile phone. These solutions have at least as many benefits as the traditional microcredit of the first generation, added to their greater simplicity in terms of access and management.

3.3 The benchmark model

The economy is made up of n agents located on segment $[0, 1]$ according the level of their productivity. When agent located at point j , ($0 \leq j \leq 1$) is active, her gross (or potential) income amount is j and her utility j^α thereby from consuming private goods, with $0 < \alpha < 1$ (marginal decreasing utility). Similarly, if g represents her level of public goods consumption, her resulting utility is g^α . Inactive agents have a reservation utility $\bar{\alpha}$ provided by self production of private goods.

Each agent can choose to be active as an independent producer in the formal sector, in the informal sector or to remain inactive. All expressions specific to the formal (resp. informal) sector are distinguished by the subscript or the index “*form*” (resp. “*inf*”). Members of the formal sector contribute to the state expenditure by paying proportional income taxes jt , with $0 < t < T$. They also pay a registration cost E independent on their productivity. They have however specific advantages. Only an activity in the formal sector gives access to traditional

banking services. The advantage of these services is proportional to formal sector members income. Namely, agent j accesses to the value jF , ($F > 0$) of financial advantages (interest on deposits, overdrafts, credit facilities, insurance, cautions and other banking services).

All agents, active and inactive, have an equal access $g = G/n$ to state spending G under the form of public services (school, health services, public transport, etc.).

Members of the informal sector do not pay taxes and registration costs but suffer double punishment when detected by tax controllers. Their inventories are destroyed, and they remain inactive without any possibility of self production. The risk to be detected then generates a expected penalty cj , ($0 < c < 1$), proportional to potential income.

Given these assumptions, the utility of agent j expresses as 3.1, 3.2, or 3.3, according her choice to be member of the formal sector, member of the informal sector or inactive, with:

$$u_j^{form} = (1 - t + F)j^\alpha + (G/n)^\alpha - E \quad (3.1)$$

$$u_j^{inf} = (1 - c)j^\alpha + (G/n)^\alpha \quad (3.2)$$

$$u_j^{inac} = \bar{\alpha} + (G/n)^\alpha \quad (3.3)$$

Lemmas 1 and 2 are immediate consequences of these assumptions.

Lemma 1. *In case of balanced public accounts, formal sector exists and state has redistributive functions only if ($t \leq F + c - E$).*

Proof: Suppose that $t > (F + c - E)$. Then, for agent located on $j = 1$ (*i.e.*, for the most productive agent), $u_1^{inf} > u_1^{form}$. Agent located at $j = 1$ then chooses to be informal all agents located at point j' , such that $j' < 1$ have the same choice. Consequently, there is no formal sector, no taxes and no more public expenses in case of balanced public accounts ■

Lemma 1 indicates that the rate of imposition must be moderated to preserve sufficient incentives for high potential income agents to choose the formal sector.

Lemma 2. *When state has redistributive functions, high potential income agents are members of the formal sector, average potential income ones from the informal sector, and low potential income agents remain inactive.*

Proof: For agent j , the advantage of being member of the informal sector instead of being inactive is given by $(1 - c)j^\alpha \geq \bar{\alpha}$. As $c < 1$, this advantage increases with j and agents with a high level of income prefer to be members of the informal sector than remaining inactive. Compare now the advantages of being respectively member of formal and informal sectors. The benefit of being formal is given by $(F + c)j^\alpha - E \geq tj^\alpha$. For sufficiently small values of t , agents with a high level of income prefer to be members of the formal sector than remaining informal. Given lemma 1, for small values of j , agent located at j remains inactive, average values of j make agent located on j member of the informal sector, while agents with high values of j are members of the formal sector ■

In the non-degenerated cases and if n_{inac} , n_{inf} et n_{form} figure respectively the number of agents choosing to be inactive, members of the informal sector and of the formal sector, the three populations of inactive agents, members of the informal sectors and members of the formal sectors can then be ranked on the segment $[0, 1]$ according to their level of income (see figure 3.1).

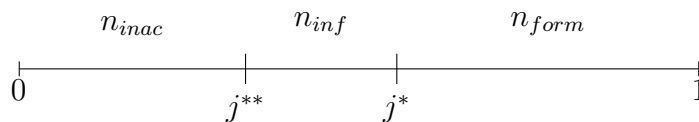


Figure 3.1: The distribution of agents according their income when active

j^{**} is the threshold location between inactive agents and members of the informal sector, and j^* the threshold location between participants to the informal and formal sectors. Elementary arithmetics provide the analytical expressions of these locations: $j^{**} = \frac{\bar{\alpha}^{1/\alpha}}{(1-c)^{1/\alpha}}$ and $j^* = \frac{E^{1/\alpha}}{(F+c-t)^{1/\alpha}}$. The level of public expenditures G is then derived for a given rate t of public taxes:

$$G = \int_{j^*}^1 njt \, dj = \frac{nt}{2}(1 - j^{*2}) \quad (3.4)$$

$$i. e., G = \frac{nt}{2} \left[\frac{(F+c-t)^{1/\alpha} - E^{1/\alpha}}{(F+c-t)^{1/\alpha}} \right].$$

Expressions (3.5) to (3.7) then provide utility of agent located at j when this agent is respectively active in the formal sector (expression (3.5)), active in the informal sector (expression (3.6)) or inactive (expression (3.7)):

$$u_j^{form} = (1 - t + F)j^\alpha + \left(\frac{t}{2}\right)^\alpha \left[\frac{(F + c - t)^{1/\alpha} - E^{1/\alpha}}{(F + c - t)^{1/\alpha}} \right]^\alpha - E \quad (3.5)$$

$$u_j^{inf} = (1-c)j^\alpha + \left(\frac{t}{2}\right)^\alpha \left[\frac{(F+c-t)^{1/\alpha} - E^{1/\alpha}}{(F+c-t)^{1/\alpha}} \right]^\alpha \quad (3.6)$$

$$u_j^{inac} = \bar{\alpha} + \left(\frac{t}{2}\right)^\alpha \left[\frac{(F+c-t)^{1/\alpha} - E^{1/\alpha}}{(F+c-t)^{1/\alpha}} \right]^\alpha \quad (3.7)$$

The population of each sector is determined directly from expressions of j^{**} and j^* . Proposition 1 is then derived:

Proposition 1. *Any increase of proportional taxes financing a uniform redistribution of wealth has no effect on unemployment but decreases the size of the formal sector and increases the size of the informal sector.*

Proof: Expressions of n_{inac} , n_{inf} and n_{form} are derived from elementary arithmetics from expressions of the threshold locations j^* and j^{**} . The resulting expressions are $n_{inac} = \frac{n\bar{\alpha}^{1/\alpha}}{(1-c)^{1/\alpha}}$, $n_{inf} = n \left[\frac{E^{1/\alpha}(1-c)^{1/\alpha} - \bar{\alpha}^{1/\alpha}(F+c-t)^{1/\alpha}}{(F+c-t)^{1/\alpha}(1-c)^{1/\alpha}} \right]$ and $n_{form} = n \left[1 - \frac{E^{1/\alpha}}{(F+c-t)^{1/\alpha}} \right]$. n_{inac} does not depend on t while n_{form} decreases and n_{inf} increases with t ■

Proposition 1 points out that, with uniform redistribution of revenue among agents, the optimal rate of taxation maximizing the size of the formal sector is $t = 0$. All increase of the rate of taxation has the only effect to decrease the size of the formal sector, without reducing employment. Note that all non-uniform redistributive policy will have effects on activity: when the redistribution is low-incomes biased, any increase of taxes also decreases the level of activity.

With uniform redistribution of wealth, other comparative static properties can also be expressed.

$$\frac{\partial(n_{form})}{\partial F} = \frac{E^{1/\alpha} n (c+F-t)^{-1-\frac{1}{\alpha}}}{\alpha} > 0,$$

$$\frac{\partial(n_{form})}{\partial E} = -\frac{E^{-1+\frac{1}{\alpha}} n (c+F-t)^{-1/\alpha}}{\alpha} < 0,$$

$$\frac{\partial(n_{form})}{\partial c} = \frac{E^{1/\alpha} n (c+F-t)^{-1-\frac{1}{\alpha}}}{\alpha} > 0,$$

$$\frac{\partial(n_{inf})}{\partial F} = -\frac{E^{1/\alpha} n (c+F-t)^{-\frac{1+\alpha}{\alpha}}}{\alpha} < 0,$$

$$\frac{\partial(n_{inf})}{\partial E} = \frac{E^{-1+\frac{1}{\alpha}} n (c+F-t)^{-1/\alpha}}{\alpha} > 0,$$

$$\frac{\partial(n_{inf})}{\partial c} = -\frac{(1-c)^{-1-\frac{1}{\alpha}}n\left((1-c)^{1+\frac{1}{\alpha}}E^{\frac{1}{\alpha}}+\bar{\alpha}^{\frac{1}{\alpha}}(c+F-t)^{1+\frac{1}{\alpha}}\right)(c+F-t)^{-\frac{1+\alpha}{\alpha}}}{\alpha} < 0,$$

$$\frac{\partial(n_{inac})}{\partial \bar{\alpha}} = \frac{\bar{\alpha}^{-1+\frac{1}{a}}(1-c)^{-1/a}n}{a} > 0,$$

$$\frac{\partial(n_{inac})}{\partial c} = \frac{\bar{\alpha}^{\frac{1}{a}}(1-c)^{-1-\frac{1}{a}}n}{a} > 0.$$

These comparative statics results can be summarized as follows:

$$n_{form} = n_{form} \left(\bar{t}^-, F^+, E^-, \bar{c}^+ \right), n_{inf} = n_{inf} \left(\bar{t}^+, F^-, E^+, \bar{c}^- \right), n_{inac} = n_{inac} \left(\bar{\alpha}^+, \bar{c}^+ \right),$$

where the signs characterize the nature of parameters impact on the relative size of the sectors. Note that the relative sizes of the formal and the informal sectors always move in opposite directions. Conversely, and as expected, the penalty \bar{c} has positive impact on the relative sizes of formal and inactive sectors.

A relevant issue is then to consider that in this economy, the optimal level of taxation should maximize the aggregated level of utility of the whole population. This welfare index expresses as (3.8):

$$W = n_{inac} \bar{\alpha} + n \int_{j^{**}}^{j^*} (1-c)j^\alpha dj + n \left[\int_{j^*}^1 ((1-t+F)j^\alpha - E) dj \right] \quad (3.8)$$

$$+ n \left(\frac{t}{2} \right)^\alpha \left[\frac{(F+c-t)^{1/\alpha} - E^{1/\alpha}}{(F+c-t)^{1/\alpha}} \right]^\alpha \quad (3.9)$$

Proposition 2. *The level of taxation maximizing welfare is higher than $t = 0$, i.e. than the level of taxation maximizing the size of the formal sector.*

Proof: See Appendix 3.

Proposition 2 points out that there is a conflict between the objectives of welfare maximization and of minimization of the informal sector size. The spread between the level of taxation maximizing welfare and the level of taxation maximizing the size of the formal sector is caused by the decreasing form of marginal utility of each type of consumption. It is the consequence of a form of complementarity between private and public consumptions. When the level of taxation is the only control variable of state, it is therefore optimal from a welfare point of view to provide public goods financed by taxes, and to accept consequently a more or less developed informal sector. It is interesting to observe¹¹ that all agents - even the most productive - prefer small taxes than no taxes at all: because public

expenses cover specific needs also valuable for highly productive agents, formal sectors members do not implicitly recommend the collapse of the informal sector, even when they express officially a different opinion.

3.4 The impact of microcredit

Two factors have negative impact on the relative size of the informal sector: advantages of financial services which limited to formal customer, and amount of penalties for evading taxes. The taxation rate and the registration cost have conversely positive influence on the size of informal sector. State has small margins of freedom on these two parameters. Registration costs cover public expenses generated by industrial and commercial activity: they are quite incompressible. Similarly, given Proposition 2, it is economically inefficient to decrease taxes under their maximizing welfare level. Other solutions are consequently needed to monitor the extent of informal sector.

It is interesting to consider the effect of traditional form of microcredit. When this kind of services is provided, it helps individual entrepreneurs and small business to overcome credit rationing by the traditional banking sector. This service is specially relevant in developing economies when it is available for unbanked individuals of the informal sector. We then consider its effects in this section. Suppose that microcredit services are now available for all active agents, whatever their productivity. The service takes the form of small advances in cash. The ceiling of these advances is lower than the usual ceiling of bank loans for the same operation and interests charges are higher than for usual loans. For these reasons, members of the formal sector which have access to banks do not use it, while members of informal sector adopt it.

The benefit of microcredit can then be captured by an increased revenue F' , ($F' < F$), available for each unitary income. Agent j potential benefit from microcredit is then jF' . Microcredit and bank credit cannot be claimed at the same time. Lemma 3 derives of these assumptions.

Lemma 3. *When microcredit is available, only informal agents have it in interest.*

Proof: If Agent j is member of the inactive sector can not have access to the microcredit because the service is conditional on conducting an economic activity. Furthermore, given that $F > F'$, $\forall j$, $(1+F-t)j + \frac{G}{n} - E > (1+F'-t)j + \frac{G}{n} - E$, i.e., no members of the formal sector will prefer using microcredit instead of the traditional facilities offered by banks. Conversely, given that $(1+F'-c)j - \frac{G}{n} > (1-c)j - \frac{G}{n}$,

all members of the informal sector have interest to use microcredit ■

From lemma 3, the new utility functions express as follows:

$$u_{j_{F'}}^{form} = (1 - t + F')j^\alpha + \left(\frac{G_{F'}}{n}\right)^\alpha - E \quad (3.10)$$

$$u_{j_{F'}}^{inf} = (1 + F' - c)j^\alpha + \left(\frac{G_{F'}}{n}\right)^\alpha \quad (3.11)$$

$$u_{j_{F'}}^{inac} = \bar{\alpha} + \left(\frac{G_{F'}}{n}\right)^\alpha \quad (3.12)$$

Proposition 3 captures the consequence of microcredit introduction for the whole population:

Proposition 3. *The introduction of microcredit under its traditional form increases the level of activity but decreases both the size of the formal sector and the level of life of inactive individuals. For an unchanged rate of proportional taxes t , it also decreases public expenses and utility of members of the formal sector and inactive individuals.*

Proof: Given the new expression of informal agents utility function, the threshold locations j^* and j^{**} move respectively upward and downward and the respective sizes of populations are now given by $n_{form_{F'}} = n \left[1 - \frac{E^{1/\alpha}}{\alpha(F-F'-t+c)^{1/\alpha}}\right]$, $n_{inf_{F'}} = n \left[\frac{E(1+F'+c)^{1/\alpha} - \bar{\alpha}^{1/\alpha}(F-F'-t+c)^{1/\alpha}}{(F-F'-t+c)^{1/\alpha}(1+F'-c)^{1/\alpha}}\right]$ and $n_{inac_{F'}} = \frac{n\bar{\alpha}^{1/\alpha}}{\alpha(1+F'-c)^{1/\alpha}}$. A comparison of n_{inac} and $n_{inac_{F'}}$ attests that $\forall F', F' > 0$, $n_{inac_{F'}} < n_{inac}$, i.e., the inactive proportion of agents is smaller after the introduction of microcredit, which demonstrates the first part of the proposition. The comparison of n_{form} and $n_{form_{F'}}$ attests that, under the same conditions, $n_{form_{F'}} < n_{form}$. As a consequence, public expenses per capita decrease. Hence, the new expression $G_{F'}$ of public expenses integrates the new expressions of j^* and j^{**} and $G_{F'} < G$. Consequently, utility of the formal agents and inactive decreases, while the effect on informal agents is ambiguous ■

The microcredit under its traditional form has then an ambiguous effect. It is an incentive for low skills agents to integrate the informal sector instead of remaining inactive, but it is also an incentive for other agents to move from the formal to the informal sector. Moreover, microcredit increases the utility of a fraction of the members of the informal sector (those with a relative high skills), but it decreases the net utility of all other agents. When successful, microcredit is not a good way to reduce the size of the informal sector, and more unexpectedly - given

the conflict of interest it generates between informal agents and the rest of the economy -, to generate harmony between members of the society.

3.5 The introduction of m-payment

All agents are now supposed endowed with mobile phones. M-payment services are offered in a basic version by the telephonic operator without any help of a financial partner¹². It provides reliability and saves transaction and holding costs generated by cash holding and payments. provides to users an additional revenue uj . An advanced version is also provided with a banking partner providing traditional banking services. This version is only available for members of the formal sector since banks refuse clients for the informal sector. it provides an additional revenue vj with $v > u$. Both versions of m-payment provide digital information that state can use to disclose members of the informal sector. Given that m-payment services present only advantages for banked agents, this form of payment is still adopted by formal sector members. Similarly, inactive agents adopt the basic version and increase their revenue in proportion \bar{u} . For members of informal sector, the additional risk to be identified and to loose inventories increases with revenue: unitary expected penalty then increases from c to c' , ($c' > c$). The new utility functions write now as expressions (3.13) to (3.16) when microcredit is withdrawn:

$$u_{j_m}^{form} = (1 - t + v)j^\alpha + \left(\frac{G_m}{n}\right)^\alpha - E \quad (3.13)$$

$$u_{j_m}^{inf} = (1 - c)j^\alpha + \left(\frac{G_m}{n}\right)^\alpha \quad (3.14)$$

$$u_{j_m}^{inf} = (1 - c' + u)j^\alpha + \left(\frac{G_m}{n}\right)^\alpha \quad (3.15)$$

$$u_{j_m}^{inac} = \bar{\alpha} + \bar{u} + \left(\frac{G_m}{n}\right)^\alpha \quad (3.16)$$

The comparison of expressions (3.15) and (3.14) attests that depending on the relative amount of u and c' , there are only two possible equilibriums, one with total adoption on m-payment devices if $u \geq c'$ and another one with partial adoption when $u < c'$. In this last case, only members on the informal sector do not adopt

m-payment devices.

Proposition 4 then derives from the analysis of the two possible situations:

Proposition 4. *The introduction of m-payment increases the size of formal sector. It increases also welfare. Its effect on the level of activity is ambiguous.*

Proof: When informal sectors members adopt m-payment, the new threshold member between informal and formal sectors member is given by $j^* = \frac{E}{\alpha(c'-t+v-u)}$ which, given the values of u, v, c, c' is smaller than its initial value in the benchmark. The same conclusion is obtained when members of the informal sector do not adopt. These comparisons establish the first part of the proposition. Public expenses per capital are still given by $\frac{(1-j^*)t}{2}$ which increases with the decrease of j^* , which proves the second item of the proposition. Its effect on the level of activity falls from the expression of j^{**} . The comparison of expressions (3.15) and (3.16) attests that the threshold revenue j^{**} increases when members of informal sector do not adopt. When they adopt, j^{**} is obtained from the comparison of (3.15) and (3.16): the result is ambiguous and depends on the respective values of \bar{u}, u and c' , and provides the last item of the proposition ■

Note also that the introduction of m-payment is Pareto improving since all agents (those who remain in the same category and those who move from one category to another one) increase their utility levels for a given rate of taxation t . The m-payment adoption also reduces the size of the informal sector. Low skills agents of the formal sector do not have any incentives to go to the informal sector. Inactive individuals also have interest to adopt it.

3.6 M-payment and new forms of microcredit

New forms of microcredit are now available through the m-payment device, as an additional service provided by the telephonic operator or one of its non-banking partner. This new form of microcredit is still not interesting for members of the formal sector: it provides a unitary additional revenue F'' such that $F' < F'' < F$ and is still not cumulative with traditional banking credit. It is then only devoted to members of the informal sector. Utility functions then write as expressions (3.17) to (3.20):

$$u_{j_m F''}^{form} = (1 - t + v)j^\alpha + \left(\frac{G_{mF''}}{n}\right)^\alpha - E \quad (3.17)$$

$$u_{j_m}^{inf} = (1 - c)j^\alpha + \left(\frac{G_m}{n}\right)^\alpha \quad (3.18)$$

$$u_{j_{mF''}}^{inf} = (1 - c' + u + F'')j^\alpha + \left(\frac{G_{mF''}}{n}\right)^\alpha \quad (3.19)$$

$$u_{j_{mF''}}^{inac} = \bar{\alpha} + \bar{u} + \left(\frac{G_{mF''}}{n}\right)^\alpha \quad (3.20)$$

The comparison of expressions (3.19) and (3.18) attests that, like in previous case, there is complete adoption of m-payment only if the cumulated advantages of m-payment and microcredit $u + F''$ dominate for informal agents the increase of risk $c' - c$ generated by the diffusion of input on line. Expressions (3.17) to (3.20) allow then to derive Proposition 6:

Proposition 5. *The new form of microcredit increases the proportion of active individuals. When the benchmark is chosen for the comparison, the joint implementation of m-payment and microcredit has an ambiguous effect on the size of the formal sector. When the case without microcredit but with m-payment is chosen for the comparison, the new form of microcredit decreases the size of the formal sector and increases the size of the informal sector. Its welfare effect is ambiguous and it is not Pareto improving when compared to the benchmark or to the case with m-payment but no microcredit.*

Proof: The benchmark expression of j^* is $\frac{E^{1/\alpha}}{(-t+F+c)^{1/\alpha}}$. Its new value after the introduction of the m-payment / microcredit is $\frac{E^{1/\alpha}}{(-t+F+v+c'-u-F'')^{1/\alpha}}$. A comparison of these two values attests that the formal sector size can decrease or increase from the benchmark to the m-payment / microcredit case, according the values of c', F'', u and v . The effect on G is then also ambiguous. Each time informal agents adopt m-payment associated with microcredit, the proportion of inactive decreases from the comparison of the initial and new values of j^{**} . The initial value of j^{**} is $\frac{\bar{\alpha}^{1/\alpha}}{(1-c)^{1/\alpha}}$. After the introduction of the m-payment / microcredit, its new expression is $\frac{(\alpha+\bar{u})^{1/\alpha}}{(1-c'+u+F'')^{1/\alpha}}$. When G decreases, the utility of inactive depends on the comparison of \bar{u} the decrease of G . For small values of \bar{u} , the utility of inactive agents decreases from the benchmark to the new situation. Even when global welfare improves, the new situation then generates conflicts of interests among active and inactive agents. When the comparison is made with the situation with m-payment but no microcredit, the introduction of microcredit increases j^* , i.e. decreases the

proportion of formal agents, decreases G , increases the utility of informal agents and decreases the utility of other categories. Welfare effect depends on various parameters and the change also generates conflicts of interest ■

3.7 Other assumptions on the effect of m-payment

This section discusses alternative assumptions related to the effect of m-payment. Section 3.5 supposes that the effect of m-payment is homogeneous among members of the informal sector. The result is then that all these members adopt or not, independently of their level of productivity (or their level of income). This assumption could be challenged if we consider that adopting or not m-payment has an impact not only on the way a member of the informal sector is paid or pay other members of the informal sector but also on the way payments are made between members of the formal and the informal sectors. When m-payment is adopted by members of formal sector, these members could encourage their informal partners to accept this kind of payment or even refuse to use cash with them, both for convenience and as an incentive to join the formal sector. It is also reasonable to suppose that higher is the income of informal members, higher is also the share of transactions they make with members of the formal sector. Without microcredit, utility function then write as following:

$$u_{j_m}^{form} = (1 - t + v)j^\alpha + \left(\frac{G_m}{n}\right)^\alpha - E \quad (3.21)$$

$$u_{j_m}^{inf} = (1 - c)(\lambda(1 - j)j)^\alpha + \left(\frac{G_m}{n}\right)^\alpha \quad (3.22)$$

$$u_{j_m}^{inf} = (1 - c' + u)j^\alpha + \left(\frac{G_m}{n}\right)^\alpha \quad (3.23)$$

$$u_{j_m}^{inac} = \bar{\alpha} + \bar{u} + \left(\frac{G_m}{n}\right)^\alpha \quad (3.24)$$

where $\lambda(1 - j)$, ($\lambda < 1$), captures the change of revenue of informal members who do not adopt m-payment. With this assumption, we obtain the following result:

Proposition 6. *Interactions between formal and informal sectors increase the size of the formal sector and improve the adoption of m-payment in the informal sector. They increase utility of formal and inactive agents but their effect on welfare is ambiguous.*

Proof: Consider the threshold agent $j^* = \frac{E}{\alpha(c'-t+v-u)}$ in the case with m-payment and no interactions between formal and informal agents when informal members adopt. Its income maintains with the new assumptions as there is no reasons that informal agents adopting without interaction may not adopt with interactions. Conversely, when informal agents do not adopt without interactions, their utility decrease with the new assumptions. When λ is sufficiently small, there is now an incentive for highest productivity informal agents to move to the formal sector. This will increase the number of formal sector members. In this case, there is a threshold agent $\bar{j} = \frac{\lambda(1-c)^{1/\alpha} - (1-c'+u)^{1/\alpha}}{\lambda(1-c)^{1/\alpha}}$ that separate informal adopters and non adopters if $\bar{j} > \frac{(\bar{\alpha}+u)^{1/\alpha}}{(1-c)^{1/\alpha}}$. The increase of the number of formal agents increases utility of formal members and of inactive members but it has an ambiguous effect on informal members: the level of utility of high income informal agents can decrease ■

3.8 Concluding remarks

The model we present in this paper analyzes different options to control the size of informal sector. We have considered a benchmark model of the informal sector. Then we have considered the impact of the different devices to control the size of the informal sector. Controlling the rate of taxation is not an efficient tool as the rate of taxation which maximises the size of the formal sector does not corresponds with the rate maximizing welfare. Thereafter, we have introduced separately the microcredit under its traditional form and the m-payment in the benchmark model. The introduction of microcredit increases the level of activity in the informal sector and decreases the size of the formal sector and the number of inactive individuals. M-payment does better by increasing both the size of the formal sector and welfare even if its effect on the level of activity is ambiguous. Finally, new forms of microcredit made available through the m-payment device enhances the level of activity but have decrease the size of the formal sector when the comparison is made with the case with m-payment without microcredit. When interactions are considered between active sectors, incentives to adopt m-payment increase for informal sector members and can enhance both the size of formal sector and the number of m-payment adopters.

The model is constrained by the use of microcredit by the UPI alone. Microcredit is also used by members of the formal sector, given the insufficiency of financial support from banks to individual and small firms. An evolution of the model could introduce this dimension: in this case, only one part of the formal

sector could have access to bank credit and the other one could be interested in new form of microcredit. One could even expect that this interest will spur a part of informal sector members to choose to be formal if the advantage provided by the microcredit is less than compensated by the necessity to pay taxes and registrations fees. A more advanced version of this paper will introduce this new evolution of the model with as expected result the possibility of m-payment combined with microcredit to increase the size of the formal sector without decreasing the level of activity.

Chapter 4

Parties prenantes et interopérabilité des dispositifs de m-paiement

4.1 Introduction

Le m-paiement a encore un rôle à jouer dans la financiarisation formelle en SSA malgré le développement rapide de ce dispositif ces dix dernières années. Les comptes de m-paiement ont augmenté de 5% la pénétration bancaire en SSA entre 2011 et 2014 (WB, 2018b). Néanmoins, le taux de pénétration du m-paiement reste faible. Seulement 11,5% de population adulte de plus de 15 ans ont un compte financier mobile. L'analyse des usages des souscripteurs au m-paiement montre qu'en particulier le paiement international est le service le moins utilisé (Granryd, 2016). Et pourtant, la région, notamment l'espace UEMOA, offre des inputs.

Dans le but d'assurer une intégration économique et sociale dans la région, l'UEMOA regroupe huit économies liées par le traité modifié du 29 janvier 2003. Les économies membres sont le Bénin, le Burkina Faso, la Côte d'Ivoire, la Guinée-Bissau, le Mali, le Niger, le Sénégal et le Togo. Elles ont une monnaie unique. En outre, le m-paiement occupe d'ores et déjà une place importante dans le niveau de bancarisation de la région. Le taux de bancarisation, hors comptes mobiles, est de 34,5% (Vasudevan et al., 2016). La prise en compte des souscripteurs au m-paiement double ce taux, soit 61,7%. Par ailleurs, près de sept millions des ressortissants de la région vivent hors de leur pays d'origine (Bationo, 2013). La majorité de cette migration est intra UEMOA.

De par la structure oligopolistique et non coopérative du secteur du m-paiement dans l'espace UEMOA, le développement du paiement international nécessite l'interopérabilité entre les différents dispositifs. Trois MNO majeurs sont présents dans

le secteur : Org, Mov, MN. Org compte pour 38% du nombre total des souscripteurs de m-paiement (BCEAO, 2015b). Le dispositif d'Org est disponible dans quatre pays de l'UEMOA: la Côte d'Ivoire, le Mali, le Niger et le Sénégal. Le service de Moov (21%) est accessible en Côte d'Ivoire, au Bénin, au Niger et au Togo. MTN (17%) dessert le Bénin, la Côte d'Ivoire et la Guinée-Bissau. Chaque ORM, on-net, permet aux utilisateurs d'effectuer des paiements intra UEMOA. Le seul cas de transfert de fonds off-net est celui entre Org Côte d'Ivoire et Arl Burkina Faso. L'autorité de régulation dans la région, la BCEAO, considère que ce manque de coopération entre les ORM limite le développement du m-paiement. Elle envisage actuellement son rôle dans la facilitation de l'interopérabilité dans la région. Cependant, l'implémentation de l'interopérabilité doit tenir compte de la maturité de chaque marché.

Dans l'espace UEMOA, doit-on se diriger d'un marché du m-paiement partiellement ouvert vers un marché totalement interconnecté ? Ce chapitre répond à cette question. Le propos de ce chapitre est d'établir les conditions nécessaires à l'implémentation de l'interopérabilité des dispositifs de m-paiement dans la région. Ainsi, nous analysons de façon générale l'impact économique potentiel de l'interopérabilité sur les parties prenantes au m-paiement. Ensuite, nous établissons les implications pour l'espace UEMOA. La contribution de ce chapitre à la littérature est qu'il pose les inputs pour l'inclusion stratégique d'une innovation pour l'État et les entreprises.

4.2 L'inéluctable interopérabilité des dispositifs de m-paiement

L'interopérabilité s'impose, généralement, aux ORM. Le projet « *Free Roaming* » en Afrique de l'Ouest en est l'exemple. Dans la région, les autorités de régulation et les ORM se sont mis d'accord sur un tarif unique de communication entre sept pays¹³. La mise en place d'un tel dispositif a nécessité l'analyse des utilités des parties prenantes.

Les clients interconnectés connaissent une augmentation d'utilité. Ce gain d'utilité s'explique par l'externalité de réseau positive et par la compétitivité-coût du m-paiement. Plus un individu peut effectuer des paiements avec d'autres utilisateurs, plus la valeur du service de m-paiement augmente pour l'individu. Par ailleurs, un groupe d'utilisateurs est encore plus concerné par l'interconnexion. Il s'agit des migrants. Les migrants effectuent des transferts de fonds internationaux. L'intérêt pour les migrants est double. D'une part, le m-paiement est moins coûteux que les alternatives traditionnelles, les banques, les opérateurs historiques de transferts d'argent (cf. figure 4.1). D'autre part, ces derniers devront baisser

leur prix pour rester compétitifs. L'interconnexion internationale des dispositifs de m-paiement contribue donc à la baisse du prix global des transferts de fonds internationaux. Ainsi, de par ses avantages pour les utilisateurs actuels et les migrants, l'interconnexion des dispositifs de m-paiement contribue à l'inclusion financière.

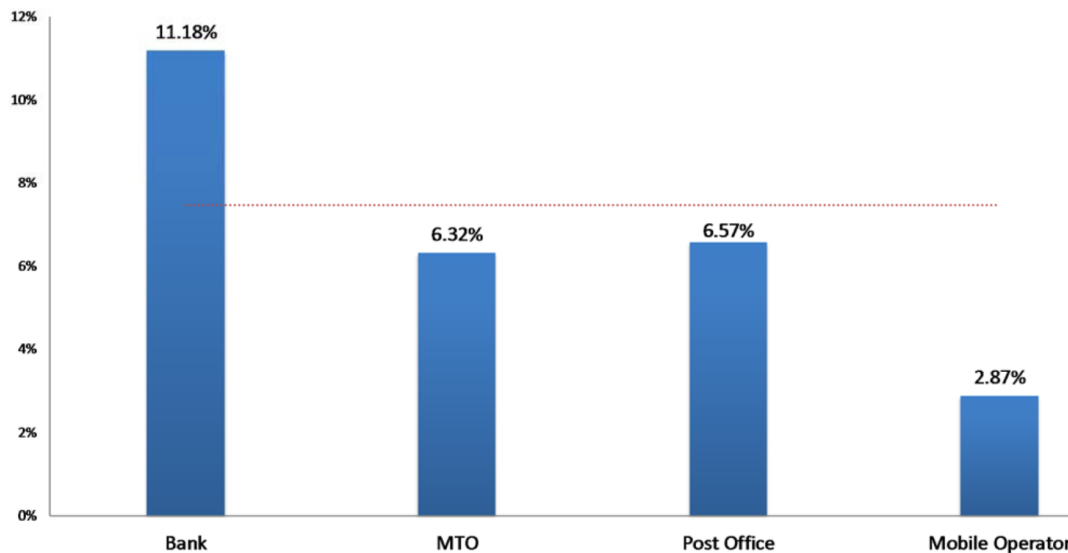


Figure 4.1: Coût moyen total des transferts de fonds par type de prestataire (% du montant nominal)

Les ORM non interopérables renoncent à une plus grande portée de leurs dispositifs. Un ORM qui ne s'interconnecte adopte une stratégie de lock-in. Cependant, il y a un coût d'opportunité à cette stratégie. Un seul ORM ne peut pas couvrir efficacement tout un marché. Ses utilisateurs ont donc besoin d'effectuer des paiements off-net. À ce propos, les ORM qui ont rendu leurs dispositifs interopérables par le passé, ont connu une augmentation globale du niveau d'utilisation de leurs services (Benson et Loftesness, 2012). Par ailleurs, il y a un aspect stratégique à s'interconnecter avant la généralisation du dispositif. Dans le cas d'un marché avec un ORM dominant et de multiples autres ORM de petites tailles, ces dernières peuvent s'interconnecter pour concurrencer le réseau de l'ORM dominant¹⁴). Aussi, il arrive que l'autorité de la concurrence l'impose. Ainsi, *ex ante* à la généralisation du dispositif, les ORM interconnectés disposent d'un avantage concurrentiel.

L'interopérabilité stimule la concurrence, mais peut aussi limiter le développement du secteur. En effet, en l'absence d'interconnexion entre les différents réseaux, les utilisateurs vont rejoindre le réseau dominant. L'incitation à rejoind-

dre le réseau dominant sera plus forte avec des niveaux de différenciation des produits et de coût du changement faibles. Sur le long terme, le réseau dominant va capturer l'ensemble du marché et imposer ses conditions. L'absence d'interopérabilité sur un secteur constitue donc une barrière à l'entrée. Cependant, en cas d'imposition de l'interopérabilité, l'autorité de régulation doit tenir compte du niveau de développement du marché. En phase initiale d'ouverture d'un secteur, les entrants investissent pour établir une position dominante. Une imposition précoce de l'interopérabilité limite donc le développement du marché. Ainsi, l'imposition de l'interopérabilité est souhaitable lorsque le marché est arrivé à maturité.

L'interopérabilité bénéficie à toutes les parties prenantes au m-paiement à condition que les uns tiennent compte de l'utilité des autres. Le coût de l'interopérabilité doit être faible pour les utilisateurs. Les ORM doivent tenir compte de l'aspect stratégique de la mise en place du dispositif. Au-delà du critère de maturité du marché, un projet d'imposition de l'interopérabilité doit tenir compte de l'existence d'une demande sous-jacente.

4.3 La demande latente pour le m-paiement international dans l'espace UEMOA

Dans son instruction N°008-05-2015, la BCEAO a exigé des ORM de mettre en place les conditions techniques et opérationnelles afin de faciliter l'interopérabilité avec les différents dispositifs de payment. Quelles implications pour les parties prenantes?

L'interopérabilité entre les dispositifs de m-paiement favorisera le développement économique et social dans l'espace UEMOA. Des milliers de migrants intra-UEMOA n'ont pas encore accès au m-paiement international. Et pourtant, ces migrants entretiennent des relations économiques avec leurs pays d'origine (cf. table 4.1). En effet, une partie des transferts de fonds servent aux dépenses de consommation et d'investissement. Par ailleurs, l'interopérabilité intra-réseaux a déjà contribué à la diminution du coût des transferts internationaux. Par exemple, sur la période 2013-2016, le coût des transferts internationaux en SSA a diminué de 3% (WB, 2017c). Cette période a coïncidé avec le développement du m-paiement international on-net dans l'espace UEMOA. Les ORM y facturent en moyenne 2% du montant nominal des transferts (Scharwatt et Williamson, 2015). Avant l'arrivée des ORM, les opérateurs historiques et les opérateurs informels facturaient plus de 4% . Les ORM ont donc diminué le coût des transferts dans la région.

Cependant, seuls les corridors connectés tirent parti de cette diminution du coût des transferts. L'interopérabilité entre les corridors non connectés permettra une inclusive diminution du coût des transferts internationaux de fonds dans l'espace UEMOA.

Corridors		Nombre de ressortissants bilatéraux	Montant des transferts de fonds bilatéral (en millions de dollars)
Bénin	Burkina	13806	18
Bénin	Mali	1827	2
Burkina Faso	Togo	15882	9
Guinée-Bissau	Sénégal	30092	33
Mali	Togo	3353	4

Table 4.1: Les corridors non interconnectés par le m-paiement international dans l'espace UEMOA

Les ORM interopérables ont une opportunité stratégique d'étendre leur activité dans l'espace UEMOA. Ceci vaut notamment pour les corridors suivants : Bénin - Burkina Faso; Bénin - Mali; Burkina Faso - Togo; Guinée-Bissau - Sénégal; Mali - Togo (cf. table 1). Par ailleurs, le niveau de maturité du secteur dans le cadre d'une interopérabilité internationale est relative. Par exemple, sur le corridor Burkina Faso-Côte d'Ivoire, lors de la mise en place de l'interopérabilité, le taux de pénétration du m-paiement au Burkina n'était que de 3,1%. Et pourtant, l'opération fut un succès. Aussi, sur ces corridors, les ORM ne sont pas en concurrence directe. Cela atténue le risque de « débauchage » d'utilisateurs. Avant son imposition par l'autorité de réglementation, les ORM interopérables bénéficieront ainsi d'un avantage compétitif.

Pays	Population, age 15-64 (en millions)	ORM dominants	Taux de pénétration du m-paiement (% 15+)
Bénin	6	MTN	2
Burkina Faso	10	Onatel Org	3,1
Côte d'Ivoire	13	MTN Org	24,3
Guinée-Bissau	1	MTN	
Mali	9	Org Malitel	11,6
Niger	10	Arl Org	3,9
Sénégal	8	Org Tigo	6,2
Togo	4	Togocel Moov	1,4

Table 4.2: Le secteur du m-paiement dans l'espace UEMOA

4.4 Conclusion

Dans ce chapitre, nous avons analysé les inputs de l'implémentation de l'interopérabilité internationale des dispositifs de m-paiement dans l'espace UEMOA. L'analyse indique que la région est économiquement intégrée. En effet, il s'agit d'un marché unique. Par ailleurs, la région connaît une forte migration interne. Ainsi, l'utilité du dispositif pour les migrants est double. D'une part, le m-paiement est moins coûteux que les alternatives historiques. D'autre part, ces derniers auront une pression à la baisse de leurs prix. L'ouverture sera aussi utile aux ORM. En effet, les ORM qui rendent leurs dispositifs interopérables connaissent une augmentation globale du niveau d'utilisation de leurs services. En outre, les ORM ont une opportunité stratégique d'étendre leur activité avant la généralisation du dispositif. En somme, le secteur du m-paiement dans l'espace UEMOA est assez mature pour être totalement interconnecté. Les corridors à interconnecter sont les suivants : Bénin - Burkina Faso ; Bénin - Mali ; Burkina Faso - Togo ; Guinée-Bissau - Sénégal ; Mali - Togo. Cependant, il faut noter que la mise en place de ce dispositif off-net nécessite aussi des négociations entre les ORM. Ces négociations portent sur les coûts d'interconnexion. À défaut de se mettre d'accord sur ces coûts, l'interopérabilité pourrait aussi passer par la fusion ou l'installation.

Conclusion générale

Cette thèse a été consacrée à l'analyse des questions de financiarisation et d'intégration du secteur informel. Elle s'est particulièrement intéressée aux propriétés du m-paiement en matière d'inclusion financière et de régulation du secteur informel dans un contexte de développement économique. Cette thèse s'est appliquée à répondre à ces interrogations par le biais de diverses méthodes : descriptive, théorique et statistique.

Le premier chapitre a proposé de nouvelles considérations dans la régulation du secteur informel. Des études devraient d'abord être menées sur la portée et la profondeur du secteur dans chaque économie. Ainsi, la régulation ne sera pas synonyme de sanction, et chaque État sera informé des contraintes spécifiques qui limitent la régulation des UPI. Ce chapitre a déjà recoupé certains inputs pour la régulation. Il s'agit de l'accès à l'information, la protection de l'innovation, la fin des paiements informels et surtout l'accès au financement. Ainsi, les procédures de régulation devraient être simplifiées et largement diffusées. Aussi, il devrait être porté à l'attention des UPI les inconvénients de leur activité pour l'intérêt général. Quant à la protection de l'innovation, elle favorise la création originale. Et une innovation protégée est une innovation qui peut être exportée. En ce qui concerne les paiements informels, ils découragent l'enregistrement. Enfin, l'accès au financement favorise le développement des activités, activités qui devront être régulées ne serait-ce qu'en partie pour continuer à prospérer. La régulation du secteur informel devrait donc passer la création d'incitations compatibles et indirectes.

Le deuxième chapitre, dans le cadre d'une campagne d'inclusion financière, a établi la contribution de l'argent mobile à l'atténuation des lacunes de la microfinance traditionnelle. L'agent mobile a atteint plus d'individus à faible revenu. Aussi, les produits de ce dispositif sont plus diversifiés. Ce chapitre a aussi mis en exergue le fait que ces deux dispositifs ne sont pas uniformément répartis entre les régions. Selon les dispositifs considérés, SA et SSA ont des résultats supérieurs. SA regroupe la majorité des utilisateurs à faibles revenus des produits de la mi-

crofinance traditionnelle. Dans la région, un impact positif du dispositif sur le revenu est même rapporté. Quant à SSA, elle compte la majorité des utilisateurs à faible revenu de l'argent mobile. Dans cette région, un effet positif de ce dispositif sur le revenu est aussi signalé. Ces résultats nuancent nos observations générales. Ces résultats indiquent aussi que la microfinance traditionnelle et l'argent mobile répondent à différentes attentes. La microfinance traditionnelle convient plus à une région à forte densité de population telle que SA. L'argent mobile s'accommode à une forte mobilité de population comme en SSA. Enfin, notons aussi que là-bas, l'argent mobile contribue à l'inclusion financière des populations qui ne sont pas particulièrement bancarisées à savoir les SME, les femmes et la population rurale et dans une moindre mesure, les migrants.

Le troisième chapitre a construit un modèle qui analyse différentes options pour contrôler la taille du secteur informel. Les résultats indiquent que le contrôle du taux d'imposition n'est pas un outil efficace car le taux d'imposition qui maximise la taille du secteur formel ne correspond pas au taux maximisant le bien-être. Le microcrédit traditionnel augmente le niveau d'activité dans le secteur informel et diminue la taille du secteur formel et le nombre d'individus inactifs. Le m-paiement fait mieux en augmentant à la fois la taille du secteur formel et le bien-être même si son effet sur le niveau d'activité est ambigu. Les nouvelles formes de microcrédit mises à disposition à travers le dispositif de m-paiement améliorent le niveau d'activité mais diminuent la taille du secteur formel lorsque la comparaison est faite avec le cas du m-paiement sans microcrédit. Lorsque des interactions sont envisagées entre les membres des secteurs formel et informel, les incitations à adopter le m-paiement augmentent pour les membres du secteur informel et peuvent améliorer à la fois la taille du secteur formel et le nombre d'adopteurs du m-paiement.

Le quatrième chapitre a analysé les inputs pour l'implémentation de l'interopérabilité internationale des dispositifs de m-paiement dans l'espace UEMOA. L'analyse indique que la région est économiquement intégrée. En effet, il s'agit d'un marché unique. Par ailleurs, la région connaît une forte migration interne. Ainsi, l'utilité du dispositif pour les migrants est double. D'une part, le m-paiement est moins coûteux que les alternatives historiques. D'autre part, ces derniers auront une pression à la baisse de leurs prix. L'ouverture sera aussi utile aux ORM. En effet, les ORM qui rendent leurs dispositifs interopérables connaissent une augmentation globale du niveau d'utilisation de leurs services. En outre, les ORM ont une opportunité stratégique d'étendre leur activité avant la généralisation du dispositif. En somme, le secteur du m-paiement dans l'espace UEMOA est assez mature pour être totalement interconnecté.

Nos résultats et préconisations sur la financiarisation et l'intégration du secteur informel vont dans le sens de WB (2018a) et ILO (2018). Le premier constate que ce qui a été l'instrument classique d'inclusion financière des économies en développement, la microfinance traditionnelle, n'a pas eu les résultats escomptés. Les nombres d'utilisateurs de ce dispositif et les produits proposés sont limités. Le second indique qu'il faut réguler le secteur informel en facilitant la transition des UPI vers l'économie formelle, en respectant les droits fondamentaux des travailleurs et en garantissant des possibilités de sécurité du revenu, de moyens de subsistance et d'entrepreneuriat.

Nous avons établi que l'argent mobile est un dispositif efficient dans la financiarisation et l'intégration du secteur informel. Nos travaux pourraient ainsi être étendus par des recherches empiriques. Pour la financiarisation, nous avons noté que la microfinance traditionnelle couplée à l'argent mobile donne de meilleurs résultats. Une plus grande inclusion financière serait donc d'intégrer la microfinance traditionnelle dans l'argent mobile. Quant à la régulation, nous avons remarqué que les relations entre le secteur informel et le secteur formel se sont redynamisées avec le m-paiement. Réguler ces relations pourrait donc être à même de contrôler le secteur informel. Nous supposons aussi qu'une économie complètement formellement financiarisée intègrera le secteur informel. Enfin, compte tenu de l'importance de la financiarisation et de l'intégration du secteur informel au développement économique, nos analyses ont des implications pour les organisations internationales, privées et publiques.

Appendices

Appendix 1

EGovernment opportunities and challenges

Ndou (2004)

Opportunities

Cost reduction and efficiency gains

Quality of service delivery to businesses and customers

Transparency, anticorruption, accountability

Increase the capacity of government

Network and community creation

Improve the quality of decision making

Promote use of ICT in other sectors of the society

Challenges

ICT infrastructure (e-readiness, computer literacy, telecommunication equipment)

Policy issues (legislation)

Human capital development and life long learning (skills, capabilities, education, learning)

Change management (culture, resistance to change)

Partnership and collaboration (public/private partnership, community and network creation)

Strategy (vision, mission)

Leadership role (motivate, involve, influence, support)

MIMIC model estimation results

Schneider and al. (2010)

Independent variables	Specification 1 88 Developing Countries (1994 - 2006)	Specification 2 98 Developing Countries (1994 - 2006)
Causal variables		
Size of government	0.15 (5.57)***	0.14 (5.97)***
Share of direct taxation	0.06 (2.57)**	
Fiscal freedom	-0.03 (1.69)*	-0.06 (2.90)***
Business freedom	-0.05 (2.33)**	-0.05 (2.18)**
Unemployment rate	-0.00 (0.06)	0.01 (0.67)
GDP per capita	-0.26 (6.87)***	-0.27 (8.79)***
Government effectiveness		
Indicator variables		
Growth rate of GDP per capita	-1.39 (6.70)***	-1.01 (7.88)***
Labor force participation rate	0.02 (0.14)	0.05 (0.59)
Growth rate of labor force		
Currency	1	1
Statistical tests		
RMSEA (<i>p</i> -value)	0.03 (0.99)	0.03 (0.99)
Chi-square (<i>p</i> -value)	44.43 (0.02)	38.70 (0.00)
AGFI	0.98	0.98
Degrees of freedom	27	20
Number of observations	741	1045

Understanding regulation: theory, strategy, and practice

Baldwin and al. (2012)

Regulation is often thought of as an activity that restricts behaviour and prevents the occurrence of certain undesirable activities (a “red light” concept). The broader view is, however, that the influence of regulation may also be enabling or facilitative (“green light”) as, for example, where the airwaves are regulated so as to allow broadcasting operations to be conducted in an ordered fashion, rather than left to the potential chaos of an uncontrolled market. [...] Motives for regulating can be distinguished from technical justifications for regulating. states may regulate for a number of motives-for example, they may be influenced by the economically powerful and may act in the interests of the regulated industry or they may see a particular regulatory stance as a means to re-election. [...] We should consider the technical justifications for regulating that may be given by a state that is assumed to be acting in pursuit of the public interest. Many of the rationales for regulating can be described as instances of “market failure”. Regulation in such cases is argued to be justified because the uncontrolled marketplace will, for some reason, fail to produce behaviour or results in accordance with the public interest.

Policy initiatives around the world on the informal sector
ILO (2014)

Policies	Means
Promoting formal employment	Pro-employment macroeconomic and sectoral policies focusing especially on the development of sustainable micro, small and medium-sized firms (MSMEs).
Regulating informal employment	Lowering the cost of transitions to formality through the creation of an enabling policy and regulatory environment that reduces barriers to formalization, while protecting workers' rights and increasing the benefits of being formal by promoting a greater awareness of the advantages and protection that come with formalization (business development services for MSMEs, access to the market, productive resources, credit programmes, and training and promotional programmes to upgrade informal economy units).
Increasing decent work in the informal economy	Developing a national social protection floor for all, implementing a minimum wage and health and safety incentives, organizing workers from the informal economy and encouraging informal firms to join together in production conglomerates or cooperatives, and supporting the development of social economy firms and organizations.

Appendix 2

Impact of mobile money on financial inclusion

Regions	Series	2011	2014-MRV
EAP	Account	55.1396	68.75662
EAP	Account, income, poorest 40%	38.99454	60.72625
EAP	Account, rural	46.18327	46.18327
EAP	Borrowed, income, poorest 40%	8.972469	7.947559
EAP	Main source of emergency funds	..	0.9258556
EAP	Saved, income, poorest 40%	15.33484	26.09603
EAP	Business, income, poorest 40%	0.9731268	0.9731268
EAP	School fees, rural	..	3.216331
EAP	Utility bills, income, poorest 40%	..	7.511461
EAP	Utility bills, rural	..	6.962401
EAP	Government transfers, income, poorest 40%	5.397263	5.397263
EAP	Government transfers, rural	5.099653	5.099653
EAP	Receive remittances, income, poorest 40%	7.019398	7.019398
EAP	Receive remittances, rural	8.250055	8.250055
EAP	Wages, income, poorest 40%	6.738355	6.738355
EAP	Wages, rural	9.124844	9.124844
EAP	Send remittances, income, poorest 40%	4.002109	4.002109
ECA	Account	43.25498	51.37996
ECA	Account, poorest 40%	34.39219	44.15751
ECA	Account, rural	34.49965	34.49965
ECA	Borrowed, income, poorest 40%	6.39062	10.43102

ECA	Main source of emergency funds	..	3.537297
ECA	Saved, income, poorest 40%	2.438396	4.255587
ECA	Business purposes, income, poorest 40%	4.949284	4.949284
ECA	School fees, rural	..	1.606577
ECA	Utility bills, income, poorest 40%	..	8.548384
ECA	Utility bills, rural	..	9.943191
ECA	Government transfers, income, poorest 40%	9.737903	9.737903
ECA	Government transfers, rural	10.48028	10.48028
ECA	Receive remittances, income, poorest 40%	4.080777	4.080777
ECA	Receive remittances, rural	3.851302	3.851302
ECA	Receive wages, income, poorest 40%	20.16467	20.16467
ECA	Receive wages, rural	20.58382	20.58382
ECA	Send remittances, income, poorest 40%	2.173366	2.173366
LAC	Account	39.25599	51.14305
LAC	Account, income, poorest 40%	24.14192	40.9192
LAC	Account, rural	34.99284	34.99284
LAC	Borrowed, income, poorest 40%	5.587095	6.872362
LAC	Main source of emergency funds	..	5.879587
LAC	Saved, income, poorest 40%	4.833948	6.921207
LAC	Business, income, poorest 40%	1.598311	1.598311
LAC	School fees, rural	..	1.095654

LAC	Utility bills, income, poorest 40%	..	2.660081
LAC	Utility bills, rural	..	3.451658
LAC	Government transfers, income, poorest 40%	6.654016	6.654016
LAC	Government transfers, rural	10.5161	10.5161
LAC	Receive remittances, income, poorest	3.089599	3.089599
LAC	Receive remittances, rural (% age 15+)	3.423378	3.423378
LAC	Receive wages, income, poorest 40%	9.886756	9.886756
LAC	Wages, rural	16.09849	16.09849
LAC	Send remittances, income, poorest 40%	1.26315	1.26315
MDE	Account	10.88015	13.96744
MDE	Income, poorest 40%	5.346205	6.91604
MDE	Rural (% age 15+) [w1]	6.045552	6.045552
MDE	Borrowed income, poorest 40%	4.219312	4.755322
MDE	Main source of emergency funds	..	1.84442
MDE	Saved, income, poorest 40%	1.028654	2.114018
MDE	Business, income, poorest 40%	0.8313055	0.8313055
MDE	School fees, rural	..	0.1475253
MDE	Utility bills, income, poorest 40%	..	0.1399779
MDE	Utility bills, rural	..	0.1132591
MDE	Government transfers, income, poorest 40%	1.75848	1.75848
MDE	Government transfers, rural	1.775714	1.775714
MDE	Receive remittances, income, poorest 40%	0.4342311	0.4342311

MDE	Receive remittances, rural	0.8148248	0.8148248
MDE	Wages, income, poorest 40%	0.847076	0.847076
MDE	Wages, rural	1.460408	1.460408
MDE	Send remittances, income, poorest 40%	0.0834909	0.0834909
SA	Account	32.32233	45.4865
SA	Income, poorest 40%	24.44405	37.35169
SA	Account, rural	29.37564	29.37564
SA	Borrowed, income, poorest 40%	8.924093	5.503007
SA	Main source of emergency funds	..	1.805509
SA	Saved, income, poorest 40%	9.974035	6.67721
SA	Business, income, poorest 40%	2.584936	2.584936
SA	School fees, rural	..	0.7472625
SA	Utility bills, income, poorest 40%	..	1.670676
SA	Utility bills, rural	..	1.855695
SA	Government transfers, income, poorest 40%	2.6811	2.6811
SA	Government transfers, rural	3.416488	3.416488
SA	Receive remittances, income, poorest 40%	1.038985	1.038985
SA	Receive remittances, rural	1.454054	1.454054
SA	Receive wages, income, poorest 40%	6.001872	6.001872
SA	Receive wages, rural	5.909783	5.909783
SA	Send remittances, income, poorest 40%	0.7845005	0.7845005
SSA	Account	23.87438	28.90136
SSA	Account, income, poorest 40%	13.39367	19.80054
SSA	Account, rural	18.72437	18.72437
SSA	Borrowed, income, poorest 40%	3.016399	4.828245

SSA	Main source of emergency funds	..	1.058696
SSA	Saved, income, poorest 40%	6.513961	9.365256
SSA	Business, income, poorest 40%	2.08159	2.08159
SSA	School fees, rural	..	3.567738
SSA	Utility bills, income, poorest 40%	..	1.269469
SSA	Utility bills, rural	..	1.830418
SSA	Receive government transfers, income, poorest 40%	2.805915	2.805915
SSA	Receive government transfers, rural	4.460533	4.460533
SSA	Receive remittances, income, poorest 40%	4.554803	4.554803
SSA	Receive remittances, rural	6.405368	6.405368
SSA	Receive wages, income, poorest 40%	4.205606	4.205606
SSA	Receive wages, rural	7.141872	7.141872
SSA	Send remittances, income, poorest 40%	2.317666	2.317666

Appendix 3

Proof of Proposition 2

The different terms of equation 3.8 express as following:

$$n_{inac} \bar{\alpha} = \frac{n\bar{\alpha}^{2/n}}{(1-c)^{2/\alpha}}$$

$$n \int_{j^{**}}^{j^*} (1-c)j^\alpha dj = \frac{(1-c)}{(\alpha+1)} \left[\frac{E^{\frac{\alpha+1}{\alpha}}}{(F+c-t)^{\frac{\alpha+1}{\alpha}}} - \frac{\bar{\alpha}^{\frac{\alpha+1}{\alpha}}}{(1-c)^{\frac{\alpha+1}{\alpha}}} \right]$$

$$n \left[\int_{j^*}^1 ((1-t+F)j^\alpha - E) dj \right] = \frac{(1-t+F)}{(\alpha+1)} \left[1 - \frac{E^{\frac{\alpha+1}{\alpha}}}{(F+c-t)^{\frac{\alpha+1}{\alpha}}} \right] - E \left[1 - \frac{E^{1/\alpha}}{(F+c-t)^{1/\alpha}} \right]$$

$$n \left(\frac{t}{2} \right)^\alpha \left[\frac{(F+c-t)^{1/\alpha} - E^{1/\alpha}}{(F+c-t)^{1/\alpha}} \right]^\alpha = n \left(\frac{t}{2} \right)^\alpha \frac{[(F+c-t)^{1/\alpha} - E^{1/\alpha}]^\alpha}{(F+c-t)}$$

The four terms vary differently on t . The first does not depend on t , the second increases with t , the third decreases when t increases, and the last does not vary monotonously: when t is small, it increases with t ; from a critical value of t it begins to vary in opposite direction. Consider now the case where initially $t = 0$ and consider the consequence of a marginal and positive variation of t for the utility of agent located on $j = 1$, i.e. the most disadvantaged by any increase of taxes. From equation 3.5, the derivative in t of agent located at $j = 1$ utility expresses as following:

$\frac{\partial u_j^{form}}{\partial t} = -1 + \frac{[\alpha(F+c-t)^{1/\alpha} - E^{1/\alpha}]^\alpha}{2\alpha t^{1-\alpha}(F+c-t)} - \frac{tM}{2}$, where M is a positive term. When $t = 0$, the third term vanishes and the second while the second term tend to infinity as soon as $\alpha < 1$. The resulting positivity of $\frac{\partial u_j^{form}}{\partial t}$ express that even the utility of the more productive agent increases when taxes marginally increase from an initial situation without any taxes. Obviously, the same result is observed for the remaining agents ■

Appendix 4

Télécoms : un tarif unique de communication dans 7 pays d'Afrique de l'Ouest

JA (2017)

Le projet « free roaming », qui vise à instaurer un tarif unique de communication entre plusieurs pays ouest-africains doit entrer officiellement en vigueur ce vendredi 31 mars.

« Ce 31 mars marque une importante avancée dans la marche vers l'intégration en Afrique de l'Ouest ». Ce commentaire de Cina Lawson, ministre togolaise des Postes et de l'économie numérique fait écho au soulagement des millions d'utilisateurs des services de téléphonie mobile au Sénégal, en Côte d'Ivoire, au Burkina Faso, au Mali, en Guinée et au Sierra Leone.

Ces six pays d'Afrique de l'Ouest ont en effet signé en novembre 2016 un protocole qui met fin à l'itinérance payante, et donne donc aux usagers la possibilité de pouvoir appeler et être appelé dans et hors de la zone de couverture de son opérateur sans payer de frais supplémentaires. Le Togo a ensuite rejoint ces pays deux mois plus tard, en janvier 2017. Il faut toutefois noter ici que le free roaming ne concerne ici que les appels, pas les données mobiles.

L'initiative date du 12 juillet 2016 . Les régulateurs télécoms ouest-africains, réunis à Dakar, s'étaient alors mis d'accord pour lancer le free roaming à la fin du premier trimestre 2017. Un lancement fortement attendu, dans un contexte où les politiques d'intégration régionale sont de plus en plus actives, les commerçants, les travailleurs agricoles ou les familles transnationales sont amenés à se déplacer davantage dans la sous-région.

L'interopérabilité des dispositifs de m-paiement au Kenya et en Tanzanie CGD (2015)

Au Kenya, M-Ps, offert par Sfc, est le principal service d'argent mobile. M-Ps n'est pas interopérable avec les services concurrents des trois autres opérateurs du pays. Pourtant, il a été et est toujours très prospère. Compte tenu de son succès, Sfc est maintenant sous pression pour changer ses habitudes. En juillet 2014, Sfc a ouvert son réseau d'agents à son concurrent Arl. Le mouvement unilatéral de l'opérateur est intervenu juste avant que l'Autorité de la concurrence du Kenya lui ordonne d'ouvrir son réseau d'agents à ses rivaux. En Tanzanie, trois des principaux opérateurs ont annoncé un accord en juin 2014 pour permettre aux abonnés d'envoyer et de recevoir de l'argent mobile avec les utilisateurs des services concurrents pour la première fois. Cependant, le plus grand opérateur du pays, Vodacom, qui offre M-Ps en Tanzanie n'a pas signé. La leçon à tirer ici est qu'il y a eu une forte concurrence pour le marché dans les deux pays. L'intervention réglementaire (ou l'anticipation d'une telle intervention) a récemment joué un rôle au Kenya, lorsque le marché basculait. Au lieu de cela, en Tanzanie, l'interconnexion volontaire entre les plus petits joueurs est apparue pour devenir des concurrents crédibles contre un plus grand titulaire.

Les exemples du Kenya et de la Tanzanie montrent également qu'il existe différents niveaux d'interconnexion, de sorte que « l'ouverture » du réseau n'est souvent qu'une étape, mais pas suffisante pour garantir que les effets du réseau soient pleinement satisfaits. Plus précisément, l'interopérabilité peut être réalisée à trois niveaux différents:

- Au niveau du réseau mobile: les clients peuvent accéder à leur service d'argent mobile via n'importe quelle carte SIM.
- Au niveau de l'agent: les agents d'un service peuvent servir les consommateurs d'un autre service (pas d'exclusivité). C'est le niveau d'interopérabilité proposé par M-Ps au Kenya.
- Au niveau de la plate-forme: les transferts d'argent peuvent être à la fois on-net et off-net. C'est le niveau d'interopérabilité négocié entre les opérateurs en Tanzanie.

Notes

¹Pour plus de détails, voir https://www.challenges.fr/entreprise/grande-conso/amazon-a-deja-enclenche-la-revolution-robotique_26268.

²Pour plus de détails, voir <https://www.lesechos.fr/13/12/2016/lesechos.fr/0211591201959-1-uberisation--cree-plus-d-emplois-qu-elle-n-en-detruit.htm>.

³Pour plus de détails, voir <https://www.ecologique-solidaire.gouv.fr/vtc-gouvernement-confirme-lapplication-loi-grandguillaume-au-1er-janvier-2018-et-accompagnera>.

⁴Pour plus de détails, voir http://www.lemonde.fr/entreprises/article/2017/10/13/uber-fait-appel-du-retrait-de-sa-licence-a-londres_5200498_1656994.html.

⁵Il est aussi possible une analyse à partir des degrés d’informalité touchant tous les secteurs économiques et financiers, avec une intensité plus ou moins forte.

⁶Sauf indications contraires, les données utilisées dans cette thèse sont collectés à partir des bases de données des autorités de régulation des TIC, de la GSMA, du MSC et de la WB

⁷Ce chapitre est issu de l’article du même nom coécrit avec le directeur de thèse Professeur Dominique Torre.

⁸For more details, see : <http://www.vodafone.com/content/index/what/technology-blog/M-Ps-created.html> ; <http://www.vodafone.com/content/index/media/vodafone-group-releases/2017/M-Ps-10.html>.

⁹Unbanked low-income individuals are 45.43% of adults in developing economies. For more details, see WB (2012).

¹⁰For more details, see Appendix 2.

¹¹See Appendix 3 for the proof of Proposition 2.

¹²This is the case for the Vodafone basic service in East-African economies.

¹³For more details, see Appendix 4.

¹⁴For more details, see Appendix 4

List of abbreviations

Abn	Airbnb
AEC	Avant l'Ère commune
Arl	Airtel
Arpanet	Advanced Research Projects Agency Network
BCEAO	Banque Centrale des États de l'Afrique de l'Ouest
DemJusti	DemanderJustice.com
EAP	East Asia Pacific
ECA	Europe and Central Asia
FSDK	Financial Sector Deepening Kenya
GDP	Gross domestic product
GSMA	Global System for Mobile Communications Association
JA	Jeune Afrique
KBC	Knowledge-based capital
LAC	Latin America and the Caribbean
MDE	Middle East
MENA	Middle East and North Africa
MFI	Microfinance institutions
MHz	Mégahertz

MIMIC	Multiple Indicators Multiple Causes
MiN	Microinsurance Network
MNO	Mobile network operator
Mov	Moov
MSC	Microcredit Summit Campaign
MN	MTN
M-Kp	M-Kopa
M-payment	Mobile payment
M-Ps	M-Pesa
OECD	Organisation for Economic Co-operation and Development
Org	Orange
Org mny	Orange Money
PIB	Produit Intérieur Brut
SA	South Asia
Safaricom	Sfc
SME	Small and medium-sized enterprises
SSA	Sub-Saharan Africa
TE	Transitions economies
Testa	Testamento
TIC	Technologies de l'information et de la communication
Ubr	Uber
UPI	Unités de production informelle
VTC	Voiture de transport avec chauffeur
WA	West Africa

WB

World Bank

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Glossary

Argent mobile : Ce dispositif numérique associe le m-paiement à d'autres produits financiers.

Inclusion financière institutionnelle : L'accès des individus notamment à faible revenu à des produits financiers utiles et abordables et qui sont fournis de manière légale et durable.

M-payment : Généralement offert par les MNO, ce dispositif numérique donne accès à des produits financiers *via* un téléphone mobile et ce sans compte bancaire.

Secteur informel : Un secteur qui regroupe les unités de production dont la personnalité morale et les activités échappent à la régulation.

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