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TAXING THE INFORMAL SECTOR IN DEVELOPING COUNTRIES: WHAT DO WE LEARN FROM MICRO- ACTIVITIES?

FISCALISER LE SECTEUR INFORMEL DANS LES PAYS EN DEVELOPPEMENT: QUE NOUS ENSEIGNENT LES MICRO-ACTIVITES ?

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Abstract

This dissertation contributes to the literature on the taxation of micro-activities operating in the informal sector. It analyses the impact of policy strategies focused on these micro-activities - access to financial institutions and the introduction of greater accountability in their relations with the public administration - on their contribution to public revenues (Chapter 3). Thereafter, the research examines tax behavior within micro-activities and investigates the existence of mimicry effects in tax payment processes (Chapter 4). Finally, the analysis evaluates the impact of local taxes on micro-activities, taking into account gender specificity (chapter 5). The central objective of this research is to provide the tax authorities with a better understanding of micro-activities in order to facilitate the design of a tax system better adapted to them and the risks they involve.

In Chapter 3, we use stochastic frontier methodology (Kumbhakar, Wang and Horncastle, 2015) on a sample of 33 developing countries over the period 1984-2010 and we obtain the following results: (i) access to financial institutions (FIA) affects differently tax revenues. Positive and significant for indirect taxes, FIA has a negative effect on the other types of taxes. However, thresholds exist above which the sense of the relationship is shifted. Increasing levels of democratic accountability in low-income countries - through disclosure of public accounts to micro-activities - reduces the inefficiency of these countries in terms of collection. This effect is more noticeable in countries rich in natural resources and those not dependent on official development assistance.

The empirical results in Chapter 4 suggest a spatial dependence in tax payment decisions within micro-activities. This means that when an entrepreneur chooses to pay the tax, he encourages other companies to pay it as well. However, this effect is much greater in the

neighborhood of constrained Gazelles, for companies operating in the same region and in the same sector.

In line with the work of Fajnzylber, Maloney and Rojas (2006), Chapter 5 indicates that the payment of local taxes promotes the productivity of micro-activities. Here again, the segmentation of the micro-activities of Grimm *et al.* (2012) enables us to refine the analysis. In general, successful companies are negatively and significantly affected by local tax payments. The productivity of survival activities and constrained gazelles are stimulated by local tax payments. Gender bias seems to exist in local tax payment processes in Madagascar. However, it seems that compared to a man, a woman who is head of a “taxpayer” business activity is more productive.

Résumé

Cette thèse contribue à la littérature sur la taxation des micro-activités opérant dans le secteur informel. Elle analyse l'impact des stratégies politiques axées sur ces micro-activités - accès aux services financiers des opérateurs et introduction d'une plus grande redevabilité dans les relations avec l'administration publique - sur la contribution aux revenus publics (chapitre 3). Par la suite, elle interroge les comportements vis-à-vis de la taxation au sein des micro-activités et recherche l'existence d'effets de mimétisme dans les processus de paiement des impôts (chapitre 4). Enfin, la recherche évalue l'impact des taxes locales sur les micro-activités en tenant compte des spécificités liées au genre (chapitre 5). L'objectif central de cette analyse est d'offrir une meilleure connaissance des micro-activités à l'administration fiscale de sorte à proposer des recommandations en vue de l'adoption d'un système fiscal mieux adapté aux micro-entreprises.

Dans le chapitre 3, l'utilisation de l'approche des frontières stochastiques (Kumbhakar, Wang et Horncastle, 2015) sur un échantillon de 33 pays en développement, sur la période 1984-2010 donne les résultats suivant : (i) l'accès aux institutions financières (FIA) affecte différemment la mobilisation des recettes fiscales. Positif et significatif pour les impôts indirects, FIA a un effet négatif sur les autres types de taxes. Toutefois, des seuils existent à partir desquels, le sens de la relation est modifié. Accroître les degrés de redevabilité démocratique dans les pays à faible revenus — par une meilleure reddition des comptes publics aux micro-activités — réduit l'inefficacité de ces pays en termes de collecte. Cet effet est plus perceptible dans les pays riches en ressources naturelles et ceux qui ne dépendent pas de l'aide publique au développement.

Les résultats empiriques du chapitre 4 suggèrent une dépendance spatiale entre les décisions de paiement des impôts au sein des micro-activités. Ce qui signifie que lorsqu'un entrepreneur choisit de s'acquitter de la taxe, il encourage les autres entreprises à en faire autant. Toutefois, cet effet est beaucoup plus important au voisinage des Gazelles restreintes, pour des entreprises exerçant leur activité dans une même région et dans une même branche.

Conformément aux travaux de Fajnzylber, Maloney et Rojas (2006), le chapitre 5 indique que le paiement des impôts locaux favorise, la productivité des micro-activités. Une fois de plus, la segmentation des micro-activités de Grimm *et al.* (2012) permet d'affiner l'analyse. En général, les entreprises performantes sont négativement et significativement affectées par les paiements d'impôts locaux. Les productivités des activités de survie et des gazelles restreintes sont, quant à elles, stimulés par les paiements d'impôts locaux. Le biais de genre semble exister dans les processus de paiement des impôts locaux à Madagascar. Mais, comparativement à un homme, une femme chef d'une activité imposée, est plus productive.

Main contents

Remerciements - Acknowledgments.....	i
Abstract	iii
Main contents	vi
List of Tables.....	viii
Acronyms	x
1. General Introduction	1
2. Conceptual framework and literature review	8
2.1 Introduction	9
2.2 Conceptual framework	13
2.2.1 Activities Not Registered in Tax Administrations’ Records: A review of literature .	13
2.2.2 How to measure the Non-observed Economy? A review of literature.....	23
2.2.3 Motivation for the choice of the retained concepts and indicators.....	34
2.3 Literature review	35
2.3.1 Taxation and the Non-Observed Economy	36
2.3.2 Taxation, Financial development, and the Non-observed Economy.....	40
2.3.3 Taxation, Democratic accountability and the Non-observed Economy.....	43
2.3.4 Non-observed economy, productivity, and efficiency.....	46
2.4 Conclusion.....	54
3. Improving informal economy’s Contribution to Tax in Sub-Saharan Africa: Do Financial Development and Democratic Accountability matter?	57
3.1 Introduction	58
3.2 Empirical analysis.....	61
3.2.1 Variables.....	61
3.2.2 Data.....	64
3.2.2 Methodology.....	64

3.3 Empirical results.....	66
3.3.1 Does the access to financial institution of informal operators affect developing countries tax revenues?	66
3.3.2 Does building a more accountable relationship with informal operators matter in reducing inefficiency in terms of tax mobilization?.....	71
3.4 Conclusion.....	91
3.5 Annexes.....	92
4. Tax compliance in the micro-activities: independent act or spillover effect? The case of Cameroon.	96
4.1 Introduction	97
4.2 Data	100
4.2.1 Define Micro-activities' categories	101
4.2.2 Characteristics by groups	104
4.3 The model.....	108
4.3.1 The Data Generating Process	108
4.3.2 The theory of proximity	110
4.4 Results	112
4.4.1 The coefficient « rho »	113
4.4.2 Spatial interactions	116
4.5 Conclusion.....	138
4.6 Annex: Description of studied variables.....	140
5. Does business licenses influence the productivity of micro-activities: an evaluation of the gender bias in Madagascar?	141
5.1 Introduction	142
5.2 Data	146
5.2.1 The Dependent variable	150
5.2.2 Explanatory variables	152
5.3 Empirical strategy	153
5.3.1 Methodology	153
5.3.2 Findings	156

5.4 Conclusion.....	162
5.5 Annexes.....	164
6. General Conclusion.....	169
7. Bibliography.....	179

List of Tables

Table 2.1: Concepts of informality and definition	20
Table 2.2: Concepts of informality: distinguishing between Legal and Illegal activities.....	21
Table 2.3: Measuring the size of the Non-Observed Economy. Comparison of methods.....	32
Table 2.4: The Size of the Non-Observed Economy in Germany According to Different Methods (in Percentage of Official GDP).....	33
Table 3.1: Estimation of country tax revenues.....	69
Table 3.2: Technical inefficiency.....	70
Table 3.3: Levels of democratic accountability	74
Table 3.4: Estimation of residual and persistent inefficiencies.....	75
Table 3.5: Estimation of tax equations (Comparison resource rich versus poor resource countries).....	79
Table 3.6: Estimation of the error components (Comparison resource rich versus poor resource countries).....	81
Table 3.7: Estimation of countries' tax equations (Comparison aid dependent versus non-aid dependent countries)	83
Table 3.8: Estimation of the error components (Comparison aid dependent versus non-aid dependent countries)	84
Table 3.9: Estimation of countries' tax potentials (Comparison LICs versus LMICs).....	86

Table 3.10: Estimation of the error components (Comparison LICs versus LMICs)	87
Table 3.11: Summary signs and significances	90
Table 3.12: Critical values of the mixed chi-square distribution	93
Table 3.13: Likelihood Ratio test	93
Table 4.1: Probability to become a top performer	103
Table 4.2: Partition of Cameroon informal operators	104
Table 4.3: Descriptive statistics	106
Table 4.4: Descriptive statistics (continued)	107
Table 4.5: Results for spatial autocorrelation tests	109
Table 4.6: Sign and significance of the coefficient « rho ».....	114
Table 5.1: probability to pay the business license.....	157
Table 5.2: Covariate balance summary	158
Table 5.3: Impact of business license of firm productivity.....	161

Acronyms

ATET	Average treatment effect on the treated
CERDI	Centre d'Etudes et de Recherches sur le Développement International
DARE	Department of Agricultural Economics and Rural Development
DEA	Data Envelopment Analysis
DGE	Dynamic General Equilibrium
DGP	Data Generating Process
DIAL	Research center in France in the field of Development Economics
DYMIMIC	Dynamic MIMIC
EBITDA	Earnings before removing Interest, Taxes, Depreciation, and Amortization
ECA	United Nations Economic Commission
ECOSOC	United Nations Economic and Social Council
ENEMPSI	Enquête Nationale sur l'Emploi et le Secteur Informel
FCFA	Franc de la Communauté Financière Africaine
FIA	Financial Institutions Access
GDP	Gross Domestic Product
GEM	General Entrepreneurship Monitoring
GIZ	Gesundheit Information Zentrum
ICLS	International Conference of Labor Statisticians
ICRG	International Country Risk Guide
ILO	International Labor Office
IMF	International Monetary Fund
INS	Institut National de Statistiques
INSTAT	Institut National de Statistiques
IPU	Informal Production Unit
IRD	Institut de Recherche pour le Développement
IS	Informal Sector
ISIC	International Standard Industrial Classification
IZA	Institute of Labor Economics

JLMS	Jondrow, Knox Lovell, Materov and Schmidt
LIC	Low Income Countries
LMIC	Low Middle Income Countries
LR	Likelihood Ratio
MCPP	Microcrédit aux Plus Pauvres
MIMIC	Multiple Indicators Multiple Causes
MPRA	Munich Personal RePEc Archive
NOE	Non-Observed Economy
NY	New York
ODA	Official Developing Assistance
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary least squared
OTE	Overall Technical efficiency
PASS	Pays d’Afrique au Sud du Sahara
PED	Pays En Développement
PSM	Propensity Score Matching
PTE	Persistent Technical Efficiency
RTE	Residual Technical Efficiency
SAC	Spatial Autocorrelation Model
SAR	Spatial Autoregressive
SCA	System of National Accounts
SDMP	Probit Spatial Durbin Model
SEM	Spatial Error Model (SEM)
SEM	Structural Equation Model
SIMPLES	Tax simplification program for SMEs
SME	Small and Medium Enterprise
SSA	Sub-Saharan Africa
SSRN	Social Science Research Network
UEMOA	Union Economique et Monétaire Ouest Africaine
UK	United Kingdom

USD	United State Dollar
VAT	Value Added Tax
WAEMU	West African Economic and Monetary Union
WDI	World Development Indicators
WP	Working Paper
WX	Spatial lag of the explanatory variables
WY	Spatial lag of the dependent variable

1. General Introduction

1. General Introduction

The contribution to public revenues from activities not registered in the tax administrations' records generated renewed interest in the debate on financing for development. One of the main reasons for this is the low levels of public revenue in developing countries, at the beginning of the 21st century (Baunsgaard and Keen, 2005; Attila, Chambas, and Combes, 2009). Indeed, tariffs declined following trade liberalization strategies and the conclusion of regional and bilateral agreements with the European Union or other trading partners (IMF, 2011).

The problem with tariff reduction is that, at the time, trade taxes accounted for a significant portion of government tax resources (a quarter of total tax revenues in sub-Saharan Africa and up to 15% for developing countries in Asia and the Pacific¹). Subsequently, a reduction in tariffs could have a negative impact on the collection of non-resource taxes, especially if no alternative sources of revenue were found.

However, a study by Gnangnon and Brun (2017) mitigated this idea by indicating that adopting export upgrading strategies — which include strategies to diversify exports and improve export quality — strengthen the contribution of the international trade on the non-resource taxes². Indeed, domestic traders are expected to generate higher export revenues and then, contribute more to non-resource taxes.

Another reason for the growing debate on the taxation of activities not registered in the tax administrations' records, is the international context marked by the fiscal crisis in the euro zone, which led to a significant reduction in Official Development Assistance (ODA). Actually, OECD (2013) indicated that between 2010 and 2012, the net ODA flows decreased by -6% in real terms. This corresponds to a -7.9% decrease in net flows towards sub-Saharan Africa and -9.9% for the African continent. The Least Developed Countries (LDCs) were the most affected by this trend, as their net bilateral ODA flows were reduced by -12.8% in real terms.

¹ See (Baunsgaard and Keen, 2005).

² Except for low-income countries, which are commodity-dependent.

1. General Introduction

Simultaneously, there is a significant need for revenues to finance development. Indeed, the Millennium Development Goals (MDGs) converted into Sustainable Development Goals (SDGs) generate a rise in public spending. Additional revenues are then required to improve public expenditures and the delivery of public goods and services — education, health, public infrastructures etc. — in order to guarantee development ([First Global Conference of the Platform for Collaboration on Tax, 2018](#)).

We believe these additional resources could be mobilized at the domestic level, through direct taxation, for example. However, there is a need for a paradigm shift. "Tax bargaining" and accountability should be introduced into the mobilization process. Indeed, they encourage the introduction of more control of citizens on their governments during the collection and the use of tax revenues.

The third conference on Financing for Development, which was held in July 2015 in Addis Ababa, provided an opportunity for States to consider what should be done to better mobilize national resources. Member countries were committed to strengthening domestic resource mobilization by improving the quality of tax administration, preventing illicit financial flows and encouraging good governance. Indeed, they assumed that: "*Combating tax evasion and tax avoidance would bring significant gains in revenue mobilization in developing countries even if there were limits to the revenue that could be raised from domestic improvements to tax policies and administration* ([United Nations Economic Commission For Africa \(ECA\), 2015](#))".

Nevertheless, poor tax legislation and inadequate tax administration are also causing tax evasion. Definitely, [Bird \(2008\)](#); [Bird and Zolt \(2008\)](#); [Dohrmann and Pinshaw \(2009\)](#) or [Carnahan \(2015\)](#) argue that tax administrations in developing countries are limited in terms of human, financial, technological or other types of resources. An effective way to mobilize tax revenue is also to use the limited resources of tax administrations in more profitable economic

1. General Introduction

sectors. The tax administration would therefore focus on large, medium-sized and small companies with a higher tax potential and delegate the management of micro-activities to different authorities.

Anyway, not registered activities in the tax administrations' records are assimilated to an economic segment where both tax avoidance and tax evasion are carried out. Inside this segment, fraudulent activities and micro-activities coexist (Chambas, 2005). What should be retained, at this step, is that the micro-activities plays an important role in developing countries by supporting job creation and providing income to citizens (Sani, 2009). As pointed out by Chambas (2005) and Bird, Martinez-Vazquez, and Torgler (2008); Cobham (2005); Grimm, Knorringa, and Lay (2012), they already contribute to taxes but this contribution remains low. However, fraudulent activities evade taxes. They should be track by the tax administration and enforce to comply with legislation.

In this dissertation, we examine the relationship between micro-operators and the tax administration. We investigate the kind of policies that could be adopted to mobilize resources from micro-activities by promoting voluntary tax compliance (Part I). We also attempt to provide tax administrations with a better understanding of micro-activities (Part II), in order to facilitate the design of appropriate tax policies. Actually, inadequate policies may lead to adverse effects such as an impoverishment of an already vulnerable population (Chambas, 2005), the reinforcement of tax evasion practices (de Soto, 1989) or an incentive to stay out of the formal sector (Maloney, 2004).

The remainder of the thesis is as follows. Chapter 2 presents the scope of the activities not registered with the tax administration through existing definitions and associated measures. It presents the tax approach to be used and explains why we focus on micro-activities.

1. General Introduction

Chapter 3 examines how access to financial institutions and the introduction of greater democratic accountability in the relationship between tax administrations and micro-operators could enhance their contribution to tax revenues.

Its main objective is to show that the more micro-activities grow and have a say concerning the collection and the use of public revenues, the more they will pay taxes. Indeed, limited access to credit is quoted — by the operators themselves³ — as an obstacle in developing their businesses. Providing the operators with access to finance could help them invest in their business — raise capital, buy inputs or hire employees —, grow their activities and pay taxes. If this happens, the development of micro-activities, would increase their visibility and thus facilitate their taxation (See [Backiny, 2009](#) or [Diagne and Thiaw, 2008](#)).

By promoting democratic accountability, political authorities could teach those operators, the utility of taxes and make them aware of their role in tax control and negotiation. As [Tyler \(2006\)](#); [Kirchler, Hoelzl, and Wahl \(2008\)](#); [Fauvelle-Aymar \(1999\)](#) suggested, accountability could develop trust in political authorities which is a key determinant of tax collection ([D’Arcy, 2009](#)).

We rely on stochastic frontiers methodology by [Kumbhakar, Wang, and Horncastle \(2015\)](#) and use a database of 33 sub-Saharan African countries for the period 1984-2010. The study is performed distinctly on non-resource, indirect, corporate and individual taxes. The analysis reveals that the Financial Institutions Access (FIA) differently affects the mobilization of tax revenues. Indeed, FIA has a significant positive effect on indirect taxes but appears negative for the others; the signs of the relationships would switch when FIA rises to a certain point. Except for indirect taxes, the access to financial institutions of operators significantly increases taxes.

³ See results of 1-2-3 Surveys in Cameroon, Madagascar and in seven West Africa capitals.

1. General Introduction

Concerning democratic accountability, the effects differ according to the nature of a country and the type of tax. Increasing the level of democratic accountability by establishing a more responsive relationship between governments and the micro-activities in low-income countries should reduce countries' inefficiencies, particularly for those with rich resources and non-aid dependent. For the other categories, further investigations are needed.

In the rest of the dissertation, we attempt to show that the heterogeneity of the micro-activities is an asset to take into account when designing taxation strategies. As revealed by [ECA \(2015\)](#), “*many countries were still facing constraints in raising revenue because of weak administrative tax capacity, the size of the tax base, tax elasticity and the volatility of sectors being taxed*”. Identifying a group of micro-operators whose compliance with taxes positively influences others, reduces collection costs. It also allows a larger proportion of micro-activities to be reached.

In doing so, we use the classification of [Grimm et al. \(2012\)](#) and study attitudes toward taxation of the micro-operators (chapter 4). We observe that decision of tax payments in the micro-activities depend not only on the economic and personal characteristics of the operators. In fact, as revealed by social psychologists, every behavior takes place in a specific environment where cultural, social or physical aspects can affect it ([Godin, 2009](#)). This generates interactions between environment and behavior. It would be difficult to study the determinants of the behavior omitting this environmental dimension.

Here, we analyze the relevance of spillover effects in the tax payment process of the micro-activities. Focusing on the effects of social interactions on tax payment decision, the methodology employed in the research is a Probit Spatial Durbin Model. We use the Cameroonian informal sector data in 2010.

The empirical results suggest a spatial dependence between the decisions on tax payments within the micro-activities. In general, decisions on tax payments of an entrepreneur may

1. General Introduction

significantly influence those of the other firms. However, according to the nature of the businesses, its localization and its category of informality, this effect may differ.

In Chapter 5, we argue that paying taxes, for the group of micro-activities above mentioned, should not reduce the productivity of the firm. Then, we use impact evaluation methodologies to assess the impact of business licenses on the productivity of Madagascar's micro-activities in 2012. We put a particular emphasis on the potential gender bias created by local taxation.

We find that: (i) consistently with the work of [Fajnzylber, Maloney, and Rojas \(2006\)](#), local tax payments lead to significant profits within micro-activities. (ii) However, these results seem to be mitigated when considering the segmentation of [Grimm *et al.* \(2012\)](#). Most performing firms are negatively and significantly impacted by tax payments when survivalists and constrained gazelles' productivity are encouraged by local tax payments. (iii) Compared to male, a female chief in a tax-paying activity is more productive.

Before presenting in-depth the conclusions of our analysis, next sections review the framework of the study and highlight the key economic concepts to be used in this work.

2. Conceptual framework and literature review

2.1 Introduction

This chapter discusses the concepts and theories used to conceptualize the research. Its main goal is to favor a better insight of the notions underlying the research. First, we attempt to precisely define the part of the not registered activities in tax administrations' records that will be used in the dissertation. Second, we review the literature of theories adopted to structure the analysis. More precisely, we discuss the link between taxation and activities not recorded in the registers of tax administrations. We also examine the literature of financial development, democratic accountability and productivity and focus on their interactions with the not registered activities mentioned above.

The scope of activities not registered with the tax administration is wide. The question of which component of this economic segment is best suited to the objectives of the study is not easy to delimit. In fact, there are so many definitions and concepts that do not make it easy to understand activities that are not recorded in the tax administration's records. The same concept can be defined in different ways and encompass very different realities (see 2.2).

In this dissertation and for taxation purposes, we choose to clarify the part of activities not registered with the tax administration based on the countries' tax books. Figure 2.1 highlights the common classification of firms in developing countries and presents the tax regime they must comply with. Through this segmentation, we identify the nature⁴ of activities not recorded in the tax administration's records.

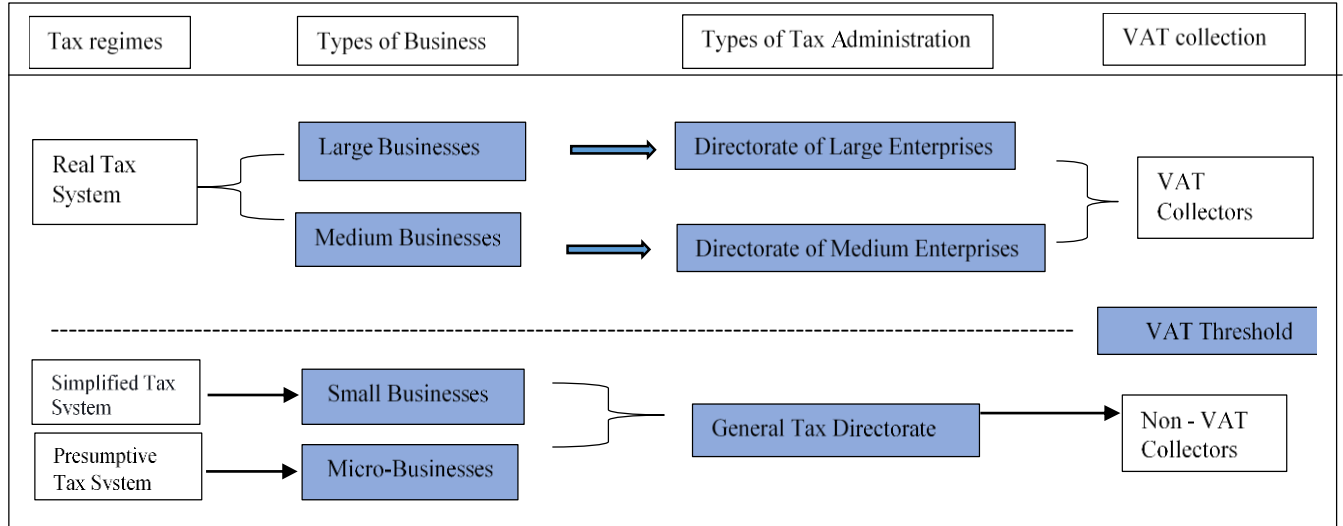
It should be noticed that only legal activities are taken into account in this study. Illegal or criminal activities are prohibited, therefore, an effective action by national security forces is the only way to overcome them.

⁴ Tax avoidance versus tax evasion.

2. Conceptual framework and literature review

Four categories of firms are generally quoted in developing countries: large, medium, small and micro-enterprises (see Figure 2.1).

Figure 2.1: Common segmentation of business activities according the tax regimes and offices.



Source: Authors' compilation based on the work of (Bodin and Koukpaizan, 2009)

Large and medium-sized enterprises refer to activities whose turnover are above the VAT registration threshold. They collect VAT from customers, for the tax administration. On average, Large-enterprises represent less than 1% of existing companies while their contribution to taxes exceeds 70% of total revenues. Medium-sized enterprises represent about 10 to 20% of all companies. Both are subject to the real tax regime (Bodin and Koukpaizan, 2009). Small and micro-businesses refer to activities below the VAT threshold. They constitute the majority of firms (70% to 80% of activities), but their tax potential is limited (5-10% of total resources) (Bodin and Koukpaizan, 2009).

Looking at countries' tax books, we notice that no common threshold exist to distinguish between Small and Micro enterprises (but also Large and Medium-sized). In Côte d'Ivoire, for example, a turnover of 5 million of CFA francs represent the threshold of the simplified tax regime. Below this threshold, businesses are subject to a presumptive tax (Direction Générale des Impôt, 2018). In the Malagasy tax book, the threshold for the simplified tax regime is 20 million Ariary. Companies below this threshold are also subject to a presumptive tax (Direction

2. Conceptual framework and literature review

[Générale des Impôts, 2012](#)). In Cameroon, presumptive taxes are due by businesses whose turnover is inferior to 10 million of FCFA ([Direction Générale des Impôts, 2019](#)). In line to figure 2.1, all these firms below the threshold of registration to the simplified tax regime correspond to the micro-activities. Above the threshold for the simplified tax regime, firms may be small, medium-sized or large⁵.

In general, each category of businesses is assigned a special unit within the tax administration. This unit manages the affiliated companies according to their needs and the compliance risk they create. In this respect, Large-enterprises, generally report to a Directorate of Large-enterprises. Medium-sized companies depend on a Directorate of Medium enterprise while small and micro-enterprises are handled by the General Tax Directorate.

Here, we argue that the needs of micro-activities differ from those of Small entities. Indeed, the performance of micro-activities is low. Most of them carry out these activities to meet their basic needs or while waiting for a better opportunity in the formal sector ([OECD \(2002\)](#), [Benjamin and Mbaye \(2012\)](#)). As [Chambas \(2005\)](#) said, taxing them with an inadequate tax policy could impoverish a more vulnerable population since they already pay for local taxes while VAT acts as a tax on their inputs ([Keen, 2013](#)).

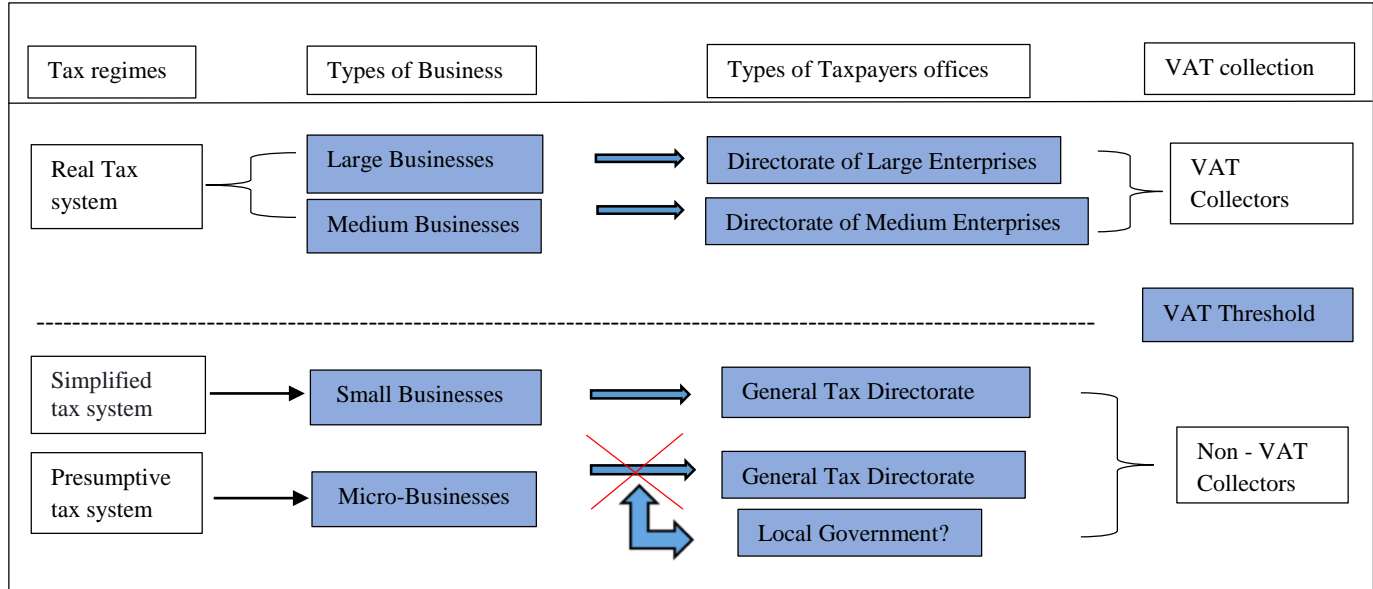
Moreover, the cost of collecting tax on micro-activities is high compared to the level of expected revenues ([Chambas, 2005](#)). In parallel to the poor performance and limited tax potential, micro-activities do not keep account. It may, therefore, be difficult for the tax administrations to assess the turnover and calculate the effective amount of taxes to be paid. Even if they could, micro-activities are numerous and widely spread throughout the countries. The tax administrations of developing countries, whose resources are limited ([Bird, 2008](#); [Bird and Zolt, 2008](#); [Dohrmann and Pinshaw, 2009](#); [Carnahan, 2015](#)), cannot easily reach them.

⁵ See [Direction Générale des Impôt \(2018\)](#), [Direction Générale des Impôts \(2012\)](#), [Direction Générale des Impôts \(2019\)](#) for more detailed information on the threshold between the simplified tax system and the real tax system.

2. Conceptual framework and literature review

In search of a tax definition for the share of non-observed activities, most suited for our analysis, Figure 2.2 proposes to exclude micro-activities' management from the tax administration.

Figure 2.2: Updated Distribution of business activities according to tax regimes and offices.



Source: Authors' compilation using [Fjeldstad, Chambas, and Brun \(2014\)](#).

As mentioned above, micro-activities are numerous and their existing tax potential is limited compared to the collection costs. We believe that it is judicious to have them administered by entities outside the tax administration. Indeed, this would permit tax administration to concentrate their resources on more profitable economic segments such as Large, Medium and Small enterprise and limit tax evasion. In addition, in the context of decentralization and searching for local government financing, taxes from micro-activities could be useful for local governments who are already successful in taxing them.

In accordance with this scheme, all activities that should be managed to a tax administration directorate (in line with Figure 2.2) but which do not comply with the legislation are considered as fraudulent. What the administration has to do is to track and enforce them to comply with the tax law. Tax administration could identify them through better planned tax audit programs. Moreover, computerized tax administrations and introducing risk analysis may help to improve the mobilization of revenues from the fraudulent businesses.

2. Conceptual framework and literature review

Micro-activities activities have low productivity and limited tax potential. For reasons of effectiveness and efficiency, they should be managed by entities such as local governments.

The remainder of the chapter reviews existing definitions and components of activities not recorded in tax administrations' registers. It attempts to clarify the concept of micro-activities in the light of these concepts (2.2.1). It also present an overview of measures used to quantify these activities (2.2.2) and motivates the choice of retained measures for the analysis (2.2.3). The second part of the chapter identifies related research on the theme of taxation of activities not registered in the tax administrations' records (2.3.1). As the purpose of the dissertation is to highlight which policies strategy, governments should pursue to improve voluntary compliance of micro-activities, we also provide a summary of the literature on the link between financial development and activities not registered in tax administrations' records (2.3.2). We also review the literature on the impact of democratic accountability and not registered activities mentioned above (2.3.3). As we aim to evaluate the incidence of local taxation on the productivity of firms, we display existing measures of firm's productivity (2.3.4) and conclude in section (2.4).

2.2 Conceptual framework

In this section, we examine the framework of existing definitions and methods for quantifying the activities not registered in tax administrations' records. The next paragraphs present the concept of informality and its evolution over time.

2.2.1 Activities Not Registered in Tax Administrations' Records: A review of literature

The scope of the activities not registered in tax administrations' records is wide and complex to define or quantify since by nature, this part of the economy refers to hidden or unobserved activities. There are as many concepts and definitions as studies devoted to this

2. Conceptual framework and literature review

subject (Nordman and Roubaud, 2009). Section (2.1.1.1) presents two key concepts — namely the informal sector and the non-observed economy — which summarize in a comprehensive way, the field of not registered activities. In section (2.1.1.2), we focus on the issue of the measurement.

2.2.1.1 The concept of Informal Sector: History and evolution

First concepts of « informality » were proposed by ILO (1972) and Hart (1973) in the early 1970's. At that time already, informality referred to different views. ILO (1972) designated as informality, activities unrecognized or unrecorded by the tax administration. These activities are not submitted to social security and/or legal concerns. On the opposite, Hart (1973) characterized informality as jobs carried out outside the Ghanaian's organized labor force (formal employment) and exerted by unskilled and illiterate workers.

In order to clarify the concept, International Labor Office (ILO) propose several definitions of the informal sector across time. At First, the informal sector was defined using seven criteria: (i) the low barriers to enter into the market, (ii) the market is competitive but unregulated, (iii) businesses are family-owned, (iv) operations are carried out on small-scale, (v) local resources (vi) high labor intensity, technologies they use and (vii) trainings are acquired outside the school system (Charmes, 1992).

Thereafter, criteria such as the absence of fixed working hours, the use of unpaid family workers or the non-application of legal and administrative rules emerge in the literature. Besides these criteria, the size of the enterprise and the non-registration in the administrations' records were also applied to define the informality.

However, these criteria are difficult to evaluate and to apply. None of the definitions specify whether compliance with one or all of the above criteria determines affiliation to the informal sector. More precise indicators were then required.

2. Conceptual framework and literature review

The 15th International Conference of Labor Statisticians (ICLS) tried to respond to this issue and defined informal activities, as *“units engaged in the production of goods or services with the primary objective of generating employment and incomes to the persons concerned. These units typically operate at a low level of organization, with little or no division between labor and capital as factors of production and on a small scale. Labor relations - where they exist - are based mostly on casual employment, kinship or personal and social relations rather than contractual arrangements with formal guarantees (ICLS, 1993)”*.

For statistical purpose, the 15th ICLS also provided an "operational" definition of the informal sector. It is a combination of two types of activities i.e. independent (own-account) workers and informal employers. The sector is then defined as *“household unincorporated enterprises with market productions that are:*

- *Informal own account enterprises (optionally, all, or those that are not registered under specific forms of national legislation);*
- *Enterprises of informal employers (optionally, all those with less than a specified level of employment and/or not registered and/or employees not registered (ICLS, 1993)”*.

In 2002, labor statisticians adopt a common definition of the informal sector. The informal sector refers to *“all economic activities by workers and economic units that are – in law or in practice – not covered or insufficiently covered by formal arrangements” (ILO 2002)*. This definition specifies the nature of the informal employment which is subdivided into two components: (i) employment into the informal sector (as defined by the 15th ICLS), and (ii) informal employment outside the informal sector.

Informal employment consists of workers whose professional activities are not subject to national labor legislation, income tax or social protection. They do not collect benefits such as paid leave, sick leave or dismissal with notice. The informal sector is then, composed of and characterized by production units while informal employment referred to jobs (ICLS, 2004).

2. Conceptual framework and literature review

As we can see, definitions above refer to activities taking place at the household level. However, a larger scope of not registered activities to the tax administrations' records, with very different reality exists. Other definitions exist in the literature, which extends the informal sector to the notion of Non-Observed Economy. Next section addresses this point.

2.2.1.2 The concept of Non-Observed Economy: Definition and categorization

OECD (2002) defined the non-observed economy (NOE), as activities hidden to the public administration for an economic purpose or due to deficiencies encountered during the data collection program. This definition characterizes the scope of activities not recorded in the tax administration's registers, mentioned above. For a sake of simplification, we will refer to the concept of non-observed economy (NOE), in the rest of the dissertation, to designate the activities not recorded in the tax administration's registers.

According to OECD (2002), the NOE is composed of activities which are *underground*, *illegal*, *informal sector*, or *undertaken by households for their own final use*. The following definitions of the Society of National Accountants (SNA) clarify these concepts in light to the national accounts statistical approach⁶:

- **“Underground production:** *productive and legal activities, but deliberately concealed from the public authorities to avoid tax payment or complying with regulations;*
- **Illegal production:** *Productive activities that generate goods or services forbidden by law or that are unlawful when carried out by unauthorized producers;*
- **Informal sector production:** *the productive activities conducted by unincorporated enterprises in the household sector that are unregistered and/or are less than a specified size in terms of employment, and that have some market production;*

⁶ OECD (2002)

2. Conceptual framework and literature review

• *The production of households for their own final use: the productive activities that result in goods or services consumed or capitalized by the households that produced them*⁷”.

For taxation purpose, only the underground and the informal sector production may be considered, in this research. Definitely, illegal or criminal activities are prohibited and then excluded of the analysis. The fourth category, which is self-consumption, can hardly be taxed. Indeed, the goods produced are consumed directly by households, relatives or the community and are not traded on the goods and services market.

Underground production represents activities that evade taxes (fraudulent activities). Referring to Figure 2.2, these companies operate within Large, Medium or Small enterprises but do not comply with the relevant legislation.

Informal sector as defined here, corresponds to the micro-activities (see Figure 2.2). They are more numerous than the others. As mentioned by [Ekkehard, Bustamante, and Bacchetta, \(2009\)](#), the informal sector has considerably grown during the last century. Its size grew from 50% to 52.2% of the total employment in Latin America; from 68.5% to 78.2% for Asian countries though slightly narrowed to 57% from 60% for African developing countries. The above trend is confirmed by the International Organization, which estimates that the informal sector provides 80% of non-farm jobs and creates 90% of new jobs in sub-Saharan Africa ([Maldonado, Badiane, and Miélot, 2004](#)). *In West Africa, the informal sector accounts for approximately 50% of national output, over 80% of employment, and 90% of new jobs* ([Mbaye, 2015](#)).

This contrast is a key issue in the debates for revenue mobilization in developing countries and led to various studies. What we are trying to achieve in this research is to question the nature and characteristics of micro-activities within the informal sector. This would allow

⁷ For a better understanding, see the classification of [Blades and Roberts \(2002\)](#).

2. Conceptual framework and literature review

policy makers to better understand these activities and design tax policies that would be more appropriate for them.

In summary, fraudulent (underground production) and micro-activities (informal production) are part of the NOE. For a sake of simplification, we will employed the term informal sector or micro-activities in the rest of the chapter to describe the NOE for reason other than fraud. Where at least one of the other categories of non-observed economy is mentioned, we will use the term “non-observed economy or NOE” to define the scope of the activities.

Summary of definitions and concepts of the Non-observed Economy

Table 2.1 displays the multiplicity of concepts that have been used to talk about the non-observed economy over the period 1973 to 2017. Table 2.2 classify these concepts using the statistical approach of the national accounts.

As mentioned in the report for the 20th anniversary of DIAL, definition of informality (but more generally the one of NOE) differs from one study to another. For example, [Hart \(1972\)](#) defined Informal operators as “... *those who escape enumeration*”. Activities on this sector “...*are classified as “the low-productivity urban sector*’. For the author, the informal sector is also perceived as “*the reserve army of underemployed and unemployed*”. It represents “*the urban traditional sector*” and so on (See table 2.1).

[Attanasso \(2009\)](#) considered as informal entrepreneurs, operators, who do not complete all the administrative procedures for the registration of their companies and do not comply with all legal obligations. It links the informal sector to the small trades. Compared to [Hart \(1972\)](#), [Attanasso \(2009\)](#), for example, introduced the notion of “registration with the tax administrations” but pointed out the necessity to distinguish between informal and fraudulent activities (See Table 2.1).

Differences in the definition of a same concept, from one study to another, sometimes reflect the need to clarify the author's idea of the non-observed economy. For example,

2. Conceptual framework and literature review

[Schneider \(1994\)](#) defines the "Shadow economy" as *all economic activities that contribute to the officially calculated (or observed) gross national product but are currently unregistered*".

In 2000, its definition of shadow economy referred to *"Legal value-added creating activities which are not taxed or registered and where the largest part can be classified as "black" or clandestine labor. "Those activities do not take into account the informal household economy which consists of all household services and production, community services and illegal underground economic activities that fit the characteristics of classical crimes like burglary, robbery, drug dealing, etc.* [Schneider and Enste \(2000\)](#).

Thus, compared to the 1994 definition, [Schneider and Enste \(2000\)](#) introduced the legal criterion into the definition of the shadow economy and excluded the scope of informal production and community services.

[Schneider \(2011\)](#) considered as shadow economy, activities which refuse to comply with tax and labor market legislation. Its Shadow economy now, refers to *All market-based legal production of goods and services that are deliberately concealed from public authorities for the following reasons: (1) to avoid payment of income, value added or other taxes, (2) to avoid payment of social security contributions, (3) to avoid having to meet certain legal labor market standards, such as minimum wages, maximum working hours, safety standards, etc., and (4) to avoid complying with certain administrative obligations, such as completing statistical questionnaires or other administrative forms.*

The more recent definition of shadow economy proposed by [Hassan and Schneider \(2016\)](#) take into account legal and productive activities and exclude illegal, criminal, charitable or self-consumption activities (See Table 2.1).

2. Conceptual framework and literature review

Table 2.1: Concepts of informality and definition

Concepts	Definitions	Authors
Informal Sector	"... that is those who escape enumeration - are variously classified as 'the low-productivity urban sector', 'the reserve army of underemployed and unemployed', 'the urban traditional sector' and so on.	Hart (1973)
Shadow, Underground Economy	"All economic activities that contribute to the officially calculated (or observed) gross national product but are currently unregistered".	Frey and Pomerhene (1984); Lubell, (1991); Schneider (1994)
Unofficial Economy	"Unofficial activity is considered as the unrecorded value added by any deliberate misreporting or evasion by a firm or individual."	Kaufman and Kaliberda (1996)
Underground Economy	"Market-based production of goods and services, whether legal or illegal, that escapes detection in the official estimates of the gross domestic product".	Smith (1994)
Informal Entrepreneur	Informal entrepreneurs are considering as entrepreneurs who have not done all the administrative steps of registering their companies and who do not respect all the regulatory obligations. It associates the informal with the small trades and rejects any systematic association between informal and fraudulent.	Attanasso (2009)
Shadow Economy	"Legal value-added creating activities which are not taxed or registered and where the largest part can be classified as "black" or clandestine labor. "Those activities do not take into account the informal household economy which consists of all household services and production, community services and illegal underground economic activities that fit the characteristics of classical crimes like burglary, robbery, drug dealing, etc.	Schneider and Enste (2000)
Shadow, Underground Economy	"Those economic activities and the income derived from them that circumvent or otherwise avoid government regulation, taxation or observation."	Dell'Anno (2003; Schneider and Dell'Anno (2003; Feige (1989); Thomas (1999)
Shadow Economy	All market-based legal production of goods and services that are deliberately concealed from public authorities for the following reasons: (1) to avoid payment of income, value added or other taxes, (2) to avoid payment of social security contributions, (3) to avoid having to meet certain legal labor market standards, such as minimum wages, maximum working hours, safety standards, etc., and (4) to avoid complying with certain administrative obligations, such as completing statistical questionnaires or other administrative forms.	Schneider (2011)
Shadow Economy	"Unreported income in the form of cash payments done solely to evade taxes... Do not include tax evasion done via accounting mismeasurement ... all goods are legal in our economy. Evasion of taxes is the only illegal activity."	Gomis-Porqueras, Peralta-Alva, and Waller (2011)
Informal Economy, Underground Economy	The informal economy is defined as including: (1) household enterprises ⁸ that have some production at market value but are not registered ;(2) underground production, where productive activities are performed by registered firms but may be concealed from the authorities to avoid compliance with regulations or the payment of taxes, or are simply illegal.	IMF (2017)
Shadow Economy, black, hidden, informal, parallel, second or underground economy (or sector)	"A set of economic activities that takes place outside the framework of bureaucratic public and private sector establishments. It is mainly regarded as a sector, which produces legal goods, but does not comply with government regulations."	Elgin and Schneider (2013)
Shadow Economy	The shadow economy reflects mostly the legal economic and productive activities that, if recorded, should contribute to the national GDP. ...the definition of the shadow economy in our study tries to avoid illegal or criminal activities, Do-it-Yourself, charitable or household activities.	Hassan and Schneider (2016)

Source: Author, based on a review of literature.

⁸ "Household enterprises are microenterprises, as inferred from household surveys that are comprised of persons who are earning money but not in salaried employment. Subsistence agriculture is included if its production is sold."

2. Conceptual framework and literature review

Table 2.1: Concepts of informality: distinguishing between Legal and Illegal activities

		Legal activities	Legal activities	Legal activities	Illegal activities
Concepts	Authors	Underground production: productive and legal activities, but deliberately concealed from the public authorities to avoid tax payment or complying with regulations	Informal sector production: the productive activities conducted by unincorporated enterprises in the household sector that are unregistered and/or are less than a specified size in terms of employment, and that have some market production	The production of households for their own final use: the productive activities that result in goods or services consumed or capitalized by the households that produced them	Illegal production: Productive activities that generate goods or services forbidden by law or that are unlawful when carried out by unauthorized producers;
Informal Sector	Hart (1973)		X		
Shadow, Underground Economy	Feige (1989); Frey and Pommerehne, (1984); Lubell (1991); Schneider, (1994)	X			
Unofficial Economy	Kaufman and Kaliberda (1996)	X			
Underground Economy	Smith (1994)	X	X		X
Informal Entrepreneur	Attanasso (2009)	X	X		
Shadow Economy	Schneider and Enste (2000)	X			
Shadow , Underground Economy	Dell'Anno (2003); Schneider (2005); Schneider and Dell'Anno, (2003); Feige (1989), Thomas, (1999)	X			
Shadow Economy	Schneider (2011)	X			
Shadow Economy	Gomis-Porqueras et al.(2011)	X			
Informal Economy, Underground Economy	IMF (2017)	X	X		X
Shadow Economy, black, hidden, informal, parallel, second or underground economy (or sector)	Elgin and Schneider (2013)	X	X	X	
Shadow Economy	Hassan and Schneider (2016)	X			

Source: Author, based on a review of the literature.

2. Conceptual framework and literature review

Looking at the segmentation of concepts according to the national account approach, we note that, same concepts may cover very different realities (Table 2.2). The underground economy as defined in Feige (1989); Thomas (1999), Dell’Anno (2003); Schneider and Dell’Anno (2003); Elgin and Schneider (2013) or IMF (2017), referred to legal activities. However, in Smith (1994), both legal and illegal activities are enclosed. The informal sector of Attanasso (2009) enclosed small trade while in Elgin and Schneider (2013) and IMF (2017), legal activities, which evade taxes are also examined.

This situation can lead to gaps when comparing the results of two studies. Before presenting some of these gaps, the following section presents the approaches used by above-mentioned authors to measure the size of the NOE.

2.2.2 How to measure the Non-observed Economy? A review of literature

Any researcher who wants to measure the size of the non-observed economy needs to define it first. As mentioned earlier, scientists generally choose definitions according to the nature of their studies. This section provides a brief overview of how the non-observed economy is measured and the use of these measures in the prevailing literature. Four groups of methods are applicable to quantify the NOE. They can be classified into Direct and Indirect approaches.

2.2.2.1 Measuring the Non-observed Economy using direct methods

Direct approaches are microeconomic. They are largely based on the [ILO \(2002\)](#) definition of the informal sector. They measure the size of the informal sector using surveys, voluntary replies to questionnaires, tax audits, and, other compliance techniques. Their main advantage is to provide a good design of the informal economic activities and the composition of its labor force ([Razafindrakoto, Roubaud, and Torelli, 2009](#)).

- *Microeconomic Surveys*

Based on a sample of voluntary respondents, microeconomics surveys provide very detailed information on Informal Production Units (IPUs) such as the type of facilities, the number of employees, the type of activity, the turnover, the expenses of firms, etc. Well-known microeconomic surveys are household, establishment, employment and mixed survey. Among them, 1-2-3 survey is commonly used by national statisticians to identify informal activities. 1-2-3 survey is a mixed modular survey⁹ proposed by DIAL to assess the share, the composition and the informal activities functioning. This survey is implemented in three phases. The first one

⁹ Mixed surveys are conducted, at the same time, on both households and businesses

2. Conceptual framework and literature review

contains a survey on employment. The second consists of a specific informal sector questionnaire to individuals who have declared working in the informal sector during the first stage. In phase three, a survey on household living conditions is conducted ([Razafindrakoto et al., 2009](#)).

As microeconomic surveys provide information on the turnover of companies, they will allow us to select micro-activities according to the countries' General Tax Books.

- The tax audit: Tax audits estimate the size of the non-observed economy by comparing taxable income reported by taxpayers with those obtained from revenue control programs conducted by tax authorities.

A lot of shortcomings of direct approaches have been revealed across time:

(i) Based on the specific aspects of household enterprises, these surveys do not take into account many other features (underground, illegal) of the non-observed economy;

(ii) The results of those surveys are sensitive to the way questionnaires are implemented, and the predisposition of interviewees to reveal their non-compliance and fraudulent behavior, etc.;

(iii) For a long time and despite recent attempts to improve, one of the main difficulty remained in making an international comparison this sector's size persists as few surveys are comparable ([OECD, 2002](#); [Restrepo-Echavarría, 2015](#); [Schneider, 2005](#); [Schneider and Enste, 2000, etc.](#));

(iv) Tax audit gives an inaccurate measure of the non-observed economy since the sample is not representative and randomized. Indeed, given the administration can only evaluate the size of audited people ([Schneider, 2005](#)).

(v) Those weaknesses lead to an under estimation of the non-observed economy. In addition, they may not provide estimations of the growth of the NOE over time ([Schneider, 2005](#)).

2. Conceptual framework and literature review

In response to shortcomings exposed above, researchers tried to introduce more dynamics in direct approaches, during recent decades. They implemented simultaneously comparable surveys in different countries. This provides “reliable” and representative information on the informal sector of those countries across time.

For example, the “Institut de Recherche pour le Développement (IRD)” has implemented a survey in seven capitals of WAEMU countries during the period 2001-2003. This survey assesses corruption, tax payments, tax registration, participation to the labor market, etc. in those countries (Bossuroy, 2007; Brilleau, Roubaud, and Torelli, 2004; Grimm et al., 2012; Lavallée and Roubaud, 2012; Leenhardt, 2004; Razafindrakoto and Roubaud, 2007; Razafindrakoto, Roubaud, and Torelli, 2009; UEMOA, 2002 etc.).

General Entrepreneurship Monitoring (GEM) assesses the size of the informal sector. It provides direct estimations of the informal sector around the world. Initially constructed to give information about the behavior and the attitudes of entrepreneurs, GEM survey also provides information about the national context and its impacts on entrepreneurship activities. For more explanations, see Facchini (2007) and Amoros, Couyoumdjian, Cristi, and Minniti, (2016).

The World Bank and the International Labor Office (ILO) also provides panel databases of informal sector and informal employment to understand their structure and functioning. Also see, for example, Farazi (2014) and Amoros, Couyoumdjian, Cristi, and Minniti (2016).

2.2.2.2 Measuring the Non-observed Economy using indirect methods

Indirect approaches are macroeconomic. They use one or more economic indicators for the approximation of the size of the non-observed economy. They can be classified into four categories set out below.

2. Conceptual framework and literature review

The indicator approaches

The indicators approaches are proxies used by researchers to account for the size of the non-observed economy, when no data on the phenomenon is not available.

- *The discrepancy or residual methods*

They are based on the calculation of the gap between two values of an indicator (the expected versus the observed value). The outcome is supposed to be a good proxy of the non-observed economy. Usually, researchers estimate the size of the NOE by calculating the gap between national expenditure and income statistics; the discrepancy between the official and the actual labor force; the difference between income and expenditure of households etc.

One of the main criticisms of these methods is that the initial measure of the indicator should be preferred to the official measure. Indeed, looking at GDP for example, researchers should use the initial measure rather than the official measure since statisticians do correct the former in order to reduce as much as possible the gap between the two sides of GDP estimation.

Another criticism is that discrepancy may be due to sampling and statistical errors ([Restrepo-Echavarria, 2015](#)).

- *Monetary approaches*

Undertaking that cash payment is the rule in the non-observed economy, researchers compare the demand for money before and after reforms of tax pressure, tax enforcement etc. The excess of money in circulation is used as a proxy the size of the NOE ([Guttman, 1977](#); [Laurent, 1979](#); [Cramer, 1980](#); etc.).

Those methods are commonly criticised for: (i) Transactions in the non-observed economy are not only done in cash; (ii) Tax morality of entrepreneurs can explain their willingness to pay tax; (iii) A baseline is used where the size of the NOE is null or at a predefined level; (iv)

2. Conceptual framework and literature review

Technological advances such as the use of credit card or telecommunication tools can also explain the evolvement, etc. A rise in the currency demand is usually due to, in large degree, a slowdown in demand deposits and not to a rise in currency due to NOE. Also, most studies assume that both the formal and non-observed economy have the same velocity of money.

For these reasons and mostly for the assumptions used by the corresponding studies, [Schneider \(2005\)](#), [Schneider, Buehn, and Montenegro \(2010\)](#) and several others authors considered monetary macro-models as inappropriate for the estimation of the size of the non-observed economy.

- ***The physical input method***

Production in the non-observed economy is modeled according to a physical indicator. The most known models are from [Lackó \(1996\)](#) and [Kaufmann and Kaliberda \(1996\)](#). They assume that the electrical power consumption reacts at the unit with GDP. [Lacko \(1996\)](#) and [Kaufmann and Kaliberda \(1996\)](#) consider the electrical power consumption as a good proxy of the overall economy. By subtracting the official GDP from this proxy, they obtain the size of the non-observed economy.

The criticisms of the methods are diverse: (i) Informal businesses (inside the non-observed economy) are more intensive in labor than in capital or source of energy; (ii) Informal activities can use other sources of energy like gas, oil, coal, etc; (iii) an efficient use of electricity due to technological progress in both non-observed and formal sectors will make the comparisons across countries irrelevant; (iv) The indirect methods are difficult to employ in the case of transition countries ([Hanousek and Palda, 2004](#)). Indeed, measuring the non-observed economy through macroeconomic data requires the stability of parameters (such as currency demand or electricity consumption) which, in transition countries are fluctuating. (v) Finally, there may be differences

2. Conceptual framework and literature review

in the elasticity of electricity/GDP across countries or the elasticity may change over time (OECD, 2002; Schneider and Enste, 2000, etc.).

Latent variable methods

Contrary to the previous procedures, latent variable methods assume that the non-observed economy is an unobserved variable which depends on two sets of causal and indicator variables. These variables are considered to be the proof of the existence of not-observed activities. The first set establishes a link between the latent variable and the explanatory variables while the second set of variables specifies the causality between the two groups of variables.

Once those variables are identified, the following step is to specify a Structural Equation Model (SEM) to estimate the size of the NOE. Three types of SEMs are used to measure the Non-observed activities. These are MIMIC (Frey and Weck-Hannemann, 1983), DYMIMIC (Giles, 1999) and DYMIMIC / Demand for money (Schneider, 2007). The MIMIC approach uses exactly the methodology of structural equation models. DYMIMIC adds to the analysis a dynamic of temporal evolution of the NOE. In the DYMIMIC / Demand for Money model, the authors limit causal and indicators variables to the most significant. They use the currency demand function to calibrate the size and evolution of the NOE.

The main advantage of Latent variable methods is to bring an international comparison of the legal part of the NOE¹⁰. They report the dynamics of the evolution of this part over time.

Several criticisms have also been made to those methods. OECD (2002) revealed that the methods would lead to an overestimation of the NOE. Breusch, (2005); Breusch et al.(2005) and Feige (2016) questioned the lack of transparency in describing the procedures and the fluctuating

¹⁰ Shadow economy is the term used by (Schneider, 2007) to define the legal part of the non-observed economy. It may excluded self-consumption and informal production.

2. Conceptual framework and literature review

feature of the obtained values of causes or indicators variables. They also pointed out that the use of ad-hoc econometric specifications lead to measurement errors. Moreover, the calibration procedure allow them to obtain absolute values of the size of the Non-observed economy. Otherwise, [Thomas \(1999\)](#) or [Elgin and Oztunali \(2012\)](#) criticized the lack of micro-foundations in the construction of the estimators.

Model-based estimation

Model-based estimation have been developed in response to the criticisms of [Thomas \(1999\)](#). He considered only a theoretical model can bring a better understanding of the determinants of the Non-observed Economy. The methods are generally used in the case of one country or a small number of countries¹¹.

[Elgin and Oztunali \(2012\)](#), proposed a two-sector Dynamic General Equilibrium (DGE) model to estimate the size of the NOE for 161 countries from 1950 to 2011. They used national income statistics which allow them to minimize the number of variables which can affect (or be affected by) the size of NOE.

The DGE responds to the weaknesses of the latent variable estimations by providing estimations without statistical errors since statistical methods are not employed. The estimation does not depend on ad-hoc specifications or assumptions; it is based on micro-foundations.

Ultimately, different measures of the size of the non-observed economy exist. They are all subject to criticisms while their advantages cannot be ignored.

¹¹ See for example [Gomis-Porqueras et al. \(2011\)](#); [Amaral and Quintin \(2006\)](#); [Antunes and Cavalcanti \(2007\)](#); [D'Erasmus and Moscoso Boedo \(2012\)](#).

2.2.2.3 Comparison of methods

We present a comparison of different measures of the size of the Non-observed Economy. The purpose of this section is to display some of the discrepancies that may arise from one method to another. The results come from the work of [Schneider \(2011\)](#).

In Table 2.2, [Schneider \(2011\)](#) examines the currency demand approach, the gap between the official market and the labor market, the national accounts approach and the MIMIC method. He compared the results of several research studies conducted in six OECD countries over different time periods. Table 2.3 compares the measures for the German non-observed economy over time.

For all countries, the national accounts approach display an important size of the non-observed economy¹² than the others. In the absence of this approach, MIMIC is the one that brings the higher results.

The differences between the results can be explained in different ways. First, the fact that the concepts used do not describe the same realities can lead to gaps during comparisons. As shown in Table 2.2, the national accounts approach provides a measure of the whole non-observed economy, while MIMIC, for example, excluded illegal activity. Compare the results of MIMIC with those of the national accounts approach will display a gap equivalent at least, to the size of the illegal activities.

Second, the weaknesses of the measures mentioned above may also justify the results. Concerning the currency demand approach, for example, the choice of the reference period in which the non-observed economy is zero can explain the variations in results.

¹² Shadow economy is the term used in [Schneider \(2007, 2011, 2012\)](#).

2. Conceptual framework and literature review

The choice of one or the other of the above methods is not easy. Indeed, there is no agreement¹³ specifying whether a higher measure of the sector should be preferred to another. It is therefore not possible to express an opinion on the use of either method for a good estimate of the non-observed economy.

¹³ Labor statisticians have adopted a common definition of the informal sector, which is generally measured using mixed 1-2-3 surveys, but World Bank or GEM databases do not use this tool.

2. Conceptual framework and literature review

Table 2.2: Measuring the size of the Non-observed Economy. Comparison of methods.

Countries	Periods	Currency demand approach (% of GDP)	Discrepancy between the official and the actual labor force (% of GDP)	OCDE survey data (based on the national accounts approach) (% of GDP)	MIMIC	Authors
Austria	1990-1991	5.47	9.6	20.6	6.9	Schneider (1998; 2002)
	1997-1998	8.93	16.0	25.87	9	
Denmark	1980	8.6	8.3	13.23		Mogensen, et al. (1995)
	1994	17.6	15.4	34.44	17.8	Schneider (2002)
France	1975-1982	6.9	3.0-6.0	12.53		De Grazia (1983) et
	1997-1998	14.9	6.0-12.0	24.36	14.9	Schneider (1998b ; 2002)
Germany	1974-1982	10.6	8.0-12.0	11.94		De Grazia (1983) et
	1997-1998	14.7	19.0-23.0	26.08	14.9	Schneider (2002)
Italy	1979	16.7	20.0-35.0	8.04		Gaetani et d' Aragona
	1997-1998	27.3	30.0-48.0	20.36	27.3	(1979) Schneider (2002)
Spain	1979-1980	19	9.6-26.5	5.64	23.1	Ruesga (1984) Schneider
	1997-1998	23.1	11.5-32.3	13.79		(2002)
Sweden	1978	13	13.0-14.0	15.10		De Grazia (1983) et
	1997-1998	19.8	19.8	25.68		Schneider (2002)

Source: [Schneider \(2011\)](#), p.20.

2. Conceptual framework and literature review

Table 2.3: The Size of the Non-Observed Economy¹⁴ in Germany According to Different Methods (in Percentage of Official GDP)

Approaches	1970	1975	1980	1985	1990	1995	2000	2005	Auteurs
Survey	-	3.6	-	-	-	-	-	-	IfD Allensbach (1975)
	-	-	-	-	-	-	4.1	3.6	Feld and Larsen (2005,2008)
Discrepancy between expenditure and income	11	10.2	13.4	-	-	-	-	-	Lippert and Walker (1997)
Discrepancy between official and actual employment	23	38.5	34	-	-	-	-	-	Langfeldt (1984a, b)
Physical input method	-	-	-	14.5	14.6	-	-	-	Feld and Larsen (2005)
Transactions approach	17.2	22.3	29.3	31.4	-	-	-	-	Feld and Larsen (2005)
Currency demand approach	3.1	6	10.3	-	-	-	-	-	Kirchgassner (1983)
	12.1	11.8	12.6	-	-	-	-	-	Langfeldt (1984a, b)
	4.5	7.8	9.2	11.3	11.8	12.5	14.7	-	Schneider and Enste (2000)
Latent (MIMIC) approach	5.8	6.1	8.2	-	-	-	-	-	Frey and Weck (1984)
	-	-	9.4	10.1	11.4	15.1	16.3	-	Pickhardt and Sarda Pons (2006)
DYMIMIC	4.2	5.8	10.8	11.2	12.2	13.9	16	15.4	Schneider (2005,2007)
Soft Modelling	-	8.3	-	-	-	-	-	-	Weck-Hannemann (1983)

Source : [Schneider \(2007,2011, 2012\)](#)

¹⁴ Also known as Shadow economy in [Schneider \(2007,2011, 2012\)](#)

2.2.3 Motivation for the choice of the retained concepts and indicators

As the issue of defining informality, choosing a method to measure the non-observed economy is not easy. As mentioned earlier, no agreement exist in the choice of the best measure when measuring the informal sector or the non-observed economy. In general, informal sector's size is measured through direct methods while other segments of NOE are measured through indirect methods. Nevertheless indirect measures may also include the size of the informal sector.

Like many authors before us, we choose the appropriate measures for this research based on the research questions.

Chapter 3 assesses the impact of financial institutions access on the contribution of micro-activities to tax revenues. It also evaluate how building a better accountability relationship between rulers and micro-operators influence countries inefficiency during tax collection.

We choose to use macroeconomic data from [Elgin and Oztunali \(2012\)](#). This choice is made given the lack of microeconomic surveys on the information about the access to credit and the perception of democratic accountability across countries and across time. For more information on the database and its construction, see section 2.2.2. The ideal database of this study should not include fraudulent activities¹⁵. However, to our knowledge, this kind of macroeconomic database does not exist.

To conform to the work of [Elgin and Oztunali \(2012, 2013\)](#), we will use the term informal economy (IE) to describe the activities studied. Indeed, [Elgin and Schneider \(2013\)](#) define as

¹⁵ Firms carried out by entrepreneurs whose size is comparable to companies Large, Medium-size or small companies. As mentioned before, inside the NOE, those firms are considered as fraudulent. They should be to track and enforce them to comply with regulation.

2. Conceptual framework and literature review

informal economy “*a set of economic activities that takes place outside the framework of bureaucratic public and private sector establishments. It is mainly regarded as a sector, which produces legal goods, but does not comply with government regulations*”. As we can see, both micro-activities and fraudulent activities, as defined in figure 2.2, are enclosed in this measure. The conclusion of the study will be interpreted only for micro-activities since in our point of view, fraudulent activities have to be tracked by the administration and enforced to comply with the legislation.

Chapter 4 examines the determinants of tax compliance in the micro-activities as defined in figure 2.2. Chapter 5 examines the impact of local taxes on the productivity of micro-activity. In each of these studies, we will use microeconomic surveys for two reasons. First, microeconomic surveys exclude illegal and fraudulent activities as mentioned in Figure 2.2. Secondly, microeconomic surveys, especially 1-2-3 surveys, provide information on the characteristics of informal firms such as turnover, value added and characteristics of the entrepreneur or the production unit. Moreover, the 1-2-3 survey gives us information on the relationships between the tax administration and the informal actors. In these two chapters, the term of micro-activities is preferred.

2.3 Literature review

Here, we review the main economic concepts employed in the dissertation. What are the links between taxation and NOE (2.3.1)? How do financial development (2.3.2) and democratic accountability (2.3.3) affect the NOE and/or taxation? How to measure the productivity of the firm (2.3.4)? These are the questions that the following paragraphs attempt to answer.

2.3.1 Taxation and the Non-Observed Economy

Despite its participation estimated to be on average 40% of the GDP¹⁶ of developing and transition economies in 2013 (Hassan and Schneider, 2016), the contribution of the non-observed economy to public revenues mobilization¹⁷ is limited. However, taxing this sector with an inadequate tax design may induce adverse effects such as (i) a pauperization of an already vulnerable population (Chambas, 2005), (ii) an incentive to remain in the informal sector and (iii) the reinforcement of tax evasion practices. It could also generate (iv) inequity problem or (v) a lack of tax compliance culture. These are the main conclusions displayed by studies on the nexus “non-observed economy– taxation”, we attempt to briefly review below.

2.3.1.1 Heterogeneity of the informal sector and taxation

Defining a comprehensive strategy for taxing the non-observed economy can be difficult because non-homogeneous segments coexist (Araujo-Bonjean and Chambas, 2004). Generally composed of activities with low productivity and carried out to meet basic needs¹⁸, the micro-activities differs from activities with higher productivity that are subject to tax evasion¹⁹ (Schneider, 2005; de Soto, 1989). Micro-activities are numerous and disseminated across countries. Most of them are created by low-skilled operators facing the lack of better job opportunities (Pimhidzai and Fox, 2012). In this way, the micro-activities are perceived as a transition process and operators do not expect long term benefits from these companies. They stay

¹⁶See Hassan and Schneider (2016) and also (Elgin and Schneider, 2013) for more detailed information. WIEGO also provides statistics for the contribution of the informal sector to gross value added. For example, they claims that informal sector represents more than 50% of non-agricultural gross value added in Benin, Niger and Togo , 46% and 30% of non-agricultural gross value added for India in 2008 and Guatemala and Colombia respectively.

¹⁷Bird, Martinez-Vazquez, and Torgler (2008) Cobham (2005); Grimm, Knorringa, and Lay (2012)

¹⁸ See OECD (2002) and Benjamin and Mbaye (2012).

¹⁹ These activities correspond to fraudulent activities in the figure 2.2.

2. Conceptual framework and literature review

in this sector and do not comply with the legislation because they perceive too little incentives to become formal (Maloney, 2004).

Micro-activities are generally subdivided in two categories. The criteria retained to differentiate companies are the disciplinary field, the geographical context or the theme of the study to implement. For example, in Sub-Saharan African countries, "*small group of successful entrepreneurs and a much larger group of entrepreneurs that apparently struggle to survive*" are identified (Lubbel, 1991).

Concerning more dynamic regions like South America or Asia, the two groups are "*entrepreneurs would prefer to have a rather secure job or are constrained genuine entrepreneurs*" (Grimm *et al.*, 2012). However, recent studies have shown the existence of enterprises with high return on investments despite their low level of capital (De Mel *et al.*, 2008; Grimm *et al.*, 2012; Diagne, 2013).

Using those empirical results, Grimm *et al.* (2012) proposed a new typology of informal sector activities with three components: the *Top Performers*; the *Constrained Gazelles* and the *Survivalists*. Top performers are the more performing activities. Constrained gazelles possess low levels of capital and technology but present strong ability to grow and survivalists carry out subsistence activities.

This typology beyond its limitations has the advantages to propose three categories of informal entrepreneurs with a medium category which possess some similar characteristics with each other's. Even if little has been done on this segment of informality, we think that in the way to reinforce their businesses, those entrepreneurs should cooperate with the tax administration. The

2. Conceptual framework and literature review

last two chapters of this dissertation use this new segmentation of Grimm *et al.* (2012) to define informal sector heterogeneity²⁰.

2.3.1.2 Determinants of the tax compliance in the informal sector

Several studies tried to understand the determinants of tax compliance in the informal sector. They found that close to 25% of informal companies pay taxes. What explain those tax payments are generally, the personal characteristics, the geographical location or the branches of activities of the firms (Backiny, 2009).

Diagne and Thiaw (2008) found that the visibility of firms to the tax administration may also explain their tax payment. Indeed, the cost of the collection of revenues from the informal sector is high, compared to the expected gain. Furthermore, tax administrations of developing countries hold limited resources. They identify a group of more detectable firms (fixed premises, a huge number of employees, etc.) and enforce them to pay taxes.

D’Arcy (2009) explains the assent to the tax of African taxpayers by three theories: the *fiscal exchange* perspective, the *national community* approach, and the *comparative treatment* thesis. She that all of the above thesis must be integrated to explain tax payment since it takes into account not only the citizens’ relationship to the state but also the relationship of his community to the state.

In our knowledge, those arguments have not yet been integrated into a study on the informal sector. In the way to understand the role of attitude towards taxation of the micro-activities operating in the informal sector, our fourth chapter integrates a variable of perception of the tax system. It also considers the “*comparative treatment*²¹” argument since it allows understanding of

²⁰ See Hart (1973); OECD (2002); Benjamin and Mbaye (2012); Schneider (2007); De Soto (1989) or Araujo and Chambas (2004) for more information about informal sector heterogeneity.

²¹what I get from the state (and how the state treats me) relative to those who are in my community (D’Arcy, 2009)

2. Conceptual framework and literature review

what happens when operators perceived that firms in the same communities pay taxes. Here communities are defined as a group of firms working in the same region, branches, etc.

Allingham and Sandmo (1972) showed that the objective of operators in the non-observed economy is to maximize their utility function. In their model of fraudulent behaviors, they assume that taxpayers have the real tax information and conduct arbitration between costs and benefits to break (or not) the law. If the tax administration does not detect them, their net revenue is higher. In the opposite, they have to pay some penalties (Allingham and Sandmo, 1972).

In both cases, the weakness of the tax compliance of the operators and the absence of punishment create an inequity problem. Formal operators perceive that the tax system is unfair (Adams and Webley, 2001; Terkper, 2003) since they have to pay taxes when others evade. This result on lower level of tax morale in formal firms and discourages tax compliance (Joshi, Prichard, and Heady, 2014).

Turning the argument of Allingham and Sandmo (1972), we assume that, taxpayers may have the real information and conduct arbitration between costs and benefits to break or not the law. If they pay taxes, they will not incur penalties or sanctions and could concentrate their effort on their firm growth. On the other side, if they evade taxes and if the administration detects them, the development of the firm may be stopped.

Building a culture of tax compliance in the informal sector is then an important objective, to avoid the reduction of the tax base. Tax administrations in developing countries currently pay little attention to micro-activities because they have a low tax potential. Local government, which are already successful in taxing micro-activities could manage them and obtain additional resources. In this way, the third chapter argues that to mobilize more revenues especially from the informal sector, a support should be given to their development (at least for those with a great potentials of

2. Conceptual framework and literature review

development) and providing information about the role and the use of taxes should increase tax compliance.

2.3.2 Taxation, Financial development, and the Non-observed Economy

In general, economists investigate the nature of the relationship between taxation and the non-observed economy (See the previous paragraph), financial development and the non-observed economy or taxation and the financial development. However, in our knowledge, none of them investigate joint effects of financial development and informal sector on tax revenue mobilization.

Using firm-level data, for example, [Dabla-Norris, Gradstein, and Inchauste \(2008\)](#), measured the impact of financial development on informality. They find that financial development measured by credit to the private sector could be effective in reducing the informality in countries with a better rule of law.

More specifically, financial constraints lead small companies to become not-observed activities, while for large companies, legal barriers are more important. [Wurm, Bose, and Capasso \(2012\)](#); [Berdiev and Saunoris \(2016\)](#); [Bittencourt, Gupta, and Stander \(2014\)](#); [Capasso and Jappelli \(2013\)](#) etc., display the same results.

On another hand, [Gobbi and Zizza \(2007\)](#) and [Elgin and Uras \(2012\)](#) found, that the size of the non-observed economy may also affect financial development. For [Gobbi and Zizza \(2007\)](#), this impact is conceivable through two channels : (i) from the demand side, operating outside the formal economy can limit the demand for financial services which can influence market structure, (ii) from the supply side, a large share of the non-observed economy with more irregular activities has a negative impact on banks by increasing monitoring costs resulting in higher costs and interest rates.

2. Conceptual framework and literature review

Using data from Italy, they find empirical evidence that operating outside the formal sector can limit the demand for financial services and acts indirectly as a barrier to enter local financial markets. [Elgin and Uras \(2012\)](#) develop a theoretical model to study the impact of the non-observed economy on financial development and find evidence of an inverted-U relationship between financial development and the size of the informal economy.

Concerning the link between taxation and financial development, [Beck, Lin, and Ma \(2014\)](#) showed that firms in countries with better credit information sharing systems and higher branch penetration evade taxes to a lesser degree. The effect is stronger for smaller firms, firms based in smaller cities, firms and industries relying more on external financing, and firms and industries and countries with greater growth potential.

In short, if countries want to increase tax payments by small firms (e.g. in the informal sector), they should favor access to financial institutions (by improving branch penetration) and reinforce systems of credit information sharing.

In the third chapter, we discuss that a better access of the micro-operators to financial institutions (access to services, access to credit, savings etc.), by limiting their financial constraints and increasing the global level of financial development should favor micro-activities' growth, improve their contribution to taxes and ease formalization.

According to recent studies, the effect of financial development on growth may differ by countries due to regional specificities or the level of financial development in the country. Indeed, considering a panel of 65 countries, [Narayan and Narayan \(2013\)](#) inspect the nature of the relationship between the development of financial and banking sector institutions and growth. One of their main findings is that dividing the database into developed and developing countries led to different outcomes. Even if the effect of financial development on growth is positive and significant on the whole panel, domestic credit produces a negative effect on economic growth for both Central

2. Conceptual framework and literature review

European, South American and African countries. This effect is insignificant for the Asian market, and Middle Eastern countries.

They explain these findings by the fact that considering both developed and developing countries in the sample, the positive effect of bank credit on growth could mask the effect of developing countries.

[Mihci \(2006\)](#) showed that finance-led growth is conditional to the level of financial development. Using a structural break analysis on a dataset of 32 countries over the period 1990-2001, he showed that up to a liquid liability ratio of 0.43, financial development has diminishing effects on GDP per capita. Then, he divided his sample of study into financially less developed countries and financially developed countries.

For financially less developed countries, the negative effect of financial development on growth is important compared to the overall sample. However, compared to the others, financially developed countries recorded a positive impact of financial development on growth.

[Samargandi, Fidrmuc, and Ghosh \(2015\)](#) examine the nature of the relationship between financial development and economic growth. They established that at a certain threshold, financial development has a negative impact on growth. This finding is opposite to the common view of a positive and significant effect of financial development on growth.

[Law and Singh \(2014\)](#) explored whether threshold levels of financial development exist in the relationship between finance and growth. As [Shen and Lee, \(2006\)](#); [Cecchetti and Kharroubi \(2012\)](#) or [Arcand, Berkes, and Panizza \(2012\)](#), their findings suggest that beyond a threshold varying between 88-100%, the effect of finance is negative for growth. Our analysis carries out those specificities to minimize the emergence of bias in the results.

2.3.3 Taxation, Democratic accountability and the Non-observed Economy

The effect of democratic accountability on tax mobilization received great attention in the debate since the early European history revealed that increasing the tax burden may result in a revolution and a demand for a more accountable government (Ross, 2004; Asongu, 2014, Baskaran, 2013; Martin, 2015; Bratton, 2012; Baskaran and Bigsten, 2013; McGuirk, 2013).

Researchers questioned the nature of this relationship in developing countries since, as showed by Ali, Fjeldstad, and Sjørusen (2014) and Cunningham (2015), many citizens in Africa do not pay taxes. In this context, it could be difficult for them to ask for more representativeness.

Moreover, the presence of abundant natural resources or aid flows reduces the demand for democratic accountability. Indeed, a major part of public spending is financed out of the taxation channel. Governments be accountable to their citizens and citizen ask for accountability since they do not pay (or pay less) taxes.

In another hand, Bird, Martinez-Vazquez, and Torgler (2008) introduced the issue of the reverse causation in the developing countries' debate. Next paragraphs present general considerations on the connection between democratic accountability and taxation.

2.3.3.1 “Taxation leads to democracy”

This paragraph presents the idea of Ross (2004) that countries relying on taxation to finance their public spending become more accountable. Indeed, based on historical evidence, empirical researches show that increasing the tax burden on citizens implies more responsiveness and accountability of governments.

2. Conceptual framework and literature review

[Baskaran and Bigsten \(2013\)](#) used data from 31 countries in sub-Saharan Africa for the period 1990-2005 and examined whether the positive effect of fiscal capacity on the government's quality observed in industrialized countries earlier prevails in sub-Saharan Africa. They found that fiscal capacity favors democracy in Africa, as the increase in the tax burden by the government translates into an increase in the voice of citizens for a more responsible government.

[Baskaran \(2013\)](#) extended this analysis to a panel of 122 countries through the 1981-2008 period. He measured democracy by the POLITY IV index and also found that "investing in tax capacity may result in a more accountable government". [Martin \(2015\)](#) realized some experiments researches in Uganda. The purpose of the paper was to examine whether taxation encourages citizens to demand more accountability from their leader for non-economic behavioral reasons. She found that when they are taxed, people are more likely to punish the authorities' poor performance in terms of management or accountability.

Alternatively, there are some pieces of evidences that the effect of democratic accountability on taxation may differ across regions or according to the public revenue origins. In several articles, researchers showed that the flow of aid, the abundance of natural resources (especially oil) may influence the degree of democratic accountability.

Through Afrobarometer Round4, [Bratton \(2012\)](#) found that Africans are voters and not citizens. The levels of accountability in these countries are low because individuals are not fully aware of their political rights and duties. They are committed to choose leaders through elections but assume on a lower level their responsibility to ask for more responsiveness of the authorities. [Asongu \(2014\)](#) indicated that "in the absence of aid, taxation improves political institution but in the presence of aid, such institutions are deteriorated". It means that institutions have to be already strong for a better effect of aid on taxation.

2. Conceptual framework and literature review

McGuirk (2013) tested whether taxation affects democracy with microeconomic data from opinion polls in 15 countries in sub-Saharan Africa and national data on natural resource rents. His empirical findings revealed that in countries where natural resources are abundant, leaders reduce the tax burden to make citizens more receptive to their policies, especially during the election period. This situation is likely to reduce democratic accountability.

2.3.3.2 Democracy leads to taxation

Bird et al. (2008) examined the relationship between corruption, voice and accountability and tax effort for a panel of developing and transition countries. They found that if the preferences of taxpayers are properly represented in political institutions, and their “voice” influence state’s decisions, their willingness to pay taxes increases. So, honesty, responsiveness and, fairness of government boost taxpayers’ willingness to remit taxes.

Ehrhart (2011) investigated the influence of political regime on domestic tax mobilization. Using a panel of 66 developing countries, and after controlling for endogeneity on the period 1990-2005, she found that political regime, measured by the Polity2 variable of the POLITY IV project have a positive and significant effect on domestic tax revenues. More specifically, she found that in countries well-endowed by natural resources, there is a need to increase levels of democracy to achieve a sustainable tax system.

Profeta, Puglisi, and Scabrosetti (2013) also used the democratic index (Polity2) to study whether political indicators have a causal effect on the structure of taxation. Using country fixed effect analysis; they suggested that Polity2 negatively influence tax revenues. This effect was significant for personal income taxes in Latin America, indirect taxes in south-east Asian countries, and direct taxes (especially income taxes) in new European countries.

2. Conceptual framework and literature review

D’Arcy (2009) found that if African states want their population to pay taxes, they must provide them with the perception that they are treated with fairness. They must also be responsive and address citizen needs. In addition, Sacks (2012) using Afrobarometer data found that competency, honesty and fairness of a government lead to greater tax compliance. For Torgler (2005), in countries with a higher level of democracy, taxpayers’ willingness to pay tax is high.

In short, democratic accountability has an ambiguous effect on taxes. In the way to propose clear policy recommendations, researchers have to distinguish between (i) the origins of public spending funding (natural resource rents, aid), the type of taxes to be levied (ii) and the regional disparities (iii). The second part of the third chapter attempt to integrate those findings in the analysis.

2.3.4 Informal firms, productivity, and efficiency

In this section, we shortly describe factors through which informal firms’ productivity and efficiency may be affected in developing countries. Economists typically use theoretical, empirical and experimental methods to validate their hypotheses. The first section reviews measures of performance and technical efficiency while the other exposes the results of the effect of a broad range of variables on the productivity of the firm.

2.3.4.1 Productivity and Efficiency: Concept, Measures and Limitations

Measures of performance are built to appreciate the economic soundness of firms. They allow evaluating the accurate level of production of the firm. By calculating the gap between the current level and the expected one, they give a measure of the inefficiency of the firm and allow improving the productivity. This enhancement of firm productivity is possible since its measure of technical

2. Conceptual framework and literature review

efficiency gives information to decision-maker to monitor the system of production and lead units under their control (Battese and Coelli, 1995).

- Firm productivity

According to OECD (2001), productivity is commonly defined as a ratio of a volume measure of output to a volume measure of input use. Various measures²² of productivity exist. Among them, financial indicators²³, ratio of productivity²⁴, the stochastic frontier and Data Envelopment Analysis (DEA) approaches are the most used. As mentioned OECD (2001), the choice will be defined by the purpose of analysis and the data availability. For example:

- Amin (2009) used the average productivity of labor defined as (*log of*) total sales in a regular month (in USD) divided by the total number of employees, when assessing how the reason of creation of an enterprise may affect the labor productivity of informal firms.

- Ravelomanantsoa, Rajaonera, and Rakotomanana (2016) selected the monthly added value in their study on the technical efficiency of informal units in Madagascar.

- McKenzie and Sakho (2010) took the 'profit' as the dependent variable for their study. They assume that the impact of firm registration on the profit is a key determinant of the decision of being formal. Another justification of this choice is that estimations of the productivity of firm rely on assumptions which may be credible or not according to the types of firms surveyed (de Mel, McKenzie, and Woodruff, 2007). Indeed as the latter revealed, in their experiment studies on Sri Lankan microenterprises, direct reports of profits are more reliable to proxy informal firm profitability. Trying to understand the difference between the profits calculated with revenue-

²² See OECD (2001), Diagne (2013)

²³ (value added, profit, return of equity (ROE))

²⁴ which represents a measure of output to a (or multiple) specific measure of input : the ratio of added value on labor or (and) capital

2. Conceptual framework and literature review

expense²⁵ data and the reported profit²⁶, they found that unreported information²⁷ may create bias for the result obtained. Among them, the fungibility of resources between the business and the household is the main concern. The informal firm used goods and material from business to the household consumption and do not remove them from the business expenses.

- Onumah, Hoerstgen-Schwark, and Brümmer (2009), Binam, Gockowski, and Nkamleu, (2008), Nordman and Vaillant (2014) adopt the stochastic frontier approach. They justify their choice by the fact that stochastic frontier methodology measures and assesses the technical efficiency²⁸ of firms by allowing a non-negative random component in the error term. It also allows to take into account the effect of the firms' environment which could generate variations in the final output (Binam et al., 2008).

- Chapelle and Plane (2005) investigated the technical efficiency of Ivorian manufacturing firms in 5 sectors using a DEA approach.

- Technical versus allocative efficiency

Contrary to the concept of productivity, efficiency measures how successful is the firm in its process of production (La Porta and Shleifer, 2014; Ismail and al., 2010). Ajibefun and Daramola (2003) remind that the basic idea of production efficiency is “the idea of no waste”. Based on this,

²⁵ See de Mel, McKenzie, and Woodruff (2007) for an example.

²⁶ In this paper, the reported profit is the answer to the question: “*What was the total income the business earning during the month of March after paying all expenses including the wages of employees, but not including any salary you paid yourself. That is, what were the profits of your business during March?*”

²⁷(i) The existence of categories of expenses or forms of profit not captured by basic surveys - goods and material recorded as enterprises' expenses but used for the domestic consumption or given by non-household members; salary paid by business owner but not reported in the firms' profits, business revenues used to finance household expenditures and not included as profit (also known as fungibility issues) ; (ii) The timing of the transactions: inputs purchased in one period may not be sold until another month (iii) Recall errors ; (iv) Lack of bookkeeping; (v) Deliberate misreporting;

²⁸ The ratio of actual to expected maximum output, given input levels and the existing technology

2. Conceptual framework and literature review

efficiency measures assess the number of goods and services produced per unit of input without wasting.

According to [Farell \(1957\)](#), the global efficiency of a firm may be distinguished into technical or allocative efficiency. In general, a unit producing the maximum output from a given set of inputs is considered as technically efficient. However, this unit is qualified for allocative efficiency if, it succeeds *in choosing an optimal set of inputs with a given set of input prices* ([Dariao and Simar, 2007](#), p15).

Technical efficiencies may be calculated by several channels. However, studies by [Kumbhakar et al.\(1991\)](#), [Reifschneider, and Stevenson \(1991\)](#), [Huang and Liu \(1994\)](#), [Battese and Coelli \(1992, 1995\)](#), proposed the use of stochastic frontier specifications since they allow simultaneously to estimate the production frontier and the technical efficiency ([Battese and Coelli, 1995](#)). In the fifth chapter, due to the lack of information concerning input prices, only the technical efficiency is analyzed.

2.3.4.2 Informal firm Performance in developing countries

Informality is generally associated with a low level of productivity²⁹. By comparing informal and formal firms, [La Porta and Shleifer \(2014\)](#) concluded that the productivity is higher for formal than informal firms. For formal firms, this can be explained by a better access to credit, the possibility to benefit from large firms or public sector contracts. Other factors as avoiding the penalty by conforming to regulations, the reputation effects and a larger scope of marketing may also favor their activities (See [Bruhn and McKenzie, 2013](#)). In order to understand the reason and channels of low levels of productivity in the informal sector, diverse assumptions are studied.

²⁹[La Porta and Shleifer \(2014\)](#), [Baez-Morales \(2015\)](#).

2. Conceptual framework and literature review

Financial constraints affect firm performance...

An experiment assessing the incidence of grant for capital acquisition on the firm performance reveals that an enterprise which benefits from a grant, boosts up its productivity (de Mel, McKenzie, and Woodruff, 2008). The impact of this is larger for companies run by men than women-entrepreneurs for which no positive impact of the grant is recorded.

Fafchamps, McKenzie, Quinn, and Woodruff (2014) used a randomized experimental design close to the former to understand the link between financial constraints and productivity in the case of Ghana. They *test both for differences in return by gender and differences in return to capital provided in-kind or in cash*. Fafchamps et al. (2014), found that the monthly profit of the firm increases by more than 15%. Female and male-run activities got a positive and significant return on capital. However, in-kind grants generate the highest profit for the beneficiary.

Contrary to de Mel et al. (2008), they introduce more variability in their analysis, looking inside the distribution of the capital. The results of the analysis are that, most subsistence female-run activity got no effect of the grant on the firms' performance. Only women with profits above the median obtain a large incidence on the grant.

Bernhardt, Field, Pande and Rigol (2017) precised the result of the previous studies by highlighting that sometimes male-run firms and female-run firms belong to the same household. Both of them may access credit. However, the credit obtained by women (through policy that helps them) is invested in the highest-return firms which are generally the one managed by men. They concluded that the gap of performance in female microenterprise is not a gap in aptitude. The low average returns on capital are the result of the investment of their own capital into their husbands' enterprises.

2. Conceptual framework and literature review

Social environment also impacts the firm performance...

[Nordman and Vaillant \(2014\)](#) explored the role of sharing norms on technical efficiencies in firm production in Madagascar. The main objective of the study was to assess how the redistributive pressure from family may affect the incentives of informal operators to pursue and develop their business.

They assume that both indirect and direct effect of family pressure may be registered: (i) the operator may be asked to share part of the goods and services produced, reducing in this way its profits for the amount of the shared products; (ii) the operator may also be asking to share part of the goods, hiring family members or hosting them in the city.

They discovered that negative externalities of distant family arise more for male-run than female-run firms. Nevertheless, female-run businesses are impacted by intense social norms and the domestic obligations they have to deal with. However, according to the category of business,

[Nordman and Vaillant \(2014\)](#) concluded that young children in the household may also positively affect the efficiency of female-run business. [Nordman and Vaillant \(2014\)](#) also, find the existence of some gender-specific effects of sharing norms on the technical efficiency. The return on capital of the firm is less important for the female owner than for male.

[Onumah et al. \(2009\)](#) adopted a stochastic frontier approach to analyze how professional and family network may impact fish farm production and technical efficiency in Ghana. The study reveals that both hired and family labor are productive, but the output obtained with the hired labor is slightly higher than the value of family labor. [Onumah et al. \(2009\)](#) also, reveal that the size of the fish pond matters. Small operators are less efficient than the largest. Belonging to a business association also conduct to higher profits ([Fajnzylber et al., 2006](#)).

2. Conceptual framework and literature review

Formalization and/or Tax payments influence firm performance...

Among the determinant of business success or failure story, formalization is also cited as a driver of firm performance. Several economists affirmed that firm registration has a positive effect on its profitability (Bruhn and McKenzie, 2013).

- McKenzie and Sakho (2010) found a positive impact of tax registration (not tax payments) on firm profitability. Those effects seem to be heterogeneous according to the firm size; small firms³⁰ get lower profits.

- de Mel, McKenzie, and Woodruff (2013) showed that an increase of a firm's average profitability was driven by the substantial productivity of a few growing firms after formalization;

- Simplifying entry regulation on registration increased the number of registered firms by 5%. However, consumers benefit more than firms themselves. Indeed the price level fell by about 1% due to the increase of competitiveness but the income of informal business decreased by 3% (Bruhn, 2011).

- Firms created under SIMPLES³¹ program in Brazil “*have a license to operate, are registered as a legal entity, pay taxes and make social security contributions. They realized higher levels of revenue and profits, employ more workers and are more capital intensive...*” (Fajnzylber, Maloney, and Montes Rojas, 2009). Assessing the effect of participation in diverse societal institutions on the performance of the firm in Mexico, Fajnzylber et al., (2006) found that paying taxes led to, at minimum, an increase of 20% of firm profits.

Many studies also investigate the effect of firm performance on formalization. In a paper summarizing the effects of reforms and policy actions to promote firm formalization in developing

³⁰ Firms with less than 2 to 5 workers and possessing less than the middle tercile of capital stock (McKenzie, and Sakho, 2010 p.15).

³¹ Under SIMPLES program.

2. Conceptual framework and literature review

countries, [Bruhn and McKenzie, \(2013\)](#) put a particular emphasis on the link between formalization and firm profitability or efficiency. They remind that the informal sector is mainly composed of a vast quantity of small-scale activities which operate in the “other path” of the economy and expose different assumptions quoted in the literature to appreciate the phenomenon.

The most popular issue comes from the work of [de Soto \(1989\)](#) for which, informal owners would like to formalize their activities, but the existence of costly regulations and the heavy bureaucracy requirements put off their willingness to do so. Various political responses emerge of this, among them, a reduction of the barriers for registering such as the time and the cost of the procedure etc. But, after many years of reforms, the problem remains: many informal firms did not complete the process for regularization ([Bruhn and McKenzie, 2013](#); [Bruhn, 2011](#) ; [Kaplan, Piedra, and Seira, 2011](#)).

Some competing views to explain the prominence of small scale informal firms appeared. [de Mel et al. \(2013\)](#) or [De Giorgio and Rahman \(2013\)](#) found that giving information or reducing/reimbursing the cost of registration had no effect on formalization rate. The increased rate of municipal inspection, though, raise firms’ formalization from 22-27% in Brazil ([de Andrade, Bruhn, and McKenzie, 2013](#)). Another reason come from [Maloney \(2004\)](#), which assume that firms would like to formalize do so. Less productive firms refuse to conform because they perceive little incentives to being formal (ongoing tax payment, cost of accounting etc.).

Male and female-run firms are differently impacted ...

As it could be noticed, most studies on the performance of informal activities also assess the gender effect of various determinants on the firm profitability. All of them conclude to significant differences between the effects of those variables on the performance of female-run versus male-run enterprises. [Nordman and Vaillant \(2014\)](#), in their study of the impact of family pressure on

2. Conceptual framework and literature review

the performance of the firms find differences in the influence of sharing norms. Males entrepreneurs are affected by distant network while, for females, intensive social norms and the presence of children in the household instigate underperforming firms. [Fafchamps et al. \(2014\)](#) found that return on capital is positive for both males and females. Among the latter, only females owners with level of profits above the median obtain a significant level of a given capital (kind or not) on their productivity.

Other factors which affect firm productivity...

[Amin \(2009\)](#) revealed that the motivation for the creation of a unit is a good predictor of its profitability. By separating necessity — meaning that the owner does not obtain a job in the formal sector-and opportunity firms — an operator opens its own business after identifying a business opportunity [Amin \(2009\)](#) found that *opportunity firms are more productive than necessity ones*. Demand-side constraints have also been cited as factors affecting the technical efficiency of the firm. Those results may vary according to the sector of activity of the firm ([Ravelomanantsoa et al., 2016](#); [Rakotomanana, 2010](#)).

2.4 Conclusion

In summary, the non-observed economy includes market and non-market production activities - legal or illegal - that contribute to the creation of wealth in an economy. These activities can be micro, fraudulent or criminal. Their impact on resource mobilization varies according to the tax potential.

Fraudulent activities have a high tax potential but pay very little tax. Tax administrations should track and enforce them to pay taxes using computerized tax system, better plan tax audit

2. Conceptual framework and literature review

programs and risk analysis. The prohibitive nature of criminal activities, keeps them away from the tax mobilization process.

Micro-activities have limited tax potential and already contribute to local taxes (Chambas, 2005). In addition, VAT acts as a tax on their inputs (Keen, 2013). Taxing them more, could worsen the living condition of the operators and their family.

Since the purpose of the thesis is to provide tax administration with a better understanding of micro-activities, we should only consider these activities in the analysis. However, due to data limitation, the third chapter use data from Elgin and Oztunali (2012) which do not distinguish between fraudulent and micro-activities. In chapter 4 and 5, 1-2-3 survey which allow to do the distinction above mentioned, based on countries' tax books are preferred. They give information about characteristics of the firm and the head of the production unit. They also provide information about attitudes toward taxation and the relationship between micro-operators and the tax administration. This information is necessary to conduct our analysis.

The review of literature on financial development, democratic accountability and their relationship to the non-observed economy and taxation display several results. Among the conclusions, it should be noted that financial development could contribute to reducing the NOE. However, countries should improve the rule of law and systems for sharing credit information. Otherwise, to increase taxes from small businesses (e. g. informal sector), countries should promote their access to financial institutions. The effect of financial development on growth (and then on tax revenues) differ according to regional specificities. In addition, as shown by Mihci (2006), finance led growth is conditional to the level of financial development.

The effect of democratic accountability on taxes is ambiguous. In order to propose clear policy recommendations, researchers should take into account the following criteria. Firstly, they should pay attention to the sources of funding for public expenditure (rents for natural resources,

2. Conceptual framework and literature review

aid). Secondly, they should distinguish according to the type of taxes (direct, indirect, etc.) to be collected. Thirdly, as in the case of financial development, regional disparities exist and must be taken into account.

In terms of productivity and efficiency, we note that a large number of measures exist. As [OECD \(2001\)](#) explained, the choice should be made according to the question of research. Informality is associated to low level of productivity and efficiency. However, there is a gender effect on the business performance unfavorable to female-run enterprises. Financial constraints, the social environment or the payment of taxes can also have an impact on business productivity. The rest of the thesis attempts to take all these information into account.

Now that we define micro-activities and how to measure them, the rest of the thesis focuses on the nature and characteristics of these micro-activities. As explained above, the objective of this research is to give the tax administration a good knowledge of micro-activities in order to define a tax system that is appropriate for them. In doing so, the rest of the manuscript questions the effect of policies such as access to financial institutions and accountability on the contribution of micro-activities to tax revenues (Chapter 3). It questions the determinants of tax compliance of micro-activities (Chapter 4) and analyse the incidence of local taxes on their productivity (Chapter 5).

Part I:

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa: Do Financial Development and Democratic Accountability matter?³²

³² Joint with Jean-François Brun (CERDI/CNRS) and Aissata Coulibaly (World Bank Fellow).

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

3.1 Introduction

Improving the contribution of the Non-Observed Economy to public revenues is a key issue that developing countries have to deal with in order to strengthen their domestic resource mobilization. Providing an answer to this question is challenging since the Non-Observed Economy is full of paradoxes.

As a reminder, fraudulent and micro-activities coexist in the Non-Observed Economy (Araujo-Bonjean and Chambas, 2004). Fraudulent activities have high potential but evade taxes. Track and enforce them to comply with the tax rules is the best strategy. Authorities could computerize tax administration or introduce a risk management system to improve the collection. In opposite, micro-activities with lower productivity are numerous and the cost of taxation is high compared to the level of revenues expected. Moreover, some of them already pay local taxes while VAT is the equivalent of a tax on the input (Keen, 2013).

In our point of view, current strategies to strengthen the contribution of micro-activities to tax revenues are partial or inappropriate to some extent. Indeed, policymakers made several reforms to ensure a better contribution of these micro-activities to tax revenues. Among them, formalization is the main policy applied in the developing world. It requires firms to register their activities to the tax department (or municipal license). To facilitate the completion of this reform, countries adopt measures such as: (i) simplifying the procedures of registration; (ii) diminishing the cost of registration and (iii) providing information about how to register (de Andrade, Bruhn, and McKenzie, 2013; de Mel, McKenzie, and Woodruff, 2013; De Giorgio and Rahman, 2013; etc.). Doing Business Project, for example, allows to cut the average time to start an enterprise in the world, from 50 to 30 days and to reduce the cost of starting a business by two-third (World Bank, 2013). After decades of reforms, not all micro-activities have completed the regulation

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

process³³. The amount of firms which stay out of the formal sector continues to progress and [Maloney \(2004\)](#) concluded that operators who want to formalize do so.

We support the view of [Chambas \(2009\)](#) that to achieve the objectives of tax mobilization, taxation must adjust: it is not crucial to formalize the informal. In doing so, the paper attempts to show that favoring micro-businesses' growth and building a more accountable relationship between rulers and operators may facilitate tax mobilization. Indeed, a problem systematically cited by micro-operators³⁴ as a limitation for their firms' growth is the financial constraint. Providing them with access to financial institutions could help them obtain credit, invest in their businesses and earn more income.

As mentioned in [Goldsmith \(1969\)](#); [Gurley and Shaw \(1960\)](#); [Lucas \(1988\)](#); [Patrick \(1966\)](#) or [Xu \(2007\)](#); etc., financial development is a key factor in economic growth as it encourages the demand for financial services such as savings and credit, which stimulates investment and innovation. The improvement in the level of development favors a "*demand for diversification of public goods that can reduce citizens' resistance to taxes. It may also strengthen tax administration's capacity in terms of revenues collection since it allows economies of scale by building a better environment for tax collection: improvement of the quality of infrastructure, the qualification of civil servants, the level of education of the population*" ([AfDB, 2010](#)).

Here, we assume that facilitating the access to financial services for the micro-activities can have the same implications. With better access to financial institutions, micro-businesses can boost their growth by getting credit and finance their investments. As they grow, their demand for public infrastructure will increase and their willingness to pay taxes will increase as well.

³³ For example, after the introduction of the "one-stop shop" in Brazil, 72% of informal firms remain in the informal sector. The introduction of the SIMPLES in the same country did not dramatically change this state with only a 5% increase in registered firms.

³⁴ See 1-2-3 Survey in Madagascar, Côte d'Ivoire, and Cameroon etc.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

In addition, by promoting democratic accountability through public disclosure of information on the role and the use of public revenues, policymakers may strengthen the contribution of informal operators to taxation. As indicated in [Bird et al. \(2008\)](#), if the preferences of taxpayers are properly represented in political institutions, and if their “voice” influences state decision, their willingness to pay taxes will increase.

[D’Arcy \(2009\)](#); [Tyler \(2006\)](#); [Kirchler, Hoelzl, and Wahl \(2008\)](#); [Fauvelle-Aymar \(1999\)](#), *etc.*, also indicated that people’s perception of the authorities may influence their willingness to pay taxes. We argue that higher degrees of accountability in the sub-Saharan economies, should increase people’s trust in their leaders, help reducing level of corruption and then improve the willingness to pay taxes. Indeed, by allowing citizens to be aware of the use of public resources, democratic accountability fosters transparency and tax bargaining in the economy. It gives to citizens, the opportunity to voluntarily pay taxes with the right to control leaders and punish them — if necessary — during the electoral process. This situation should simplify tax collection process and reduce countries’ inefficiency in terms of public mobilization.

The methodology employed in this chapter, is the stochastic frontier approach of [Kumbhakar, Wang, and Horncastle \(2015\)](#), based on the works of [Kumbhakar, Lien, and Hardaker \(2014\)](#) and [Colombi, Kumbhakar, Martini, and Vittadini \(2014\)](#). They pointed out the importance to distinguish between transient and persistent inefficiency when conducting stochastic frontier analysis. This consideration appears important in our study since the micro-activities — due to their number and the limit tax potential — constitute a structural barrier to resource mobilization in developing countries. As [Brun and Diakité \(2016\)](#), we consider that distinguishing between short-run and persistent efficiencies in the tax collection process could have some political implications.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

The sample of the study is composed of 33 developing countries over the period 1984-2010. As mentioned above, we choose to use macroeconomic³⁵ data since they provide information about the size of the informal economy, global and detailed level of taxation and the relationship between population and tax authorities. Data on the size of the informal economy are provided by [Elgin and Oztunali \(2012\)](#). Illegal (criminal) activities are not included in the sample.

We first analyse the impact of the access to financial institutions of informal operators on the resources mobilization. Secondly, we test the incidence of a more accountable relationship between rulers and informal businesses on the inefficiencies in terms of collection. To test our hypothesis, we add Financial Institution Access³⁶ ([Svirydzenka, 2016](#)) as a determinant of the tax revenue equation. We integrate an interactive “financial development x informal Economy” to measure the access of informal economy to the financial sector. We use the Democratic Accountability index by [the PRS Group \(2015\)](#) and consider it as a factor of countries' technical inefficiency. We also incorporate an interactive “democratic accountability x informal economy” to this equation.

The rest of the paper is structured as follows: Section 3.2 describes the methodology used to identify the effect on tax revenues of the selected policies on the informal economy. Section 3.3 discusses the results and we conclude in Section 3.4.

3.2 Empirical analysis

3.2.1 Variables

We assess the impact of three variables of interest namely Informal Economy (IE), Financial Institution Access (FIA) and Democratic Accountability (DA) on tax revenues and inefficiencies. Here, informal economy is defined as *"a set of economic activities that takes place outside the*

³⁵ In opposite to macroeconomic data, microeconomic surveys provide a better understanding of the characteristics and functioning of informal enterprises. They distinguish micro activities from fraudulent activities but do not give sufficient information on the amount of taxes paid.

³⁶ See Annex 3.5.2 for a complete description of variables.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

framework of bureaucratic public and private sector establishments. It is mainly regarded as a sector, which produces legal goods, but does not comply with government regulations" (Elgin and Schneider, 2013).

As measure of financial institutions access, we use the financial development index coming from [Svirydzenka \(2016\)](#). This index is composed of nine indicators develop to evaluate how financial system are developed across countries ([Svirydzenka, 2016](#)). By this index, the researcher measure the deepening, the accessibility and the efficiency of financial institutions and/or market. For this analysis, we use the indicator “Financial Institution Access (FIA)” which proxy financial access by the number of bank branches and ATMs per 100,000 adults.

Our Democratic Accountability index is from [the PRS Group \(2015\)](#) and describes how public authorities are responsive to their citizens. We introduce two interactive variables (IE x FIA and IE x DA) to understand how the selected policies address to the informal economy may strengthen its contribution to tax mobilization.

We also add a set of control variables widely used in the literature. These variables are retained since they are generally statistically significant to explain the variations in public resources mobilization. These are: the part of import of goods and services in percentage of the GDP; the share of agricultural value added, GDP per capita and, the part of natural resources in the GDP.

Foreign trade — here measured by the part of import of goods and services in percentage of the GDP — is, by nature, easy to tax, compared to domestic transactions. An increase of the trade ratio may induce a raise of Non-resource taxes. Indeed, as explained by [Gnangnon and Brun \(2017\)](#) with the diversification and improvement of export quality, domestic traders are expected to generate higher export revenues and then contribute more to non-resource taxes.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

On the opposite, agriculture, which usually consists of subsistence activities in developing countries, is largely informal and therefore difficult to tax. A high share of the agriculture value added in percentage of GDP generally result in a low level of tax collected (Brun and Diakite, 2016; Morrissey *et al.*, 2016).

We use GDP per capita as a proxy of the countries' level of economic development. When per capita GDP increase, living standards are expected to raise and the demand for public goods such as education, health and public infrastructure is expected to diversify. As AfDB (2010) said, "*demand for diversification of public goods that can reduce citizens' resistance to taxes*". Therefore, we expect Non-resource taxes to increase with the higher level of GDP per capita.

As Martinez-Vazquez (2001) said, countries with high natural resource endowments develop a low capacity to collect tax revenues. This is reinforced by the findings of Ross (2001); Herb (2005), Tsui (2009); Treisman (2007); Baskaran (2013) and McGuirk (2013) where, in countries with high levels of natural resources, governments ask their citizens to pay low taxes so they do not have to be responsive. As a result, we expect our "Natural Resources" variable to have a negative impact on taxes other than resources.

The expected signs of the variables of interest are (i) negative for informal Economy meaning that a huge informal economy reduces taxes; (ii) Better access to financial institution is supposed to boost growth (Patrick, 1966; McKinnon, 1973; Lucas, 1988; Beck *et al.*, 2014; etc.). We then expect a positive influence of our financial indicator (iii) and the interactive on tax mobilization. Democratic accountability is expected to inhibit countries inefficiencies in terms of collection and then increase the tax effort (iv).

However, Ross (2001); Herb (2005); Collier (2006); Treisman (2007), McGuirk (2013); Bermeo (2011); Baskaran (2013); Asongu (2012) revealed that in resources rich or aid dependents countries, a larger part of government resources is financed by rents and aid respectively. Public

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

revenues do not require citizens' participation. In this way, building a close relationship between citizens and authorities is difficult. As a consequence, low degrees of democratic accountability could intensify countries inefficiencies. (v) The interactive informal economy x democratic accountability is expected to display a negative impact on countries inefficiencies.

3.2.2 Data

As mentioned earlier, the analysis is based on a panel of 33 sub-Saharan countries for which data are available for the 1984-2010 period. The analysis is performed distinctly on Non-resources taxes, Direct taxes, Indirect taxes, Individual taxes and Corporate taxes. The purpose of this decomposition is to take into account specificities that may appear during the process of mobilization of each tax. As revealed by [Rakner and Gloppen \(2003\)](#), for example, indirect tax mobilization is not impacted by the lack of government accountability since the mobilization of such resources does not require proximity between the tax administration and the taxpayer.

3.2.2 Methodology

Considering the works of [Kumbhakar et al. \(2014\)](#) and [Colombi et al. \(2014\)](#), we split the error term into four components: a time invariant heterogeneity (α); a short run or residual efficiency (uit), a time invariant efficiency also known as the persistent efficiency (η_i) and the idiosyncratic term (vit). The model is written as follow:

$$y_{it} = \alpha_i + (\gamma * IS + FIA + \theta * IS * FIA + \beta x'_{it}) + \varepsilon_{it} \quad (1)$$

Where y_{it} is estimated for each type of government revenues. x'_{it} is the vector of control variables. ε_{it} is the error component decomposed as follow:

$$\varepsilon_{it} = vit - uit + E(uit) \quad (2)$$

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

$$\alpha_i = \mu_i - \eta_i + E(\eta_i) \quad (3)$$

The model is estimated in 3 steps. First, we estimate a random effect model and predict the error component and the random effect. Step 2 allows the calculation of the time-varying technical efficiency. In step 3, we estimate the time invariant component of the error term (persistent efficiency). The error component and the random effect are considered as dependent variables into the stochastic frontier models. Equations of the Residual Technical Efficiency (RTE) and Persistent Technical Efficiency (PTE) are written as follow:

$$RTE = \exp(-uit|\epsilon_{it}) \quad (4)$$

$$PTE = \exp(-\eta_i) \quad (5)$$

The procedure is ended after computing the overall technical efficiency.

$$OTE = PTE \times RTE \quad (6)$$

As the study explores the factors explaining the inefficiency in terms of collection, we follow the previous steps but predict the technical inefficiency (instead of efficiency). Indeed, the technical efficiency will display the tax effort - the percentage of the country's tax potential than tax administration collect.

However what we study, in this dissertation, is the share of the tax potential which is not collected. Basically, we want to know whether establishing a more accountable relationship between informal operators and the government can reduce the percentage of the non-raising tax

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

potential. In doing so, we allow the variance of residual (uit) and persistent inefficiencies (η_i) to be function of z variables. We allow³⁷ DA and DA x IE as the only parameters of the equations.

3.3 Empirical results

3.3.1 Does the access to financial institution of informal operators affect developing countries tax revenues?

Outcomes of the first Step of [Kumbhakar et al. \(2014\)](#) and [Colombi et al. \(2014\)](#) are enclosed in Table 3.1. Access to financial services seems to significantly affect indirect, corporate, and individual taxes. Positive for indirect³⁸ taxes (15.3%), FIA negatively affects level of corporate taxes. Indeed, a 1% increase of people's access to financial institutions decrease corporates tax revenues for about 13%.

Since our sample is entirely composed of African developing countries (82.5% of them are LIC), an explanation of this findings is provided by the work of [Narayan and Narayan \(2013\)](#). For the latter, the positive sign obtained for the first studies on the finance-growth nexus is mainly due to developed countries.

On taking into account regional disparities, they found that both Central and South America, African and European developing countries are significantly and negatively impacted by financial development (domestic credit) when no significant effect exists for Middle-Eastern developing countries. In addition, [Barajas, Chami, and Yousefi \(2013\)](#) found that private credit in oil dependent countries and LICs have a negative influence on growth.

³⁷ Several papers attempt to explain the link between technical inefficiency measure and some possible determinants. See [Kumbhakar, Wang, and Horncastle \(2015\)](#) for more information.

³⁸ Indirect taxation and especially VAT taxes are collected without taking into account the level of development of the firm.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

The effect of FIA on tax collection is also non-linear. Adding the squared valued of FIA shows that there is a threshold beyond which, financial development increases corporate taxes and decreases indirect taxes. These findings are also in the light of financial development theories since [Cecchetti and Kharroubi \(2012\)](#); [Law and Singh \(2014\)](#); [Arcand et al., \(2012\)](#); [Rioja and Valev \(2004\)](#) or [Mihci \(2006\)](#) etc., revealed the existence of thresholds beyond which financial development effects become non-linear for growth (see Table 3.1).

Following [Mihci \(2006\)](#), we calculated the average liquidity to GDP ratio. Over the period 1990-2001, we found a liquidity ratio to GDP equal on average to 16.2%. This ratio is inferior to the threshold of 43% required to expect better effects of financial development on tax mobilization. Looking at the average value of private credit to GDP ratio in the sample, we noticed that the threshold – at least 88% of GDP ratio³⁹ – is not reached. This mean that, if rulers want financial development to contribute to growth, they should encourage commercial banks to lend money to operators.

However, a negative effect of the square of FIA on indirect taxes is observed (see Table 3.1). Here this negative effect of financial institution access may be due to the nature of the taxation which is levied without citizen's consent or income levels. Current level of financial development are sufficient for this type of collect.

Giving access to financial institutions to informal operators significantly increases taxes (indirect taxes excluded). However, amplitude of the coefficients is low. A 1 % increase of informal operators' access to financial institution improve the level of collected taxes for on average 0.1%. Here again, the low-level of financial access in the sample, explains the findings (see Table 3.1).

³⁹ See ([Law and Singh, 2014](#); [Arcand et al., 2012](#)).

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

The other covariates take the expected signs. Informal economy, agricultural value added and the presence of resource taxes produced a negative incidence on taxes collection. It implies that tax mobilization in countries with large informal economy, large part of agriculture or high level of natural resources will grow at slower rate (see Table 3.1).

For example, an increase of informal economy of 1% decreases taxes for 2% to 6% according to the studied taxes, with the more important effect for individual taxes. According to the type of taxes, a large part of agriculture in the economy reduces the level of taxes from 0.6% to 2.9%. Once again, individual taxes seem to be more impacted than the others with a non-significant effect on corporate taxes (Table 3.1).

The presence of natural resources in the country diminishes tax resources from about 0.8% to 3.3%. Trade and GDP per capita positively impact tax collection. A 1% increase of imported goods and services contributes to at least 0.4% of taxes mobilization for all types of taxes and the effect of per capita GDP seems to be only significant for non-resource taxes (Table 3.1).

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

Table 3.1: Estimation of country tax revenues

	Frontiers				
	(Log) Non Resource taxes (%GDP)	(Log) Direct Taxes (%GDP)	(Log) Indirect Taxes (%GDP)	(Log) Corporate Taxes (%GDP)	(Log) Individual Taxes(%GDP)
Informal Economy	-0.017*** (0.003)	-0.033*** (0.004)	-0.030*** (0.006)	-0.047*** (0.006)	-0.057*** (0.006)
Imports of goods and services (% of GDP)	0.004*** (0.001)	0.005*** (0.001)	-0.003 (0.002)	0.007*** (0.002)	0.001 (0.002)
Agriculture, value added (% of GDP)	-0.006*** (0.001)	-0.013*** (0.002)	-0.028*** (0.003)	-0.002 (0.003)	-0.029*** (0.003)
GDP per capita (Log)	0.087* (0.049)	0.107 (0.071)	-0.058 (0.094)	0.096 (0.100)	0.140 (0.107)
Resource taxes (%GDP)	-0.016*** (0.002)	-0.008** (0.004)	-0.022*** (0.005)	0.001 (0.006)	-0.029*** (0.006)
FIA	-0.013 (0.014)	-0.031 (0.021)	0.153*** (0.030)	-0.132*** (0.037)	-0.040 (0.034)
FIA2	-0.000 (0.000)	-0.000 (0.000)	-0.001** (0.000)	0.001* (0.000)	-0.001** (0.000)
Informal economy x FIA	0.001*** (0.000)	0.002*** (0.001)	-0.003*** (0.001)	0.003*** (0.001)	0.004*** (0.001)
Constant	2.448*** (0.423)	1.747*** (0.619)	3.711*** (0.819)	1.297 (0.849)	1.910** (0.911)
Observations	806	806	805	754	729
Number of group	33	33	33	31	31
R-squared within	0.236	0.272	0.266	0.133	0.423
R-squared overall	0.389	0.350	0.147	0.201	0.331
R-squared between	0.312	0.229	0.074	0.169	0.191
Sigma_u	0.327	0.460	0.479	0.557	0.890
Rho	0.706	0.680	0.526	0.589	0.839
chi2	255.036	282.021	247.712	112.703	492.621
P	0.000	0.000	0.000	0.000	0.000

Dependent variables are Non-resource, Direct, Indirect, Corporate and Individual Taxes.
Standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

Table 3.2 presents technical inefficiencies predicted during the step 2 and 3 above mentioned.

Following the methodology of [Kumbhakar et al. \(2015\)](#), we compute the residual and the persistent inefficiencies. As a reminder, the technical inefficiency is considered as the share of the country tax potential which is not collected by the tax administration.

Table 3.2: Technical inefficiency

Residual Inefficiency	Obs	Mean	Std. Dev.	Min	Max
(Log) Non Resource Taxes (%GDP)	552	0.140	0.093	0.030	0.909
(Log) Indirect Taxes (%GDP)	552	0.331	0.208	0.079	1.513
(Log) Direct Taxes (%GDP)	552	0.154	0.110	0.011	0.734
(Log) Individual Taxes(%GDP)	486	0.070	0.170	5.20e-15	1.605
(Log) Corporate Taxes (%GDP)	511	0.164	0.107	0.023	0.781
Persistent inefficiency	Obs	Mean	Std. Dev.	Min	Max
(Log) Non Resource taxes (%GDP)	552	0.325	0.235	0.050	1.013
(Log) Indirect Taxes (%GDP)	552	0.643	0.494	0.091	1.945
(Log) Direct Taxes (%GDP)	552	0.133	0.088	0.010	0.438
(Log) Individual Taxes(%GDP)	486	0.532	0.291	0.148	2.686

Source: Authors calculation using data from Mansour (2014).

Table 3.2 displays that levels of persistent inefficiency are higher than residual inefficiency. On average, countries do not mobilized a small part of their residual tax effort. 14-16% of non-resource, direct and corporate taxes are not collected by the tax administration. Only 7% of the individual tax potential and around 33% of indirect tax potential are not collected by the tax administration.

As mentioned [Brun and Diakité \(2016\)](#), small levels of residual inefficiency may be explained by the success of recent reforms to improve the performance of tax administrations and fight against tax evasion in developing countries.

Levels of persistent inefficiency are higher than short run inefficiencies. Indirect and individual taxes respectively record 64% and 53% of persistent inefficiency. The part of the non-resource tax uncollected by the tax administration raises 32%. Direct taxes continue to have lowest level of inefficiency, however, the rate is near than 2 times important than priory. These high levels

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

of persistent inefficiencies especially in the case of individual taxes confirm our view that political reforms need to be implemented in order to reduce the loss of tax resources (Table 3.2).

3.3.2 Does building a more accountable relationship with informal operators matter in reducing inefficiency in terms of tax mobilization?

Here we compute the JLMS⁴⁰ technical inefficiency extended by [Kumbhakar \(1987\)](#). It means that a negative sign of our variables of interest may be interpreted as a decrease of countries inefficiency. *P*-values of the determinants of countries' inefficiencies are mostly significant indicating that the inclusion of democratic accountability and the interactive "democratic accountability x Informal economy" is supported by the data⁴¹ (See Table 3.4).

However, the relationships between $E(u_{it})$ - expected residual inefficiency- or $E(\eta_i)$ - expected persistent inefficiency - and their determinants are non-linear meaning that, coefficients of the estimations are not very instructive. As recommended by [Kumbhakar et al.\(2015\)](#) and also [Lai and Kumbhakar \(2018\)](#), we report marginal effects of variable "Democratic accountability" and the interactive term "Democratic accountability x Informal economy" to account for the magnitude of those variables of interest.

We also provide the marginal effect of the squared of democratic accountability to check the existence of a non-linear relationship of democratic accountability.

⁴⁰ [Jondrow, Lovell, Materov and Schmidt \(1982\)](#).

⁴¹ Annex 3.5.1 also reports the result of the likelihood test, performed to ensure that stochastic frontier is preferred to OLS.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

The findings of this analysis are enclosed in Table 3.4. This table is divided into two parts. The first part display the results of the analysis of residual inefficiency. The second part present the result for the persistent inefficiency.

The study of the residual inefficiency reveals that current levels of democratic accountability in the sample significantly improve short term efficiencies in terms of indirect taxes collection. A one point variation of the degree of democratic accountability favors a decrease of 11% of short terms inefficiencies for indirect taxes. This finding seems to be contrary to the work of [Rakner and Gloppen \(2003\)](#). Indeed, for the latters, levying indirect taxes do not facilitate the establishment of a close link between government and citizens.

However, as expected, low levels of democratic accountability in the sample increases short-term inefficiencies in the mobilization of direct taxes by 10.2%. Relationships between democratic accountability (current level) with other taxes are not significant. By improving its levels, we notice that democratic accountability help reducing significantly inefficiencies for Non-resources (1.2%), direct (2.6%) and individual taxes (16.8%).

Combined with the informal economy, democratic accountability significantly decrease corporate tax inefficiencies (0.2%) but worsen individual tax inefficiencies (0.6%). Considering [Bird et al. \(2008\)](#) and [Torgler \(2005\)](#), we assume that low levels of democratic accountability in our sample (see Table 3.3) do not favor resource mobilization.

The estimation of persistent inefficiencies (Table 3.4) also reveals a mitigated impact of democratic accountability on countries' tax inefficiencies. Here, indirect and individual taxes mobilization are worsen by the lack of democratic accountability. On average, current level of Democratic accountability increase indirect and individual inefficiencies by more than 80%. Democratic accountability seems to reduce uncollected non-resource tax potential (2.8%).

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

When looking at the squared value of democratic accountability, some reverse effects of democratic accountability appear. The uncollected individual tax potential is reduced by 8.4%. The impact of democratic accountability on the non-resource tax inefficiency is still negative. Furthermore, minor marginal effects (2.8% for accountability and only 0.2% for the squared value) are associated with this relationship. These results denote that more must be done in terms of democratic accountability to improve the level of taxes.

Applying democratic accountability to the informal economy which represents a high percentage of the active population contributes this time to decrease the country's inefficiencies for at least⁴² four type of taxes. On average, being accountable with informal operators, decrease countries inefficiencies in terms of collection by 0.1% for direct taxes; 1.6% for indirect taxes; 0.8% for individual taxes (Also see Table 3.4).

In summary, high levels of democratic accountability are profitable if governments want to reduce technical inefficiencies and then improve tax mobilization. In the short term, there is no need to concentrate on indirect taxes since democratic accountability already positively impact the tax mobilization.

However, a closest link between the authorities and population should reduce the uncollected tax potential especially for direct and corporate taxes. The analysis also reveals that long-term (persistent) inefficiencies may be significantly reduced if a particular emphasis is put on building a more accountable relationship with informal operators. Here, both direct and indirect taxes seem to be impacted.

⁴² We cannot conclude for corporate taxes since the model does not converge.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

N.B: Levels of democratic accountability in the sample

Table 3.3 presents the descriptive statistics for the variable "Democratic Accountability". This makes it possible to compare the degree of democratic accountability in the countries selected for analysis with that of others. As ICRG (2015) mentioned, the higher the degree of democratic accountability in the country, the higher its score. Table 3.3 displays that the level of democratic accountability in the sample is lower than that of the entire database and of countries outside the study sample.

Table 3.3: Levels of democratic accountability

Levels of Democratic accountability	Observations	Mean	Std. Dev.	Min	Max
Full database	3727	3.739	1.674	0	6
Out of the sample	3151	3.874	1.714	0	6
In the sample	576	3.000	1.192	0	5.5

Source: Authors calculation using data from ICRG (2015)

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

Table 3.4: Estimation of residual and persistent inefficiencies

	Estimation of residual efficiencies					Estimation of persistent efficiencies				
	(Log) Non Resource taxes (%GDP)	(Log) Direct Taxes (%GDP)	(Log) Indirect Taxes (%GDP)	(Log) Corporate Taxes (%GDP)	(Log) Individual Taxes(% GDP)	(Log) Non Resource taxes (%GDP)	(Log) Direct Taxes (%GDP)	(Log) Indirect Taxes (%GDP)	(Log) Corporate Taxes (%GDP)	(Log) Individual Taxes(% GDP)
Frontier Constant	0.134*** (0.018)	0.148*** (0.029)	0.361*** (0.036)	0.148*** (0.049)	0.071*** (0.019)	0.350*** (0.016)	0.185*** (0.046)	0.691*** (0.039)	.	0.703*** (0.113)
Usigmas										
Democratic Accountability	0.624 (0.520)	1.797** (0.850)	-0.746* (0.406)	0.975 (0.961)	5.503 (5.154)	-0.627** (0.286)	1.509 (1.160)	1.262*** (0.306)	.	1.876*** (0.699)
DA x DA	-0.203** (0.092)	-0.456*** (0.175)	0.046 (0.061)	-0.152 (0.149)	-3.963** (1.597)	0.096** (0.040)	-0.310 (0.220)	-0.000 (0.046)	.	-0.170* (0.098)
IE x DA	-0.002 (0.005)	-0.007 (0.007)	0.002 (0.004)	-0.025* (0.013)	0.138*** (0.041)	-0.002 (0.003)	-0.023* (0.012)	-0.030*** (0.003)	.	-0.025*** (0.006)
Constant	-3.115*** (0.569)	-3.500*** (0.861)	-0.316 (0.441)	-1.760** (0.788)	-10.091*** (3.452)	-0.696** (0.329)	-2.551** (1.055)	-0.813** (0.367)	.	-1.757* (0.928)
Vsigmas										
Constant	-3.728*** (0.109)	-2.717*** (0.090)	-2.496*** (0.138)	-1.984*** (0.087)	-2.211*** (0.070)	-4.721*** (0.290)	-1.684*** (0.071)	-2.615*** (0.207)	.	-1.126*** (0.188)
Marginal effect on e(u)										
DA	0.038	0.102	-0.110	0.085	0.195	-0.028	0.098	0.886	.	0.800
IE x DA	0.000	-0.000	0.000	-0.002	0.006	0.000	-0.001	-0.016	.	-0.008
DA x DA	-0.012	-0.026	0.006	-0.013	-0.168	-0.002	-0.020	-0.039	.	-0.084
Observations	552	552	552	511	486	552	552	552	.	486
Log-Likelihood	132.722	-94.232	-248.788	-251.114	-178.174	-4.172	-336.444	-401.047	.	-505.076
chi2	54.273	26.069	100.352	8.958	14.184	452.094	16.444	316.565	.	38.417
P	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	.	0.000
Converged	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.	1.000

Dependent variables are residual efficiencies and persistent efficiencies.

They are calculated for each types of resources (Non-resource, Direct, Indirect, Corporate and Individual Taxes)..

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

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

According to the recent literature, the negative incidence of democratic accountability on revenue collection is observed in countries with a high level of natural resources⁴³ and aid⁴⁴. Indeed countries with important natural resource rents obtain an important part of their public resources without the participation of citizens (Baskaran, 2013). They ask for lower taxes in order to avoid being accountable (McGuirk, 2013).

However, the high-level of received ODA may favor external accountability (accountability to the donors) at the expense of internal accountability. *Theoretical basis is that foreign aid could disrupt the growth of representative institutions due to low revenue bargaining: taxation in exchange for better political governance* (Asongu, 2014) and extend external accountability. Bräutigam (2000) explained that the existence of external accountability tends to reduce relations between citizens and the government. A government that finances itself with loans or donations does not see the need to be accountable to its citizens. This can reduce the state's incentive to implement effective public spending. The result is the weakening of the tax compliance based on the responsibility of the state in terms of citizen satisfaction (Moss, Pettersson Gelande, and van de Walle, 2006).

Considering the structure of our database, we attempt to determine which of natural resources or aid explain lower levels of democratic accountability in the sample. Descriptive statistics display by figures (1-3) propose a comparison of indicators of natural resources rents, aid flows per capita and democratic accountability in the sample.

We notice that compared to the others, countries in the sample have higher levels of Resource to GDP ratio; higher level of ODA received per capita to GDP ratio and lower level of democratic accountability (See figures 1-3). In this way, low level of democratic accountability

⁴³ Ross (2001); Herb (2005), Tsui (2009); Treisman (2007); McGuirk (2013)

⁴⁴ Collier (2006); Bermeo (2011)

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

may be explained by both natural resources and aid abundance in our sample. High levels of natural resource rents do not favor accountability. In addition, with high rates of ODA per capita to GDP, one may think that accountability if it exists is turned outward.

Figure 3: Comparison of Resources taxes to GDP ratio

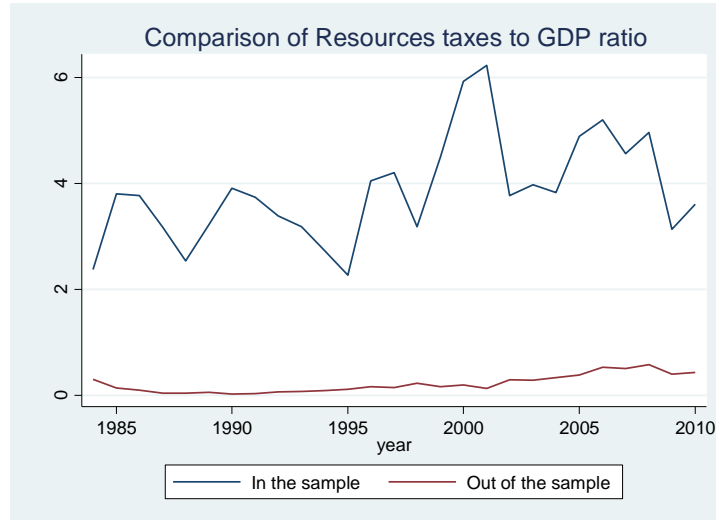
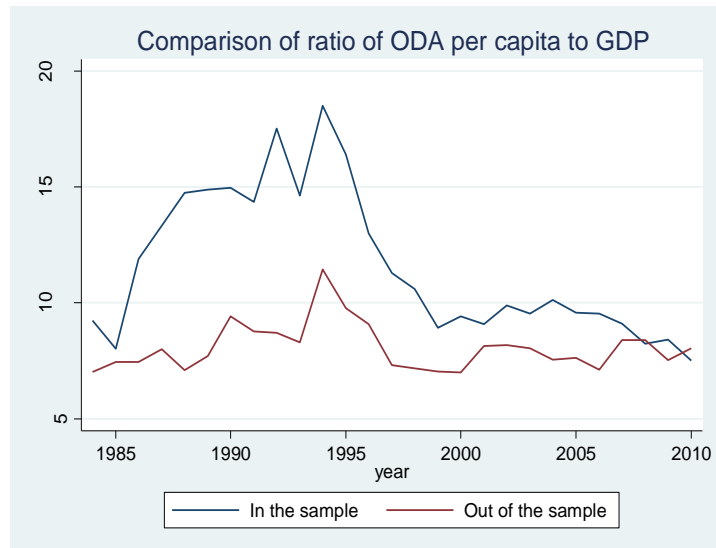
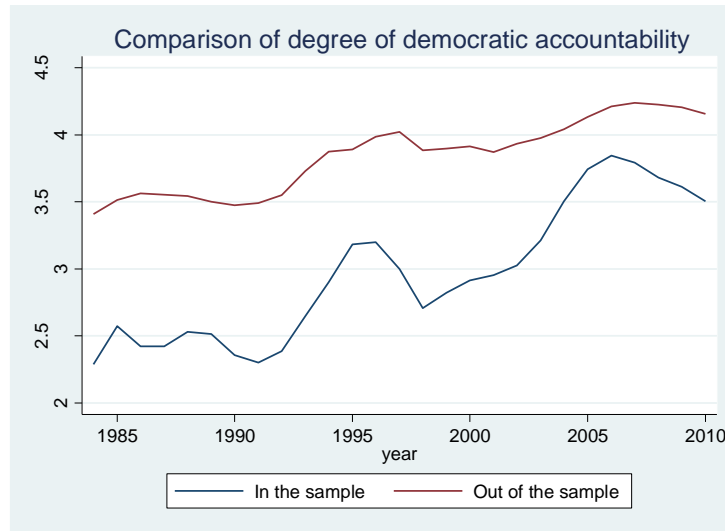


Figure 4: Comparison of ration of ODA per capita to GDP



3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

Figure 5: Comparison of degree of democratic accountability



To investigate if a distinction needs to be done in the implementation or reinforcement of democratic accountability in developing countries according to their nature and then propose more precise policies, we perform the previous analysis on subsamples. The initial sample is divided into rich versus resource-poor countries; aid dependent versus non-aid dependent countries and also low-income versus low-middle income countries. Findings⁴⁵ are summarize in next tables.

Resource-rich versus resource-poor countries

In general, all the covariates of the tax revenue equation have the expected signs (See Table 3.5). Only the measure of international trade and GDP per capita, in the indirect tax equation, have the opposite signs. The measure of the import of goods and services in percentage of GDP and the GDP per capita diminish indirect taxes. Considering the estimation of technical inefficiencies, p-value confirms that democratic accountability and its squared value are good predictors of the error component (residual tax inefficiency).

As noticed above, the effect is not the same for all taxes. Democratic accountability is only significant in the case of resource-poor countries. It significantly cut indirect tax inefficiency.

⁴⁵ Some models do not converge.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

Table 3.5: Estimation of tax equations (Comparison resource rich versus poor resource countries)

	Resource rich countries					Poor resource countries				
	(Log) Non Resource taxes (%GDP), Mansour (2014)	(Log) Direct Taxes (%GDP), Mansour (2014)	(Log) Indirect Taxes (%GDP), Mansour (2014)	(Log) Corporate Taxes (%GDP), Mansour (2014)	(Log) Individual Taxes(%GDP), Mansour (2014)	(Log) Non Resource taxes (%GDP), Mansour (2014)	(Log) Direct Taxes (%GDP), Mansour (2014)	(Log) Indirect Taxes (%GDP), Mansour (2014)	(Log) Corporate Taxes (%GDP), Mansour (2014)	(Log) Individual Taxes(%GDP), Mansour (2014)
Informal Economy	-0.020*** (0.004)	-0.041*** (0.005)	-0.034*** (0.007)	-0.048*** (0.007)	-0.070*** (0.007)	-0.011 (0.007)	-0.029** (0.012)	-0.003 (0.013)	-0.037** (0.019)	-0.023* (0.012)
Imports of goods and services (% of GDP)	0.003*** (0.001)	0.004*** (0.001)	-0.004** (0.002)	0.005*** (0.002)	0.000 (0.002)	0.023*** (0.003)	0.027*** (0.004)	0.013** (0.005)	0.043*** (0.007)	0.008* (0.004)
Agriculture, value added (% of GDP)	-0.006*** (0.002)	-0.016*** (0.002)	-0.025*** (0.004)	-0.002 (0.003)	-0.033*** (0.003)	-0.011*** (0.004)	0.001 (0.006)	-0.037*** (0.007)	0.009 (0.010)	-0.003 (0.006)
(Log) GDP per capita	0.044 (0.053)	0.031 (0.075)	-0.021 (0.104)	0.065 (0.111)	0.194 (0.123)	-0.024 (0.100)	0.339* (0.193)	-0.624*** (0.190)	0.537** (0.242)	-0.129 (0.191)
Resource taxes (% of GDP)	-0.019*** (0.003)	-0.015*** (0.004)	-0.023*** (0.006)	-0.002 (0.006)	-0.033*** (0.007)	-0.032*** (0.011)	0.000 (0.018)	-0.039* (0.021)	0.030 (0.031)	-0.068*** (0.018)
FIA	-0.015 (0.023)	-0.095*** (0.033)	0.182*** (0.048)	-0.162*** (0.049)	-0.180*** (0.047)	0.067* (0.036)	0.064 (0.066)	0.250*** (0.069)	0.006 (0.092)	0.265*** (0.066)
FIA2	-0.000 (0.000)	0.000 (0.000)	-0.001** (0.000)	0.000 (0.000)	0.000 (0.000)	-0.001** (0.000)	-0.001 (0.001)	-0.002*** (0.001)	0.000 (0.001)	-0.004*** (0.001)
Informal economy x FIA	0.001*** (0.000)	0.003*** (0.001)	-0.004*** (0.001)	0.004*** (0.001)	0.006*** (0.001)	-0.002* (0.001)	-0.002 (0.002)	-0.007*** (0.002)	-0.001 (0.002)	-0.002 (0.002)
Constant	2.892*** (0.452)	2.771*** (0.640)	3.592*** (0.897)	1.502 (0.930)	2.425** (1.030)	2.573*** (0.838)	-1.018 (1.597)	6.256*** (1.595)	-3.631* (2.056)	1.534 (1.583)
Observations	650	650	649	598	574	156	156	156	156	155
Number of group	31	31	31	28	28	12	12	12	12	11
R-squared within	0.228	0.273	0.281	0.121	0.428	0.416	0.331	0.260	0.285	0.539
R-squared overall	0.378	0.300	0.110	0.170	0.195	0.624	0.536	0.230	0.465	0.677
R-squared between	0.393	0.287	0.047	0.182	0.118	0.593	0.520	0.514	0.423	0.605
sigma_u	0.291	0.406	0.477	0.642	0.957	0.273	0.640	0.498	0.603	0.634
Rho	0.642	0.621	0.523	0.674	0.850	0.753	0.863	0.763	0.653	0.869
chi2	210.584	235.359	212.126	83.321	391.705	112.367	76.513	64.483	61.754	169.232
P	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Dependent variables are Non-resource, Direct, Indirect, Corporate and Individual Taxes.
Standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

However, the quadratic term of democratic accountability reveals that amplifying levels of democratic accountability may decrease tax inefficiency on both resource-rich and resource-poor countries. The interactive term “democratic accountability x informal economy” seems not to impact, at least significantly, resource-poor countries. In resource-rich countries, targeting democratic accountability to informal operators, decreases corporate tax inefficiency in the short-term but increases inefficiencies in terms of individual tax collection.

Considering the persistent inefficiency, democratic accountability appears significant only for resource-rich countries. It decreases non-resource and corporate tax inefficiencies but increases those of indirect taxes. For those countries, combining democratic accountability with informal economy significantly reduces persistent inefficiencies (non-resource taxes excluded). Resource-poor countries are only affected by a high level of democratic accountability. The quadratic term appears negative and significant for non-resource taxes, meaning that at high level, democratic accountability should decrease tax inefficiency. Individual taxes' inefficiencies are also negatively impacted by democratic accountability in poor countries. All these results are enclosed in Table 3.6.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

Table 3.6: Estimation of the error components (Comparison resource rich versus poor resource countries)

	resource- rich countries					resource-poor countries				
	(Log) Non Resource taxes (%GDP), Mansour (2014)	(Log) Direct Taxes (%GDP), Mansour (2014)	(Log) Indirect Taxes (%GDP), Mansour (2014)	(Log) Corporate Taxes (%GDP), Mansour (2014)	(Log) Individual Taxes(%GDP), Mansour (2014)	(Log) Non Resource taxes (%GDP), Mansour (2014)	(Log) Direct Taxes (%GDP), Mansour (2014)	(Log) Indirect Taxes (%GDP), Mansour (2014)	(Log) Corporate Taxes (%GDP), Mansour (2014)	(Log) Individual Taxes(%GDP) , Mansour (2014)
	Error component					Error component				
Frontier Constant	0.138*** (0.022)	0.179*** (0.033)	0.392*** (0.039)	0.135** (0.053)	0.085*** (0.026)	0.125*** (0.029)	0.244*** (0.030)	0.273*** (0.025)	0.222** (0.109)	0.243*** (0.032)
Usigmas DA	0.629 (0.655)	1.176 (0.828)	-0.386 (0.436)	1.410 (1.055)	8.382 (5.982)	0.430 (0.836)	1.051 (0.760)	-1.432* (0.744)	-0.777 (1.280)	-0.578 (0.735)
DA x DA	-0.247** (0.126)	-0.365** (0.158)	-0.033 (0.068)	-0.082 (0.141)	-4.052** (1.920)	-0.096 (0.125)	-0.159 (0.108)	0.159 (0.109)	0.047 (0.188)	0.061 (0.106)
IE x DA	0.001 (0.007)	-0.004 (0.009)	0.005 (0.005)	-0.042* (0.022)	0.099*** (0.033)	-0.001 (0.006)	-0.005 (0.005)	0.007 (0.005)	0.006 (0.010)	0.001 (0.005)
Constant	-3.090*** (0.681)	-2.652*** (0.746)	-0.722 (0.492)	-1.861** (0.780)	-11.614** (4.585)	-3.836*** (1.119)	-3.349*** (1.023)	-0.365 (0.913)	-1.135 (1.406)	-1.372 (0.944)
Vsigmas Constant	-3.642*** (0.124)	-2.786*** (0.112)	-2.641*** (0.176)	-2.238*** (0.107)	-1.979*** (0.083)	-4.664*** (0.357)	-4.386*** (0.405)	-4.381*** (0.321)	-2.028*** (0.232)	-4.385*** (0.429)
Observations	412	412	412	371	347	140	140	140	140	139
Log-Likelihood	81.992	-72.056	-186.743	-133.355	-167.285	82.867	20.683	19.295	-72.373	23.493
chi2	39.422	30.155	100.650	6.510	10.487	18.829	64.520	115.723	4.131	57.831
P	0.000	0.000	0.000	0.011	0.001	0.000	0.000	0.000	0.042	0.000
Converged	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	Random effect					Random effect				
Frontier Constant	0.302*** (0.017)	.	0.731*** (0.037)	0.530*** (0.029)	1.090*** (0.075)	0.168*** (0.019)	0.258*** (0.046)	.	.	0.140* (0.076)
Usigmas DA	-0.947*** (0.367)	.	1.118*** (0.364)	-1.316*** (0.413)	1.108*** (0.416)	3.162 (2.252)	18.510 (12.289)	.	.	4.006 (2.650)
DA x DA	0.181*** (0.049)	.	0.065 (0.056)	0.409*** (0.058)	0.028 (0.053)	-1.910*** (0.558)	-4.031 (2.583)	.	.	-0.300 (0.321)
IE x DA	-0.005 (0.004)	.	-0.033*** (0.005)	-0.033*** (0.006)	-0.031*** (0.006)	0.072* (0.040)	0.023 (0.032)	.	.	-0.067*** (0.025)
Constant	-0.367 (0.374)	.	-0.612 (0.397)	2.716*** (0.447)	0.383 (0.437)	-6.974*** (2.102)	-24.189 (15.980)	.	.	-5.448 (3.994)
Vsigmas Constant	-4.550*** (0.253)	.	-2.485*** (0.163)	-3.308*** (0.192)	-2.025*** (0.309)	-3.530*** (0.126)	-1.648*** (0.123)	.	.	-1.358*** (0.124)
Observations	412	.	412	371	347	140	140	.	.	139
Log-Likelihood	12.472	.	-298.438	-159.357	-366.750	44.447	-85.160	.	.	-104.492
chi2	309.646	.	398.095	345.029	209.215	81.468	30.841	.	.	3.393
P	0.000	.	0.000	0.000	0.000	0.000	0.000	.	.	0.065
Converged	1.000	.	1.000	1.000	1.000	1.000	1.000	.	.	1.000

Dependent variables are residual efficiencies and persistent efficiencies.

They are calculated for each types of resources (Non-resource, Direct, Indirect, Corporate and Individual Taxes).

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

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

Aid dependent versus non-aid dependent countries

Results for Aid dependent and non-aid dependent countries are enclosed in tables 3.7 and 3.8.

In Table 3.7, we noticed that the covariates of the tax equation get similar signs and interpretation than previously. Concerning residual inefficiency, only indirect taxes, in the case of non-aid dependent countries are significantly impacted by democratic accountability. Improving the levels of democratic accountability does not provide a significant impact on tax inefficiency.

Once again, more accountable relationship with the informal economy decreases corporate tax inefficiencies and increases indirect tax inefficiency. The analysis reveals that current levels of democratic accountability in non-aid dependent countries significantly reinforce persistent inefficiencies (See Table 3.8).

Increasing their level of democratic accountability will significantly decrease the share of the uncollected tax potential, at least for direct, indirect, corporate taxes. Apart from the case of direct taxes case, the combination of informal economy and democratic accountability also diminish inefficiencies.

In aid-dependent countries, only the model of non-resource taxes converges. Current levels of democratic accountability do not significantly impact tax mobilization. But, growing those levels increase persistent tax inefficiencies. Nevertheless being accountable to the informal economy will decrease the share of the uncollected potential (Also see Table 3.8).

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

Table 3.7: Estimation of countries' tax equations (Comparison aid dependent versus non-aid dependent countries)

	non aid dependent countries					Aid dependent countries
	(Log) Non Resource taxes (%GDP), Mansour (2014)	(Log) Direct Taxes (%GDP), Mansour (2014)	(Log) Indirect Taxes (%GDP), Mansour (2014)	(Log) Corporate Taxes (%GDP), Mansour (2014)	(Log) Individual Taxes(%GDP), Mansour (2014)	(Log) Non Resource taxes (%GDP), Mansour (2014)
Informal Economy	-0.020*** (0.005)	-0.040*** (0.007)	-0.023** (0.011)	-0.070*** (0.010)	-0.057*** (0.010)	-0.017*** (0.004)
Imports of goods and services (% of GDP)	0.005*** (0.001)	0.006*** (0.002)	-0.005* (0.003)	0.010*** (0.002)	0.001 (0.002)	0.004*** (0.001)
Agriculture, value added (% of GDP)	-0.011*** (0.003)	-0.010*** (0.004)	-0.040*** (0.006)	-0.005 (0.005)	-0.014*** (0.005)	-0.004** (0.002)
(Log) GDP per capita	0.064 (0.064)	0.174** (0.087)	-0.258** (0.118)	0.094 (0.118)	0.349** (0.139)	-0.034 (0.069)
Resource taxes (% of GDP)	-0.018*** (0.003)	-0.010** (0.004)	-0.023*** (0.006)	-0.000 (0.006)	-0.024*** (0.006)	-0.007 (0.008)
FIA	-0.037* (0.021)	-0.082*** (0.028)	0.151*** (0.045)	-0.253*** (0.054)	-0.002 (0.047)	0.014 (0.040)
FIA2	0.000 (0.000)	0.000 (0.000)	-0.001** (0.001)	0.002*** (0.001)	-0.002*** (0.001)	-0.001** (0.000)
Informal Economy x FIA	0.002*** (0.001)	0.003*** (0.001)	-0.003*** (0.001)	0.006*** (0.001)	0.004*** (0.001)	0.001 (0.001)
Constant	2.870*** (0.592)	1.471* (0.808)	5.213*** (1.120)	2.334** (1.073)	-0.179 (1.244)	3.227*** (0.558)
Observations	387	387	387	351	326	419
Number of group	30	30	30	28	28	27
R-squared within	0.275	0.313	0.265	0.253	0.488	0.160
R-squared overall	0.514	0.423	0.319	0.206	0.345	0.322
R-squared between	0.368	0.254	0.291	0.155	0.146	0.506
sigma_u	0.293	0.445	0.415	0.485	0.991	0.302
Rho	0.672	0.720	0.471	0.578	0.904	0.710
chi2	155.975	154.213	132.483	92.738	252.665	96.520
P	0.000	0.000	0.000	0.000	0.000	0.000

Dependent variables are Non-resource, Direct, Indirect, Corporate and Individual Taxes.

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

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

Table 3.8: Estimation of the error components (Comparison aid dependent versus non-aid dependent countries)

	Non aid dependent countries					Aid dependent countries
	(Log) Non Resource taxes (%GDP), Mansour (2014)	(Log) Direct Taxes (%GDP), Mansour (2014)	(Log) Indirect Taxes (%GDP), Mansour (2014)	(Log) Corporate Taxes (%GDP), Mansour (2014)	(Log) Individual Taxes(%GDP), Mansour (2014)	(Log) Non Resource taxes (%GDP), Mansour (2014)
Error component						
Frontier Constant	0.070** (0.033)	0.058* (0.031)	0.347*** (0.041)	0.214*** (0.051)	0.001 (0.021)	0.141*** (0.021)
Usigmas DA	-0.280 (1.161)	6.155 (4.664)	-1.288** (0.611)	0.437 (0.774)	-3.666 (57.392)	0.643 (0.733)
Dem2	-0.109 (0.206)	-1.341 (1.048)	0.111 (0.087)	-0.044 (0.122)	-4.184 (17.970)	-0.245* (0.136)
IE x DA	0.005 (0.010)	-0.025 (0.015)	0.010** (0.005)	-0.024*** (0.008)	0.305 (0.237)	-0.002 (0.008)
Constant	-3.019** (1.390)	-7.759 (4.831)	-0.144 (0.738)	-0.405 (0.886)	-9.790 (36.536)	-2.900*** (0.667)
Vsigmas Constant	-3.616*** (0.142)	-3.032*** (0.107)	-2.652*** (0.176)	-2.842*** (0.203)	-2.509*** (0.099)	-3.958*** (0.140)
Observations	261	261	261	234	209	291
Log-Likelihood	78.159	9.587	-108.530	-58.922	-35.476	90.000
chi2	4.439	3.548	72.725	17.789	0.002	46.702
P	0.035	0.060	0.000	0.000	0.966	0.000
Converged	1.000	1.000	1.000	1.000	1.000	1.000
Random effect						
Frontier Constant	0.060 (0.050)	0.176* (0.094)	0.425*** (0.070)	0.170*** (0.037)	0.596*** (0.098)	0.234*** (0.021)
Usigmas DA	0.952 (1.249)	2.013 (1.286)	2.910*** (0.954)	10.713*** (2.965)	3.080*** (0.919)	-0.764 (0.524)
DA x DA	-0.300 (0.212)	-0.467** (0.212)	-0.312** (0.128)	-1.999*** (0.562)	-0.461*** (0.135)	0.319*** (0.067)
IE x DA	0.015* (0.008)	0.014** (0.006)	-0.018*** (0.004)	-0.064*** (0.015)	-0.001 (0.005)	-0.031*** (0.007)
Constant	-5.228** (2.126)	-5.006** (2.097)	-4.522*** (1.626)	-9.239*** (3.255)	-4.571*** (1.473)	0.415 (0.471)
Vsigmas Constant	-3.461*** (0.230)	-2.280*** (0.272)	-2.992*** (0.473)	-1.946*** (0.112)	-1.397*** (0.247)	-3.770*** (0.157)
Observations	261	261	261	234	209	291
Log-Likelihood	46.621	-119.477	-151.068	-128.414	-244.917	0.793
chi2	1.432	3.485	36.816	20.653	37.130	124.005
P	0.231	0.062	0.000	0.000	0.000	0.000
Converged	1.000	1.000	1.000	1.000	1.000	1.000

Dependent variables are residual efficiencies and persistent efficiencies.

They are calculated for each types of resources (Non-resource, Direct, Indirect, Corporate and Individual Taxes)..

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

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

Low income versus Low middle-income countries

Table 3.10 displays that current levels of democratic accountability significantly raise short-term and persistent inefficiencies. Only persistent corporate tax inefficiency are reduced by democratic accountability. However, increasing the current levels worsen those taxes inefficiencies.

Democratic accountability interacted with informal economy generally decrease levels of inefficiency for both LICs and LMICs. However, especially in LICs and for all models which converge, being more accountable to informal operators diminishes persistent inefficiencies. The effect is only significant for direct and indirect taxes.

Once again, the covariates of the tax equation (results enclosed in Table 3.9) get similar signs and interpretation than previously.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

Table 3.9: Estimation of countries' tax potentials (Comparison LICs versus LMICs)

	LICs					LMIC			
	(Log) Non Resource taxes (%GDP), Mansour (2014)	(Log) Direct Taxes (%GDP), Mansour (2014)	(Log) Indirect Taxes (%GDP), Mansour (2014)	(Log) Corporate Taxes (%GDP), Mansour (2014)	(Log) Individual Taxes(%GDP), Mansour (2014)	(Log) Non Resource taxes (%GDP), Mansour (2014)	(Log) Indirect Taxes (%GDP), Mansour (2014)	(Log) Direct Taxes (%GDP), Mansour (2014)	(Log) Corporate Taxes (%GDP), Mansour (2014)
Informal Economy	-0.059*** (0.008)	-0.034*** (0.006)	-0.032*** (0.007)	-0.019*** (0.004)	-0.051*** (0.009)	-0.001 (0.020)	-0.086** (0.043)	0.026 (0.020)	-0.003 (0.028)
Imports of goods and services (% of GDP)	0.002 (0.002)	0.007*** (0.001)	0.002 (0.002)	0.006*** (0.001)	0.008*** (0.002)	0.002 (0.003)	-0.002 (0.006)	-0.008*** (0.003)	-0.001 (0.004)
Agriculture, value added (% of GDP)	-0.029*** (0.003)	-0.013*** (0.002)	-0.023*** (0.003)	-0.006*** (0.002)	-0.001 (0.004)	-0.021 (0.017)	-0.153*** (0.038)	-0.043** (0.017)	-0.073*** (0.024)
(Log) GDP per capita	0.311** (0.134)	0.333*** (0.095)	-0.131 (0.107)	0.080 (0.059)	0.194 (0.135)	0.118 (0.247)	-0.795 (0.535)	-0.422* (0.246)	-0.983*** (0.354)
Resource taxes (% of GDP)	-0.027*** (0.006)	-0.007* (0.004)	-0.020*** (0.005)	-0.015*** (0.003)	0.004 (0.006)	-0.080*** (0.009)	-0.057*** (0.020)	-0.059*** (0.009)	-0.027* (0.014)
FIA	-0.006 (0.127)	-0.071 (0.056)	0.103 (0.074)	-0.021 (0.037)	-0.157* (0.092)	-0.025 (0.025)	-0.110** (0.055)	0.083*** (0.025)	0.074* (0.043)
FIA2	-0.012** (0.005)	0.001 (0.002)	-0.017*** (0.003)	-0.004** (0.002)	-0.001 (0.004)	-0.000 (0.000)	-0.000 (0.000)	-0.001*** (0.000)	-0.000 (0.000)
Informal Economy x FIA	0.004 (0.003)	0.002 (0.001)	0.003 (0.002)	0.002** (0.001)	0.004* (0.002)	0.001 (0.001)	0.005** (0.002)	-0.002* (0.001)	-0.002 (0.001)
Constant	1.166 (1.098)	0.464 (0.778)	3.844*** (0.879)	2.555*** (0.486)	0.749 (1.114)	2.106 (2.272)	11.895** (4.931)	5.244** (2.264)	10.004*** (3.131)
Observations	595	665	664	665	620	100	100	100	93
Number of group	24	26	26	26	24	5	5	5	5
R-squared within	0.441	0.307	0.225	0.244	0.157	0.283	0.488	0.383	0.112
R-squared overall	0.169	0.170	0.322	0.361	0.131	0.852	0.702	0.875	0.693
R-squared between	0.085	0.159	0.304	0.559	0.160	0.985	0.969	0.995	0.997
sigma_u	0.888	0.438	0.325	0.236	0.551	0.000	0.000	0.000	0.000
Rho	0.830	0.643	0.351	0.546	0.562	0.000	0.000	0.000	0.000
chi2	434.457	271.453	196.297	239.793	111.409	525.253	214.723	637.938	189.431
P	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Dependent variables are Non-resource, Direct, Indirect, Corporate and Individual Taxes.
Standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

Table 3.10: Estimation of the error components (Comparison LICs versus LMICs)

	LICs					LMICs			
	(Log) Non Resource taxes (%GDP), Mansour (2014)	(Log) Direct Taxes (%GDP), Mansour (2014)	(Log) Indirect Taxes (%GDP), Mansour (2014)	(Log) Corporate Taxes (%GDP), Mansour (2014)	(Log) Individual Taxes(%GDP), Mansour (2014)	(Log) Non Resource taxes (%GDP), Mansour (2014)	(Log) Indirect Taxes (%GDP), Mansour (2014)	(Log) Direct Taxes (%GDP), Mansour (2014)	(Log) Corporate Taxes (%GDP), Mansour (2014)
	Error component					Error component			
Frontier									
Constant	0.072*** (0.023)	0.154*** (0.032)	0.345*** (0.039)	0.136*** (0.019)	0.162*** (0.056)	0.215*** (0.058)	0.409*** (0.096)	0.078* (0.040)	0.100 (0.139)
Usigmas									
DA	6.427 (6.267)	1.871** (0.825)	-0.462 (0.431)	0.977* (0.557)	0.904 (0.896)	14.994 (13.304)	19.591 (13.015)	113.399 (198.101)	123.350 (197.099)
DA x DA	-4.266** (1.972)	-0.453*** (0.161)	-0.017 (0.068)	-0.259** (0.103)	-0.062 (0.132)	-1.050 (1.446)	-1.492 (1.409)	-11.964 (20.838)	-13.896 (22.135)
IsceyDem	0.137*** (0.042)	-0.008 (0.009)	0.002 (0.005)	-0.004 (0.006)	-0.030* (0.016)	-0.241*** (0.091)	-0.283*** (0.088)	-0.016 (0.149)	-0.097 (0.274)
Constant	-10.760** (4.197)	-3.596*** (0.839)	-0.591 (0.454)	-3.319*** (0.592)	-1.569** (0.780)	-20.427 (26.734)	-25.840 (25.981)	-270.547 (477.733)	-263.365 (409.640)
Vsigmas									
Constant	-2.091*** (0.077)	-2.615*** (0.097)	-2.625*** (0.161)	-3.687*** (0.118)	-1.940*** (0.101)	-3.798*** (0.378)	-2.879*** (0.393)	-3.465*** (0.208)	-2.423*** (0.274)
Observations	402	468	468	468	427	48	48	48	48
Log-Likelihood	-171.847	-102.961	-191.090	97.418	-223.163	13.174	-10.631	14.680	-11.922
chi2	10.129	23.678	80.015	50.232	8.381	13.951	18.088	3.720	0.520
P	0.001	0.000	0.000	0.000	0.004	0.000	0.000	0.054	0.471
Converged	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	Random effect					Random effect			
Frontier									
Constant	.	0.156** (0.068)	0.095*** (0.019)	0.316*** (0.011)	.	.	.	.	.
Usigmas									
DA	.	1.899 (1.276)	7.806*** (2.302)	-0.667** (0.314)	.	.	.	.	.
DA x DA	.	-0.289 (0.265)	-0.935** (0.411)	0.103** (0.040)	.	.	.	.	.
IE x DA	.	-0.032* (0.013)	-0.168*** (0.045)	-0.003 (0.004)	.	.	.	.	.
Constant	.	-2.053* (1.120)	-2.621** (1.023)	-0.422 (0.332)	.	.	.	.	.
Vsigmas									
Constant	.	-1.477*** (0.091)	-2.378*** (0.070)	-6.813*** (0.627)	.	.	.	.	.
Observations	.	468	468	468	.	.	.	.	.
Log-Likelihood	.	-344.830	-124.037	18.877	.	.	.	.	.
chi2	.	5.248	23.813	829.576	.	.	.	.	.
P	.	0.022	0.000	0.000	.	.	.	.	.
Converged	.	1.000	1.000	1.000	.	.	.	.	.

Dependent variables are residual efficiencies and persistent efficiencies. They are calculated for each types of resources (Non-resource, Direct, Indirect, Corporate and Individual Taxes). Standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

Summary

Table 3.11 displays a summary of signs and significances of the effect of democratic accountability for each of the six subsamples.

- ***Rich resources countries***

- ✓ Democratic accountability does not significantly impact short-term inefficiencies in rich resources countries; however, in the long-term, both non-resources and corporates tax efforts stimulated by current levels of democratic accountability.
- ✓ Increasing current levels of democratic accountability should produce better outcomes on residual efficiency at least for, non-resources, direct and individual taxation. For persistent efficiency, increasing democratic accountability seems to worsen the technical inefficiency for non-resources and corporate taxes.
- ✓ Democratic accountability x Informal Economy help reducing short-term inefficiency for corporate taxes and persistent inefficiency in the case of indirect, corporate and individual taxes.

- ***Poor resource countries***

- ✓ Democratic accountability significantly reduce short-term inefficiency of indirect taxes;
- ✓ The interactive term is only significant when individual tax's persistent inefficiencies are studied.

- ***Non aid-dependent countries***

- ✓ Democratic accountability drops indirect taxes' residual technical efficiency and increase persistent inefficiency for indirect, corporate and individual taxes.
- ✓ As expected, increasing degree of democratic accountability should decrease persistent inefficiencies for Direct, indirect, corporate and individual taxes.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

✓ Informal Economy x democratic accountability significantly influence residual tax inefficiency for indirect and corporate taxes with the expected negative effect for corporate taxes. For long-term inefficiencies, the expected negative sign is display for indirect taxes and corporates taxes.

- *Aid dependent countries*

✓ Only the model for non-resources taxes converges. It shows that increasing level of democratic accountability improve residual tax effort but decrease persistent tax effort.

✓ The interactive once again got the expected sign meaning that targeting the informal Economy in term of democratic accountability should reduce persistent technical inefficiencies.

- *LICs*

✓ Low levels of democratic accountability significantly worsen countries residual inefficiencies (direct and corporate taxes). But at higher levels, the inverse situation is observed.

✓ The expected sign of the interactive is perceived for individual tax inefficiencies (short term efficiencies) and both direct and indirect taxes on the long run.

✓ Indirect taxes persistent inefficiencies are increase by democratic accountability. Corporates taxes inefficiencies are reduce by current level of democratic accountability. Once again, reinforce level of democratic accountability significantly decrease indirect taxes' inefficiency but develop corporates taxes inefficiencies.

LIMCs

✓ Only the study of the interactive term presents some significant results. Non- resource taxes and Direct taxes inefficiencies are negatively impacted by a more responsive relationship between government and informal operators.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

Table 3.11: Summary signs and significances

Variables	Resource -Rich Countries										Resource-poor Countries									
	Non Resource taxes		Direct Taxes		Indirect Taxes		Corporate Taxes		Individual Taxes		Non Resources taxes		Direct Taxes		Indirect Taxes		Corporate Taxes		Individual Taxes	
	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS
Residual	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS
DA		(+)		(+)		(-)		(+)		(+)		(+)		(-)		(-)		(-)		(-)
DA x DA	(-)		(-)			(-)		(-)	(-)		(-)		(-)		(+)		(+)		(+)	
IE x DA		(+)		(-)		(+)	(-)		(+)		(-)		(-)		(+)		(+)		(+)	
Persistent																				
DA	(-)		.	.	(+)		(-)		(+)		(+)		(+)	.	.	.	.			(+)
DA x DA	(+)		.	.	(+)		(+)		(+)		(-)		(-)	.	.	.	.			(-)
IE x DA		(-)	.	.	(-)		(-)		(-)		(+)		(+)	.	.	.	.	(-)		(-)

*S=significant; NS=non-significant; IE x DA=Informal Economy x democratic accountability

Variables	Non aid dependent Countries										Aid dependent Countries			
	Non Resources taxes		Direct Taxes		Indirect Taxes		Corporate Taxes		Individual Taxes		Non Resources taxes			
	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS
Residual														
DA		(-)		(+)		(-)		(+)		(-)		(-)		(+)
DA x DA		(-)		(-)		(+)		(-)		(-)		(-)		(-)
IE x DA		(+)		(-)		(+)		(-)		(+)		(+)		(-)
Persistent														
DA		(+)		(+)		(+)		(+)		(+)		(+)		(-)
DA x DA		(-)		(-)		(-)		(-)		(-)		(-)		(+)
IE x DA	(+)			(+)		(-)		(-)		(-)		(-)		(-)

Variables	LICs										LMICs							
	Non Resources taxes		Direct Taxes		Indirect Taxes		Corporate Taxes		Individual Taxes		Non Resources taxes		Direct Taxes		Indirect Taxes		Corporate Taxes	
	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS
Residual																		
DA		(+)	(+)			(-)	(+)		(+)		(+)		(+)		(+)		(+)	
DA x DA	(-)		(-)		(-)	(-)	(-)		(-)		(-)		(-)		(-)		(-)	
IE x DA	(+)			(-)		(+)		(-)	(-)		(-)		(-)		(-)		(-)	
Persistent																		
DA	.	.		(+)	(+)		(-)	
DA x DA	.	.		(-)	(-)		(+)	
IE x DA	.	.	(-)		(-)		(-)	

3.4 Conclusion

Using the stochastic frontier methodology by [Kumbhakar, Wang, and Horncastle \(2015\)](#) on a sample of 33 developing countries over the period 1984-2010, We investigate how access to financial institutions impact the contribution of the informal Economy to public revenues. It appears that access to financial services have a significant effect on indirect, corporate, individual taxes.

This effect of FIA on the tax mobilization is two-fold. (i) First we notice that indirect taxes are positively influenced by current levels of financial development when, corporate taxes is negatively affected. (ii) Adding the squared valued of FIA suggests the existence of a threshold beyond which, financial development may modify former effects on taxation. We record an augmentation of corporate taxes and a decrease of indirect taxes. Giving to informal operators, the access to financial institutions also significantly affect taxes. All taxes are impacted by the interactive. The effect is positive for non-resource, corporate, direct and individual taxes but negative for the others (indirect taxes). Nevertheless, the amplitude of the coefficients are low.

Policy recommendations emerging of those conclusions are (i) governments need to improve current level of financial development to strengthen the positive effect, (ii) the adoption of complementary policies such as improving level of democratic accountability may also help in this regard.

We then investigate if building a more accountable relationship between informal operators and authorities could intensify those findings by reducing inefficiencies in terms of the process of tax mobilization. Our results suggest that increasing global levels of democratic accountability is also a good policy. The impact of democratic accountability on tax mobilization differs according to the nature of the country and the type of tax.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

It suppose that effective reforms should focus on reducing inefficiencies by distinguishing within countries, across taxes and in a consistent manner. Indeed, in resources rich countries, for example, governments should focus on targeting the informal Economy since the effect of the interactive is significant and monotonic⁴⁶. It should also distinguish between persistent and some short term efficiencies. However, government should be cautious since results display the existence of threshold effect beyond which democratic accountability could amplify long term inefficiencies.

For non-aid dependent countries, increasing the level of democratic accountability uniformly influence all type of resources. Targeting informal economy by democratic accountability will display good results only for indirect, corporate taxes. A good policy design should focus on how to extend global levels of democratic accountability in those countries. Direct, indirect, corporate and individual taxes will be positively impacted. Targeting informal economy should be an alternative procedure since only corporate and indirect taxes could be impacted. Studies must be done to ensure that no perverse effect is display on the other taxes.

Increasing levels of democratic accountability by targeting the informal economy in LICs should also reduce countries inefficiencies. The effect seems to be monotonic⁴⁷, even if it is not significant. For resource-poor, aid-dependent and low-middle income countries, since not all the models converge, more investigations must be done to propose specific policies.

3.5 Annexes

Annex 3.5.1: Likelihood ratio tests

We compute the likelihood ratio test to ensure the presence of technical inefficiency in our analysis. In doing so, the log-likelihood value of the estimated stochastic frontier and the

⁴⁶ At least when the model converge i.e. for corporate, indirect and individual taxes.

⁴⁷ At least when the model converge.

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

correspondent OLS models are required. Once those two values obtained, the LR statistic is calculated via the following equation:

$$\text{LR statistic} = -2 * (\log\text{-Likelihood}_{\text{OLS}} - \log\text{-likelihood}_{\text{error_model}})$$

To compute the test, we also need the degree of freedom in the error model. As there is two parameters in our error model, the degree of freedom (dof) is equal to 2. Decision for the test significance is done with the table of critical value of the mixed chi-square distribution

Table 3.12: Critical values of the mixed chi-square distribution

Dof	Significance level						
	0.25	0.1	0.05	0.025	0.01	0.005	0.001
2	2.090	3.808	5.138	6.483	8.273	9.634	12.810

Source: Table 1, (Kodde and Palm, 1986)

The critical value at the 1% level of significance is 9.634. All LR statistics have values exceeding this threshold. We then reject the null hypothesis of no technical inefficiency in our models.

Table 3.13: Likelihood Ratio test

LR test (Residual inefficiency)	
Type of taxes	LR statistic
(Log) Non Resource taxes (%GDP)	25.570
(Log) Indirect Taxes(%GDP)	534.592
(Log) Direct Taxes (%GDP)	220.860
(Log) Individual Taxes(%GDP)	306.671
(Log) Corporate Taxes (%GDP)	447.629
LR test (Persistent inefficiency)	
Type of taxes	LR statistic
(Log) Non Resource taxes (%GDP)	470.194
(Log) Indirect Taxes(%GDP)	757.124
(Log) Direct Taxes (%GDP)	430.124
(Log) Individual Taxes(%GDP)	754.798

Source: Authors calculation, using data from Mansour (2014)

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

Annex 3.5.2: List of variables, sources and definition

Variables	Definitions	Sources
Informal economy	<i>A set of economic activities that takes place outside the framework of bureaucratic public and private sector establishments. It is mainly regarded as a sector, which produces legal goods, but does not comply with government regulations (Elgin and Schneider, 2013).</i>	Elgin and Oztunali (2012)
Imports of goods and services (% of GDP)	<i>Imports of goods and services represent the value of all goods and other market services received from the rest of the world.</i>	The World Bank (2018)
Agriculture, value added (% of GDP)	<i>Agriculture corresponds to ISIC divisions 1-5 and includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3 or 4.</i>	The World Bank (2018)
(Log) GDP per capita	<i>GDP per capita is gross domestic product divided by midyear population. Data are in current U.S. dollars.</i>	The World Bank (2018)
Resource taxes (% of GDP)	<i>These include primarily revenues from the Corporate Tax that are collected from extractive activities in the oil and gas, and mining sectors, and royalties</i>	Mansour (2014)
FIA	<i>Financial institutions access is proxied by the number of bank branches and ATMs per 100,000 adults. Additional indicators were considered, such as the number of bank accounts per 1,000 adults, percent of firms with line of credit, and usage of mobile phones to send and receive money. These indicators were not included in the sub-index because they lack sufficiently large country and time coverage.</i>	Svirydzenka (2016)
Democratic accountability	<i>A measure of how responsive government is to its people, on the basis that the less responsive it is, the more likely it is that the government will fall, peacefully in a democratic society, but possibly violently in a non-democratic one.</i>	ICRG (2015)
(Log) Direct Taxes (% GDP)	<i>These include taxes on all income sources (i.e. business profits, wages, portfolio income, income from real property, capital gains, etc.).</i>	Mansour (2014)
(Log) Indirect Taxes (% GDP)	<i>Indirect taxes include all domestic consumption taxes, such as sales taxes of various sorts, including value-added taxes (VATs), and excise taxes. In some countries, excise taxes may include ad-valorem or specific taxes on certain agricultural products, such as coffee and cocoa.</i>	Mansour (2014)
(Log) Corporate Taxes (% GDP)	<i>This is the tax imposed on corporate income in countries that have a corporate tax. This can include taxes on profits from individual enterprises or any other business entities liable to a schedular profit tax in countries that have schedular tax systems (a number of Francophone countries).</i>	Mansour (2014)
(Log) Individual Taxes (% GDP)	<i>This is the tax imposed on income of individuals from all sources in countries that apply a comprehensive income tax on individuals, including tax on business profits. In countries that apply a schedular income tax, the Individual Tax includes primarily taxes on wages.</i>	Mansour (2014)
(Log) Non Resource taxes (% GDP), Mansour (2014)	<i>Total taxes collected in the country excluding resource taxes.</i>	Mansour (2014)

3. Improving informal economy's Contribution to Tax in Sub-Saharan Africa

Annex 3.5.3: Descriptive statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
(Log) Non Resource taxes (%GDP)	806	2.424	0.505	0.238	4.056
(Log) Indirect Taxes (%GDP)	805	1.218	0.799	-2.208	2.442
(Log) Direct Taxes (%GDP)	806	1.107	0.704	-1.554	2.710
(Log) Individual Taxes(%GDP)	729	0.2278	0.984	-4.899	2.257
(Log) Corporate Taxes (%GDP)	754	0.243	0.787	-4.152	2.203
Informal Economy	806	40.835	8.328	23.692	60.187
Imports of good and service (%GDP)	806	37.626	17.418	2.982	117.008
Agricultural value added (%GDP)	806	28.812	14.892	0.892	62.383
(Log) GDP per capita	806	6.795	0.949	4.880	9.920
Resource tax (%GDP)	806	3.375	7.764	0	48.675
FIA	806	4.754	6.195	0	55.34
Democratic Accountability	552	3.022	1.199	0	5.5

Source: Authors' calculations using data from, Mansour (2014); Elgin et al. (2012); Svirydenka (2016); ICRG (2015) and The World bank (2018).

Part II:

**4. Tax compliance in the micro-activities:
independent act or spillover effect? The
case of Cameroon⁴⁸.**

⁴⁸This article is produced in collaboration with Jean-François Brun and Nasser Ari Tanimoune.

4.1 Introduction

Despite the progress made, tax revenues collected by developing countries are still insufficient to finance the Sustainable Development Goals. Already in 2015, the report of the Third Conference on Financing for Development stipulated: *“For all countries, public policies and the mobilization and effective use of domestic resources are central to the pursuit of sustainable development. Significant additional domestic resources, supplemented by international assistance, will be critical to realizing sustainable development and achieving the SDGs”*.

The [First Global Conference of the Platform for Collaboration on Tax \(2018\)](#) reinforced this statement by arguing that more needs to be done in terms of domestic resource mobilization. Indeed, to provide basic services such as infrastructure, security or health, developing countries should raise at least 15% of their GDP, as taxes. Many of them (nearly 30 of the poorest countries) are still below this threshold. In response to the goal of domestic mobilization, ECA member countries pledged to encourage political actions for the *“broadening of the tax base and continuing efforts to integrate the informal sector into the formal economy”*.

Indeed, as highlighted by [Maldonado et al. \(2004\)](#); [Ekkehard et al. \(2009\)](#); [Schneider et al. \(2010\)](#); [Mbaye \(2015\)](#); [Hassan and Schneider \(2016\)](#); etc., the informal sector accounts for a huge part of GDP (up to 39%) in developing economies. It is the main provider of jobs ([Sani, 2009](#)) – 80%-90% of jobs in sub-Saharan Africa – but contributes slightly to the collection of public revenues ([Bird, Martinez-Vazquez, and Torgler, 2008](#); [Cobham, 2005](#); [Grimm, Knorringa, and Lay, 2012](#)).

Taxing this sector then seems to be one of the main challenges developing countries have to deal with in the way to finance their development. Nevertheless, in this sector, both fraudulent and micro activities coexist. As suggested by [Chambas \(2005\)](#), tax administrations

4 Tax compliance in the micro-activities: independent act or spillover effect?

should focus their attention on fraudulent businesses which have an important tax potential but evade taxes. Micro-businesses often pay taxes like business license, property taxes, and VAT on inputs, etc.

Increasing their tax burden may pauperize the most vulnerable population. Tax potentials of those micro-activities are low and taxing them may be expensive compared to the expected gains. Consequently, the gap in revenues in developing countries could not be fulfilled by taxing micro-activities at least in the medium term. However, as mentioned above, not taxing informal businesses raise issues such as equity, accountability and tax compliance.

According to 1-2-3 surveys realized in some African countries⁴⁹, near to 25% of micro activities really pay taxes. What about the rest of the micro-activities? This creates an incentive for free-riding behavior as many operators do not pay taxes but still benefit from public services. Taxpayers may be discouraged if they detect non-compliance behavior in their neighborhood. Moreover, the exemption of micro-activities from taxes does not lead them to understand its utility and calls into question the disclosure of information concerning the use of tax revenues (OECD, 2010).

In our viewpoint and as the third chapter showed, the focus should be placed on the access of micro-operators to financial institutions and increase levels of democratic accountability. Nevertheless, capacities of tax administrations in developing countries are limited. Tax revenues from the micro-activities in the medium-term are also limited. In addition, not all micro-activities can claim credit from financial institutions. The idea behind this study is to identify a group of micro-activities in which policies such as access to finance and building closer relationships with tax authorities could be beneficial. Tax payments by these entrepreneurs should have a positive influence on other micro-operators by promoting

⁴⁹ Cameroon, Madagascar, Mali, Côte d'Ivoire, Senegal, Burkina Faso, Niger, Benin, Togo.

4 Tax compliance in the micro-activities: independent act or spillover effect?

voluntary tax payments. It should also limit the resources to be used by the tax administration in the mobilization process.

In doing so, this chapter investigates the presence of spillover effects in tax payments process in the Cameroonian micro-activities. This approach is founded on socio-psychological theories in which, any behavior takes place in a specific area where cultural, social and physical context take account. Consequently, interactions between the environment and behavior are consistently prevailing (Godin, 2009) and it is not possible to consider social phenomena omitting the types of influences exercised (Fisher, 2010).

In the present study, we are particularly interested in the impact of social interactions on the decision of tax payments. The paper uses the national employment and informal sector survey in Cameroon (2010)⁵⁰. This database is based on the 1-2-3⁵¹ survey methodology proposed by DIAL⁵².

Three reasons justify the choice of Cameroon. First, the Cameroonian household surveys (1-2-3 surveys included) generally allow appreciating characteristics of a representative subsample of the population at the national level. Second Cameroon has a long tradition of collecting data in the informal sector. Finally, the characteristics of the Cameroonian informal sector are on average similar to those observed in other developing countries. Here, informal sector accounts for 37 % of GDP, participate in 92% of job creation but contributes only to 2 % in terms of tax mobilization (INS, 2010).

⁵⁰ This database was the only one we had in our possession at the time of writing this article.

⁵¹ 1-2-3 Survey is a modular mixed survey developed by DIAL (UMR Paris Dauphine) to evaluate the share of micro-activity in a country. The survey is implemented in three phases: the first one is a survey on employment. The second consists to implement a specific micro-activities questionnaire to those people who declared working in the micro-activities during the first step. This permits to assess economic activities of the micro-activities. In the third step, the surveys assess household living conditions (Razafindrakoto and al., 2009). Only the first two phases were implemented in the Cameroon survey.

⁵² In 1-2-3 survey, an informal company is a unit where the head carries out an unregistered business and/or a business with no formal written accounts (Amougou, Dzossa, Fouoking, Nepetsoun, and Tédou, 2009).

4 Tax compliance in the micro-activities: independent act or spillover effect?

The original research methodology (Section 4.3) is a *Probit Spatial Durbin Model (SDMP)*⁵³ which permits to assess social interactions between two entities. After distinguishing the micro-activities into categories (Section 4.2), the existence of spatial dependence between categories' of micro-activities is evaluated and the impact of social interactions in the tax payment procedure is analyzed (Section 4.4).

Empirical results suggest a spatial dependence between the decisions of payments within the Cameroonian micro-activities. Direct and indirect neighbors can influence operators, which means that the behavior towards the taxation of a micro-operator is also the sum of a set of behaviors occurring in its environment that tends to influence his opinions.

4.2 Data

The survey on the employment and the informal sector of Cameroon (2010) is used in this analysis. It is the equivalent of 1-2-3 survey proposed by DIAL. For a reminder, 1-2-3 survey is a modular mixed survey in which the share, the composition and the functioning of the informal activities are assessed.

The survey is implemented in three steps: the first one is a survey on the employment. On the second step, a specific questionnaire is applied to individuals who declared working in the informal sector during the first step. In the third part, the surveys assess household living conditions (Razafindrakoto *et al.*, 2009). In the Cameroonian case, only the first two phases are implemented. This survey is the second one conducted nationwide. Given our tax definition (See Chapter 2), we only allow companies with a turnover of less than 10 million CFA francs to be included in the final database.

Observations are composed of independent workers, employers or workers. For the study, we consider only promoters. It means operators who created the business or managed them at

⁵³Lesage, 2014; LeSage and Pace, 2009, etc.

4 Tax compliance in the micro-activities: independent act or spillover effect?

the moment of the survey. The final database contains 3676 observations. We then applied the classification of [Grimm et al. \(2012\)](#) to account for heterogeneity.

According to the General Tax Code of Cameroon ([Direction Générale des Impôts Cameroun, 2011](#)), micro-operators have to pay two type of taxes: the discharged tax and the business license. The discharged tax is owed by operators not subject to the basic regime, to the assessment based on actual earnings and the simplified taxation regime. It excluded other forms of taxation. However, an entrepreneur with a turnover higher than fifteen (15) millions of FCFA must also pay the license tax.

For this study, we only retained the discharged tax which is the tax generally due by micro-operators and also because of the lack of information on the business license variable. The variable is designated as follow: "Did the production unit you manage, pay the *Discharged tax* during the last 12 months?" Two answers are possible: "1: yes" or "0: no".

4.2.1 Define Micro-activities' categories

The method proposed by [Grimm et al. \(2012\)](#) considered an informal sector composed of three constituents: the top performers, the constrained gazelles, and the survivalists. Top performers are defined as "entrepreneurs in the top 25% of the capital distribution". From these firms, the latter authors select the 40% with the highest capital profitability, i.e. the highest value added per unit of physical capital.

Constrained Gazelles are firms which show similar managerial abilities in running their firm to top-performers, but which operate with substantially lower capital stocks. Their stock of capital is almost as low as that of survivalists. However, they are much more productive and can earn much higher returns on capital than survivalists" ([Grimm et al., 2012](#)). Survivalists are firms with the lowest amounts of capital and capital productivity.

[Grimm et al. \(2012\)](#) method is made of three steps. First, the authors created the top performer's category. They selected informal operators with capital in the highest quartile (top

4 Tax compliance in the micro-activities: independent act or spillover effect?

25%). Among them, they classed as top performers those realizing at least 60% as the rate of capital productivity.

After doing that, they fitted for the total sample, the probability of being a top performer, and subdivided the sample into three groups. The first group contains firms with the lowest probability to become a top performer (probability below 0.5) and is called the survivalists. Firms with probability above average are split between top performers (as explained above) and constrained gazelles (firms considered as performers but not top performers).

As the study analyzes tax compliance within the micro-activities, the method used is derived from the approach described above. However, the criterion of categorization retained here is the annual turnover of the firm instead of the value added used by [Grimm et al. \(2012\)](#). In our perspective, this criterion seems to be more interesting for a study on taxation since taxes are calculated on firms' turnover.

- ***Step 1: The performers' group***

The first group is composed of promoters who belong to the upper (75th) quartile of capital. In this group, those who obtained a turnover equivalent to 60% of the capital amount is considered as a top performer.

- ***Step 2: Probability of being a top performer***

Now the probability of being a Top performer is calculated with the next probit regression:

$$Pr (Y=1) = \alpha + \beta Xi + \varepsilon, \text{ Where,}$$

Y is the variable "being a top performer", encoded "1" if the promoter is a top performer as define above and 0 otherwise.

Xi represents the characteristics of the head and the firm.

4 Tax compliance in the micro-activities: independent act or spillover effect?

β is the vector of parameters, α is the intercept and ε , the error term.

Table 4.1: Probability to become a top performer

	Coefficients	Marg effect
<i>Owner characteristics</i>		
Age	0.093*** (0.015)	0,017
Age squared	-0,001 0,000	0,000
Gender	-0.445*** (0.0733)	-0,008
No education	Ref	Ref
Primary	0.117 (0.131)	0,019
Secondary	0.250* (0.140)	0,044
Higher	0.484*** (0.184)	0,095
Speak french	0.474*** (0.0975)	0,088
<i>Firms characteristics</i>		
Age of the unit	-0.000 (0.001)	0,000
Motivation	0.268*** (0.060)	0,050
<i>Branches</i>		
Food-processing	0.521*** (0.172)	0,080
Clothing and apparel	0.632*** (0.178)	0,104
Other industries	-0.434* (0.231)	-0,035
Construction	0.592*** (0.206)	0,095
Wholesale	0.396*** (0.141)	0,056
Retail	1.061*** (0.161)	0,218
Transportation	0.801*** (0.155)	0,145
Repair services	0.555*** (0.196)	0,087
Communication	0.497** (0.216)	0,075
Other services	0.195 (0.166)	0,024
Constant	-3.976*** (0.332)	
Observations		3,485
Pseudo r-squared		0.145
Standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1.		

4 Tax compliance in the micro-activities: independent act or spillover effect?

Estimation strategy reveals that the probability of becoming a top performer is positively and significantly affected by the age, the level of education and the ability to speak French. Generally, the sector of activity has a positive incidence on the probability of being a top performer. Being a woman reduces the probability to become a top performer.

• *Step 3: Final classification*

After computing the probability of being a top performer, operators are divided into three groups. First, firms with a probability below the average are aggregated to the survivalist group. Those who have a probability above this statistic but who were not in the top performer group (as explained above) are called constrained gazelles.

The following table shows the repartition of the sample. Only thirteen percent of the firms are Top performers, constrained gazelles represent thirty-two percent of the sample and survivalists, with fifty-five percent of the promoters, are the most important group.

Table 4.2: Partition of Cameroon micro-operators

	Frequency	Percentage
Top Performers	476	12.94
Constrained Gazelles	1180	32.07
Survivalists	2023	54.99
Total	3679	100

Source: Authors calculations using data from EESI (2010)

Results of the classification are similar to those of [Grimm et al. \(2012\)](#) since survivalists are the most numerous group. Constrained gazelles are numerous but less than survivalists and top performers are less than the others. The next section describes the characteristics of each group and displays the statistical differences among them.

4.2.2 Characteristics by groups

First, we attempt to show that the three groups created are homogeneous and independent of each other. T-test statistics disclose that the three groups are different concerning criterion

4 Tax compliance in the micro-activities: independent act or spillover effect?

used for classification. The firm's capital and turnover are statistically different for the groups. The average capital of top-performer is eight times more than the other groups and the turnover of this group represents two times the ones of constrained gazelles and survivalists.

Concerning behavioral factors, differences between the three groups are also noticeable. Top performers work on average more than constrained gazelles and survivalists. Most of them keep account even if those accounts are not detailed. Top performers are statistically more compliant to the tax system; nearly 50% of them pay taxes whether it is local or statutory. Survivalists assent less to the tax system. Only fifteen percent (15%) of them would register to administration against more than 25% of constrained gazelles. Only thirteen percent of them would pay and 10% actually pay taxes.

This result is observed whatever the tax being collected. Top performers are also more numerous to have water (9% against 6% for Constrained gazelles or 3% for survivalists) and electricity connection (near than 70% against 56% for Constrained gazelles and 41% for survivalists). They generally work in fixed facilities at a market or a shop/restaurant location. Constrained Gazelles work more with a fixed installation on the street, in their home with special installation and also in a shop/restaurant location. Survivalists generally work at their home with or without special installation and have a mobile location at the market. More survivalists are owners of their location while nearly 3/4 of top performers rent their facilities.

5. Does business licenses influence the productivity of micro-activities

Table 4.3: Descriptive statistics

	(1) Top-performers	(2) Constrained Gazelles	(3) Survivalists	T-Test (1) vs. (v2)	T-test (2) vs. (v3)
Average Capital (Thousands of CFA Francs)	1233.09	152.09	51.16	0.000***	0.000***
Average Turnover (Thousands of CFA Francs)	7136.51	3417.13	1901.928	0.000***	0.000***
Owner Characteristics					
Age (years)	35.92	36.14	34.57	0.925	0.0116
Gender (1=Male)	0.68	0.68	0.30	0.670	0.000***
No education	0.06	5.34%	0.26	0.377	0.000**
Primary education	0.30	0.31	0.35	0.846	0.006**
Secondary education	0.57	0.57	0.36	0.889	0.000***
Higher Education	0.07	0.06	0.03	0.515	0.000***
Speak French	0.88	0.88	0.54	0.896	0.000***
Age UPI (years)	20.60	21.50	20.23	0.937	0.858
Motivation (1=entrepreneurship spirit)	0.63	0.66	0.42	0.169	0.000***
Behavior factors					
Labor hours of owner (Month Average)	246.00	210.00	185.00	0.000***	0.000***
Book keeping (not detailed)	0.21	0.13	0.09	0.000***	0.000***
Would register firm	0.59	0.31	0.16	0.000***	0.000***
Would pay tax	0.75	0.50	0.31	0.000***	0.000***
Pay tax yet	0.55	0.26	0.10	0.000***	0.000***
Pay discharge tax yet	0.56	0.28	0.11	0.000***	0.000***
Pay local tax	0.54	0.23	0.09	0.000***	0.000***

Source: Authors calculations, using data from EESI (2010)

However, some similar characteristics appear between the groups. For example, owners' characteristics and the place in which activities are carried out are the same for top performers and constrained gazelles. The average age of their promoters is 36 years old; more than half of them have received secondary education; 68% of each group is male and nearly 90% speaks French.

One of the main differences of survivalists with others is that only 30% of them are male. Operators in that category are less educated than those in the first two groups. In fact, 25% of survivalists received no education, about five times the number of top performers or constrained gazelles. Only 2% have received a higher education and less than 40% have received secondary education.

Constrained gazelles and Survivalists are self-employed and top-performers generally have employees. In general, micro-activities are set up by the promoter alone (approximately 90%).

5. Does business licenses influence the productivity of micro-activities

Table 4.4: Descriptive statistics (continued)

<i>Characteristics of firm</i>	Top-performers	Constrained gazelles	Survivalists	T-test (1) vs. (v2)	T-test (2) vs. (v3)
Water connection	0.09	0.06	0.03	0.144	0.077*
Electricity connection	0.70	0.56	0.42	0.011*	0.000***
Landline	0.02	0.01	0.00	0.0807*	0.687
<i>Location type</i>					
Itinerant	0.02	0.12	0.08	0.000***	0.002**
Mobile location on the street	0.01	0.05	0.07	0.006*	0.001**
Fixe location on the street	0.05	0.09	0.08	0.005*	0.311
Vehicle serves as location	0.22	0.15	0.01	0.001***	0.000***
Firms located at client's	0.02	0.04	0.09	0.008*	0.001***
Firms located at home with special installation	0.05	0.13	0.29	0.000***	0.000***
Firms located at home without special installation	0.05	0.07	0.09	0.463	0.005**
Mobile location on market	0.04	0.08	0.12	0.001***	0.006**
Other (without business locations)	0.01	0.01	0.02	0.203	0.009**
Fixed location on market	0.20	0.10	0.07	0.000***	0.062*
Shop/restaurant	0.28	0.12	0.06	0.000***	0.000***
River or sea	0.00	0.01	0.01	0.344	0.375
Warehouse	0.02	0.02	0.02	0.915	0.268
Other (with business locations)	0.00	0.00	0.00	0.499	0.161
<i>Location statute</i>					
Ownership	0.17	0.19	0.22	0.746	0.289
Rented	0.75	0.66	0.58	0.021	0.097
Lent	0.03	0.07	0.08	0.009	0.678
Squatted	0.04	0.04	0.06	0.647	0.581
Other	0.81%	0.01	0.03	0.728	0.050
<i>Reason of business set up</i>					
No job in large company	0.11	0.10	0.09	0.490	0.507
No job in small company	0.10	0.07	0.11	0.024**	0.000***
To have a better salary	0.27	0.22	0.14	0.057*	0.000***
To be independent	0.33	0.38	0.24	0.024**	0.000***
By family tradition	0.03	0.05	0.04	0.066*	0.114
Not enough money	0.11	0.14	0.29	0.134	0.000***
Other	0.05	0.04	0.09	0.108	0.000***
<i>Sector</i>					
Agriculture	.	0.00	.	0.152	0.003**
Food-processing	0.03	0.02	0.21	0.480	0.000***
Clothing and apparel	0.06	0.08	0.06	0.199	0.028**
Other industry	0.09	0.09	0.02	0.889	0.000***
Construction	0.01	0.01	0.07	0.775	0.000***
Wholesale	0.04	0.05	0.01	0.396	0.000***
Retail	0.27	0.29	0.37	0.7977	0.000***
Transportation	0.23	0.16	0.00	0.001***	0.000***
Restoration	0.12	0.13	0.08	0.412	0.000***
Repair services	0.05	0.06	0.02	0.237	0.000***
Communication	0.03	0.03	0.03	0.905	0.945
Other services	0.07	0.08	0.13	0.500	0.000***
<i>Region</i>					
Douala	0.49	0.30	0.21	0.000***	0.000***
Yaoundé	0.13	0.19	0.14	0.008**	0.001***
Adamaoua	0.04	0.03	0.04	0.589	0.746
Center	0.02	0.05	0.04	0.003***	0.094**
East	0.01	0.02	0.03	0.199	0.425
Far north	0.03	0.06	0.18	0.006**	0.000***
Coast	0.05	0.05	0.03	0.851	0.034**
North	0.04	0.08	0.09	0.017**	0.180
North-west	0.02	0.05	0.08	0.023**	0.000
West	0.09	0.10	0.08	0.626	0.081
South	0.04	0.04	0.02	0.994	0.019**
South-west	0.03	0.03	0.06	0.832	0.006**

5. Does business licenses influence the productivity of micro-activities

While top performers and constrained gazelles began their activities to become more independent, survivalists do it first, because they do not have enough funds to carry out other activities. Retail business, transportation, and catering activities are sectors with higher attendance but in general, survivalists operate more in retail trade and catering activities than in transportation (below 1%). Douala and Yaoundé are regions with the most micro-activities but the proportions differ according to groups (61% of top performers, 48% of constrained gazelles and 34% for survivalists).

4.3 The model

4.3.1 The Data Generating Process

Our study check for mimicry in the process of tax payments in the micro-activities. As we use the innovative spatial econometric procedures, one of the first things to do is to choose the appropriate data generation process (DGP) for the study.

Our sensitivity let us prefer a model with global spillovers. Actually, we assume that “a decision of tax payments of a micro-entrepreneur may have an incidence on the decision of its close neighborhood to pay or not for taxes. Furthermore, the decision of this neighbor can also affect decisions of his own neighbors and so on”. Between the existing DGP, [LeSage and Pace \(2009\)](#) reveals that the most appropriate to test for global spillovers is the Spatial Durbin Model (SDM). It produces *unbiased coefficient estimates* compared to the Spatial Autoregressive (SAR), the Spatial Error Model (SEM) and the Spatial Autocorrelation Model (SAC).

For [LeSage and Pace \(2009\)](#), the estimated coefficients of these three DGP will be deteriorated by omitted variables bias because the models do not include the spatial lag of the explanatory variables WX . In addition, due to the exclusion of the spatial lag of the dependent variable, another bias will affect the SEM model. [LeSage and Pace \(2009\)](#) conclude that *the*

5. Does business licenses influence the productivity of micro-activities

correctness of inference regarding the biased coefficient estimates for the SEM, SAR and SAC models becomes a moot issue here.

We compute some LM-tests in order to test for the existence of a spatial autocorrelation in our sample (see Table 4.5). These tests also reinforced the choice of the appropriate DGP for our sample.

Table 4.5: Results for spatial autocorrelation tests

	LM1	LM2	Moran I for probit
Region	180.186	182.957	51.621
Branch	240.677	243.098	54.799
Branch-region	88.110	114.943	38.634
Region-branch-performer	-15.388	-16.864	3.429
Region-branch-constrained	38.595	47.976	23.985
Region-branch-survivalist	51.529	64.956	22.872

Source: Authors calculations using data from EESI (2010)

LM-tests and Moran I for Probit display that we cannot reject the hypothesis of the presence of a spatial autocorrelation in our data. All statistics are greater than the threshold of 1.96 necessary to reject the null hypothesis of “absence of spatial autocorrelation”. As well as SAR and SEM functional forms can be accepted.

According to the claim of [LeSage and Pace, \(2009\)](#) and [Elhorst \(2010\)](#), *if the OLS model is rejected in favor of the spatial lag, the spatial error model or in favor of both models, then the Spatial Durbin Model should be estimated (Elhorst, 2010, p16)*. We then estimate a Spatial Durbin Model. As the dependent variable is the dummy “The operator pay or not for taxes”, we use a Probit Spatial Durbin Model (SDMP). The tax compliance equation is presented as follows:

$$\Pr (Y=1) = \rho * W * y + XB + W * XB' + e$$

5. Does business licenses influence the productivity of micro-activities

Y is the tax payment variable which takes 1 if the entrepreneur pays for discharged tax⁵⁴ and 0 otherwise.

W is the weight matrix;

WY is the spatial lag of Y i.e. the variable representing the decision of payment of the principal⁵⁵ neighbors.

X , the vector of own-explanatory variables of the individual;

WX ⁵⁶, the vector of explanatory variables of the neighbors;

B and B' , vectors of parameters;

ρ is the effect of neighbors on the individual studied;

e is the term of error.

4.3.2 The theory of proximity

As the main hypothesis of the study is to assess the impact the decision to pay taxes of an operator may have on others, we considered that individuals should be as close as possible to have the opportunity to see what others are doing.

The notion of proximity is built around three characteristics: the geographical unit, the affiliation at the same branch and the type of micro-activities. However, we assume that entrepreneurs in the south region cannot see how the Northerners are handling their enterprise. So to be considered as neighbor, operators must operate at least in the same region.

To perfect this definition of proximity, we argue that participation in a sector of activities may also influence the behavior of operators. For example, [Backiny \(2009\)](#) show that operators in clothing or other industries are less inclined to pay taxes than those in commerce and services.

⁵⁴ Discharged tax is the tax informal operators have to pay according to the general tax code.

⁵⁵ Neighbors defined by the spatial weight matrix.

⁵⁶ Each explanatory variable is constructed as an average from neighboring observations ([Lacombe and LeSage, 2013](#))

5. Does business licenses influence the productivity of micro-activities

So we can suppose that networks as professional organizations or specific characteristics in the branch can affect an entrepreneur's behavior.

To allow tax administrations to invest less in the tax collection from micro-activities and mobilize resources, we consider they should concentrate their efforts on a category of operators which may positively and significantly influence the others. Looking for this group of entrepreneur, we use the membership of [Grimm *et al.* \(2012\)](#) as the ultimate criterion to define the concept of proximity.

We first build geographic and sectorial matrices. In these matrices, two firms are neighbors if they work in the same region or a same branch of activities. Second, we combine these two matrices to create a close proximity link that can lead to mimicry behavior.

To take into account the specific impact of the type of micro-activities, we combine each of the previous matrices with a vector of a category of micro-activities. For example, to be neighbors, operators must operate in the same region and near to a top-performer (1) or in the same branch and close by a top-performer (2) or in the same region and in the same branch and near to a top performer (3).

We do the same consideration for all categories of informality as describe by [Grimm *et al.* \(2012\)](#). Finally, twelve (12) matrices are used to measure the existence of social interactions in the case of Cameroon micro-activities operators.

Four different equations have been created at this point. Equations (1) and (2) are constructed with traditional drivers of informal sector tax payments namely characteristics of firms and the heads of unit.

Contrarily to equation (1), equation (2) introduces some squared variables to test for non-linearity effect across time. In the third (3) design, we add proxies of some possible determinants of tax compliance such as the perception of the tax system⁵⁷ or the fact to keep not

⁵⁷ [D'Arcy, \(2009\)](#); [Andreoni, Erard, and Feinstein \(1998\)](#); [Armah-Attoh and Awal, \(2013\)](#)

5. Does business licenses influence the productivity of micro-activities

detailed account (account), and the reason why the enterprise was created (en_spirit). The perception of the tax system is an indicator of tax compliance since [Allingham and Sandmo \(1972\)](#) or [GIZ \(2010\)](#) revealed that high tax rates and a complex structure of the tax system may significantly predispose firms to evade taxes.

We assume that the unit heads who want to grow their business are the ones who created it with the objectives of being independent or making more money. For these operators, keeping an account (even if it is undetailed) will make it possible to monitor the evolution of the activities. For those kinds of businesses, we believe that the head of units will pay taxes to avoid conflicts with the tax authorities.

The sign of the variable of perception of the tax system is expected to be negative. Indeed, the variable takes value “1” if the operators have a misperception of the tax system and 0, otherwise. For the two other innovative controls, we expect that the fact of keeping an undetailed account and having an entrepreneurial spirit will be positively correlated with the probability to pay tax.

Those two variables are also binary and respectively take value “1” if operators keep undetailed account, “1” if being more independent or earn more money were the reason for the creation of the enterprise and 0, otherwise. In equation (4), investigations are conducted when the full set of explanatory variables is added. For each category of micro-activities, those estimations have been made and results are enclosed afterwards.

4.4 Results

This paragraph presents the analysis results of the different specifications of the spatial weight matrix exposed above. In the first part, a particular accent is put on the coefficient of spatial autocorrelation “Rho” to check for the relevance and the type of social interactions

5. Does business licenses influence the productivity of micro-activities

between firms. For each estimation, only signs and significances of this coefficient are interpreted. In the second part, key results in terms of spatial dependence are presented.

Using spatial econometric tools allow us to obtain the direct, the indirect and the total effect of tax compliance behavior of one firm on others. According to [Lacombe and LeSage \(2013\)](#), direct effects measure *how a change in an explanatory variable in county i affects the dependent variable in county i , plus any feedback effects*.

For this analysis, direct effects represent how a modification in the own-explanatory variables of firm i may impact its decision of tax payment. They also account for the average changes recorded in the explanatory variables of the principal neighbors (calling z) which may influence the decision of tax payments of firm i (feedbacks effects: WX).

The indirect effect display how the prior change observed in firm i may impact the decision of tax payments in all other firms (calling j) ([Lacombe and LeSage, 2013](#)). Once again, feedbacks effects (meaning change on explanatory variables of a firm z on the decision of tax payments on firm j) are considered.

Total effects are the sum of direct and indirect effects ([Lacombe and LeSage, 2013](#)). They reveal the total change in the probability of paying for the discharged tax resulting from a change in an explanatory variable in an observed business.

4.4.1 The coefficient « rho »

Table 4.6 reviews sign and significance of the coefficient “rho” for each matrix used. For a reminder, “rho” is the coefficient in front of the term $W*Y$. It permits to measure the effect of the main neighbor on the micro-operator. A significant coefficient of ρ means there is a spatial dependence in the tax payment’s procedure which means that independent Probit models will result in biased and inconsistent estimates and inferences ([LeSage and Pace, 2009](#)).

Columns (1) and (2) show the coefficient of Rho obtained with the variables commonly used in the literature as determinants of tax payments (characteristics of both the head of unit

5. Does business licenses influence the productivity of micro-activities

and firms). Column (3) reports the results when we add to the previous variables the other controls aforementioned. Column (4) presents the calculations of the Rho for the full set of variables.

Results are strongly robust concerning the existence of a spatial effect on the tax payment process but the nature of the relationship differs according to the matrix used. Since the central objective of the paper is to examine social interactions in terms of tax compliance between categories of micro-activities, it appears important to define a strongly and closely link between operators. Indeed, as [Tobler \(2004\)](#) noted, "*Everything is related to everything else, but near things are more related than distant things*".

Table 4.6: Sign and significance of the coefficient « rho »

Matrices	(1)	(2)	(3)	(4)
Branch	0.609 ***	-0.825 ***	-0.850 ***	-0.836 ***
Region	-0.03	-0.778 ***	-0.828 ***	-0.869 ***
Branch-region	0.656 ***	0.609 ***	0.514 ***	0.473 ***
Branch-performer	0.455	-0.464	-0.366	-0.387
Branch-Constrained	0.501 *	-0.646 **	-0.638 **	-0.616 *
Branch-survivalists	-0.585 **	-0.677 **	-0.681 **	-0.726 **
Region-performer	-0.278	-0.233	-0.436	-0.317
Region-Constrained	-0.309	-0.35	-0.463	-0.582 *
Region-survivalist	0.582 *	-0.259	-0.654 **	-0.767 ***
Branch-region-performer (W1)	0.455 ***	0.465 ***	0.328 *	0.327 *
Branch-region-constrained (W2)	0.640 ***	0.584 ***	0.382 ***	0.415 ***
Branch-region-survivalist (W3)	0.409 ***	0.245 **	0.342 *	0.042

Source: Authors calculations using data from EESI (2010)

Taken individually, matrices region and branch illustrate the presence of a strongly significant spatial effect in the procedure of tax payments in the micro-activities. For each of them, a negative impact is generally observed. For example, if we consider that the nearest neighbor in a region pays for tax, the sign of the “rho” coefficient indicates that the operator will not pay tax. But, the construction of the weight matrix with only one of those variables may introduce some misinterpretation of social interactions.

As explained before, an operator doing its activities in the north region of Cameroon may not be informed about the tax attitude of another entrepreneur working in Douala or Yaoundé.

5. Does business licenses influence the productivity of micro-activities

In addition, it seems uncertain to think traders and constructors know the decision of each other's in terms of taxation just because they are working in the same region.

The same consideration must be done when we look at branch dimension. Two companies in the same branch are not informed about each other tax attitude, if the first company carries out its business at Yaoundé and the other one works in the extreme north.

Adding categories of micro-activities as a criterion to the construction of the weight matrixes by branch or region conserve the nature of the relationship but mostly drop the significance of the spatial dependence effect. However, the consideration of building a close link of proximity remains.

To solve this problem, we finally associate branch and regional matrices with the micro-activities' categories. Those combinations reveal that the neighbor's decision to pay taxes has a positive and strong impact on other micro-businesses. This means that the closer businesses are, the more positive social interactions can be.

The effect of proximity by region and branch coupled with categories of micro-activity produces mainly positive and significantly larger results. The impact appears to be more important for constrained gazelles than the other categories and tend to be less relevant in the case of survivalists.

As mentioned earlier, the implementation of reforms that promote access to finance or the accountability of the authorities to a group of informal operators which has a positive influence on others in terms of tax may be beneficial. Constrained gazelles could be the group of informal firm we are looking for.

The coefficient "rho" indicates that their decision on tax payments caused a significant increase in the level of tax compliance in their surroundings. Next part of this chapter will give details about channels for which those social dependences are created.

4.4.2 Spatial interactions

4.4.2.1 The total or cumulative effect

The analysis of the total effects shows that in general, tax payments are explained by the nature of the facilities in which businesses are carried out, the gender of the head and the amount of salaries in the firm. The age of the head is a good predictor only for constrained gazelle's category (Table 4.7). But, for the two others categories, it became significant only when squared variables are adding.

The new variables added in equations (3) are significantly independent of the membership of categories. That means they get an important role in the tax payment process. Even though the results for “the fact to keep account” and “having created its enterprises to be more independent” get the expected sign (positive), the perception of the tax system has a counterintuitive result.

Contrary to the claim of [Andreoni, Erard, and Feinstein \(1998\)](#); [Armah-Attoh and Awal, \(2013\)](#) that, *an increase in the perception that the tax system is unfair or that taxes are higher or unfordable increases the odds to evade taxes*, having a misperception of the tax system favor tax payments. This means that micro-operators continue to pay taxes even if they consider the tax system to be unfair. For example, top-performers results display that the negative perception of the tax system increase the probability to pay tax by 24%, on average (Table 4.8).

What may explain this result is the construction of the variable of perception of the tax system⁵⁸ itself. In fact, the question: “Did you have problems or difficulties in the following areas: too many regulations, taxes and, fees?” try to assess whether regulations and taxes are hindrances for micro-activities. Although the complexity of the tax system (too many taxes to pay) is a real predictor of tax payment; too many regulations generally explain a slowdown in

⁵⁸ However, in the absence of a better proxy, we will continue to use the variable “perception of the tax system” as defined in the previous sections.

5. Does business licenses influence the productivity of micro-activities

the process of formalization (Bruhn and McKenzie, 2013; de Mel *et al.*, 2013; etc.). However, they not necessarily affect effective tax payments. In this way, the results disclosed by the tax perception variable may be strongly correlated with the variable of regulation and then explain formalization process.

The ability of tax agents to enforce operators with more observable criteria (fixed facilities, longevity, huge number of employees, etc.), to pay tax may, however, explain why operators pay even if they have a wrong perception of the tax system. Between the squared variables adding to the equation (2), only the age of the head is significant. This reveals the existence of an age threshold from which, the probability for the business owner to pay tax reduces.

More specifically, total effects indicate that when the operator works in the environs of a top-performer, the lifetime of the latter's business and an increasing part of employees will help to reduce the probability of their neighbors to pay tax (Table 4.8).

Once again, visibility criteria of the top performer (an old business noticeable by the tax administration) may explain why the other firms may not pay taxes. Nonetheless, this non-compliance of the other firms may reflect a free riding behavior since comparing themselves to the top performer paying taxes; other operators may consider their businesses not rich enough to pay taxes.

When firms work near to constrained gazelles, the level of education of the head, the fact to work in fixed facilities and the share of salaries help increasing respectively, for 2% to 3%; 22% to 31% and 7% to 13%, the probability to pay tax (Table 4.7). As in the case of top performers, the type of facilities and the longevity of the firm will influence the decision to pay taxes of the observed.

Carrying out its businesses near to a survivalist does not produce specific results when looking at the age of the head, his level of education etc. However, looking to the nature of the

5. Does business licenses influence the productivity of micro-activities

facilities, it seems that if survivalists work in fixed installations, the probability to pay taxes of the observed individual increase from 17.23% to 20.18% (Table 4.9). If the head of this survivalist activity is a male, the probability of others to pay also increases. As a reminder, neither working in the environs of top performer nor constrained gazelles, the gender produces a significant result on the probability to pay taxes.

Looking at the three innovative variables, it appears that a misperception of the tax system by survivalist rise from 22.17%, the probability to comply with the tax of the other firms working in the neighborhood. An increasing number of survivalists' business keeps account even if it is not detailed intensify the probability of tax payment of the observed firm from 21 to 28%.

The fact survivalists created their business to earn more money or to be independent, also boost the probability of payments in the region by 24%. A misperception of the tax system in constrained gazelles' activity seems to negatively influence the chance of the observed firm to pay taxes, but the effect is not significant. Keeping an undetailed account and entrepreneurship spirit respectively increase tax payment from 20.5% to 22.7% and 16%. Near to top performer, none of those variables produce a significant result on the probability to pay the discharged tax.

To conclude this paragraph, it is important to notice that the results shown above are generally in line with the literature especially for the effects of visibility criteria on the probability to pay taxes. For the other controls, the effects of the perception of the tax system seem to be ambiguous and counterintuitive especially in terms of spillover effects (WX).

5. Does business licenses influence the productivity of micro-activities

Table 4.7: Constrained Gazelle's Total Effects

	(1)	(2)	(3)	(4)
m5	0.002 *** 0.001	0.023 *** 0.004	0.002 *** 0.001	0.017 *** 0.003
nivins1	0.032 *** 0.011	0.045 0.056	0.021 ** 0.010	0.029 0.049
typ_local	0.312 *** 0.018	0.279 *** 0.017	0.230 *** 0.016	0.223 *** 0.015
val_k	0.000 0.000	0.000 *** 0.000	0.000 0.000	0.000 *** 0.000
Gender	-0.227 *** 0.018	-0.213 *** 0.017	-0.162 *** 0.018	-0.160 *** 0.016
part_salar	0.128 *** 0.038	0.074 ** 0.035	0.052 0.032	0.020 0.031
age_upi	0.0001 0.000	-0.0004 0.002	0.000073 0.000	-0.001 0.002
Tax_percep			0.260 *** 0.017	0.249 *** 0.018
Account			0.089 *** 0.020	0.081 *** 0.020
En_spirit			0.074 *** 0.015	0.074 *** 0.013
m5_sq		-0.0002 *** 0.000		-0.0002 *** 0.000
nivins_sq		-0.005 0.012		-0.002 0.010
valk_sq		0.000 0.000		0.000 0.000
ageupi_sq		0.000 0.000		0.000 0.000
W2*m5	0.014 *** 0.004	0.041 *** 0.015	0.008 *** 0.003	0.033 ** 0.014
W2*nivins1	-0.044 0.037	0.098 0.279	-0.057 * 0.031	-0.011 0.268
W2*typ_local	-0.538 *** 0.082	-0.513 *** 0.075	-0.440 *** 0.079	-0.451 *** 0.078
W2*val_k	-0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
W2*gender	0.053 0.061	0.079 0.056	0.049 0.058	0.060 0.055
W2*part_salar	-0.161 0.257	-0.290 0.258	-0.194 0.231	-0.255 0.244
W2*age_upi	-0.006 *** 0.002	-0.045 *** 0.016	-0.005 *** 0.002	-0.028 * 0.015
W2* Tax_percep			0.075 0.101	-0.039 0.112
W2*account			0.227 ** 0.110	0.206 * 0.114
W2*en_spirit			0.164 * 0.092	0.078 0.085
W2*m5_sq		-0.0005 ** 0.000		-0.0004 ** 0.000
W2*nivins_sq		-0.061 0.057		-0.030 0.062
W2*valk_sq		0.000 0.000		0.000 0.000
W2*ageupi_sq		0.0004 ** 0.000		0.0002 0.000

The dependent variable is the micro-operator pays for the discharged tax.
Standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1.

5. Does business licenses influence the productivity of micro-activities

Table 4.8: Top-performer's Total Effects

	(1)	(2)	(3)	(4)
m5	0.001	0.017 ***	0.001	0.012 ***
	0.001	0.003	0.001	0.003
nivins1	0.002	0.034	-0.002	0.011
	0.009	0.046	0.009	0.043
typ_local	0.231 ***	0.218 ***	0.182 ***	0.175 ***
	0.018	0.016	0.015	0.014
val_k	0.000	0.000 ***	0.000	0.000 **
	0.000	0.000	0.000	0.000
Gender	-0.183 ***	-0.180 ***	-0.136 ***	-0.136 ***
	0.016	0.017	0.016	0.015
part_salar	0.081 ***	0.058 *	0.040	0.023
	0.030	0.035	0.030	0.028
age_upi	0.0001	-0.000	0.0001	-0.0001
	0.000	0.002	0.000	0.002
Tax_percep			0.247 ***	0.235 ***
			0.017	0.017
Account			0.077 ***	0.069 ***
			0.017	0.019
En_spirit			0.054 ***	0.053 ***
			0.013	0.013
m5_sq		-0.0001 ***		-0.0001 ***
		0.000		0.000
nivins_sq		-0.008		-0.004
		0.010		0.009
valk_sq		0.000		0.000
		0.000		0.000
ageupi_sq		0.000		0.000
		0.000		0.000
W1*m5	0.009 **	0.025	0.005	0.030
	0.004	0.022	0.004	0.019
W1*nivins1	0.091 *	0.074	0.072	-0.239
	0.046	0.348	0.045	0.327
W1*typ_local	-0.338 ***	-0.306 ***	-0.190 *	-0.184 *
	0.091	0.091	0.102	0.097
W1*val_k	0.000 **	-0.000	0.000	-0.000
	0.000	0.000	0.000	0.000
W1*gender	-0.047	-0.080	-0.024	-0.057
	0.073	0.082	0.077	0.073
W1*part_salar	-0.736 **	-0.7932 **	-0.521 **	-0.604 **
	0.331	0.313	0.261	0.305
W1*age_upi	-0.006 **	-0.015	-0.005 *	-0.013
	0.003	0.023	0.002	0.022
W1*Tax_percep			0.129	0.161
			0.159	0.152
W1*account			-0.002	-0.015
			0.147	0.172
W1*en_siprit			0.025	0.044
			0.125	0.133
W1*m5_sq		-0.0003		-0.0003
		0.000		0.000
W1*nivins_sq		-0.007		0.066
		0.078		0.076
W1*valk_sq		0.000		0.000
		0.000		0.000
W1*ageupi_sq		0.0001		0.000
		0.000		0.000

The dependent variable is the micro-operator pays for the discharged tax.
Standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1.

5. Does business licenses influence the productivity of micro-activities

Table 4.9: Survivalist's Total effects

	(1)	(2)	(3)	(4)
m5	0.001	0.014 ***	0.001	0.009 ***
	0.001	0.004	0.001	0.003
nivins1	-0.006	0.067	-0.006	0.047
	0.012	0.053	0.011	0.045
typ_local	0.214 ***	0.187 ***	0.176 ***	0.147 ***
	0.022	0.019	0.019	0.014
val_k	0.000	0.000 ***	0.000	0.000 ***
	0.000	0.000	0.000	0.000
Gender	-0.195 ***	-0.193 ***	-0.149 ***	-0.141 ***
	0.026	0.025	0.022	0.017
part_salar	0.120 ***	0.089 ***	0.054 *	0.031
	0.037	0.032	0.033	0.027
age_upi	0.0002	0.001	0.000	0.000
	0.000	0.002	0.000	0.002
Tax_percep			0.274 ***	0.228 ***
			0.023	0.016
Account			0.091 ***	0.076 ***
			0.020	0.018
En_spirit			0.041 **	0.037 ***
			0.017	0.013
m5_sq		-0.0001 ***		-0.000 ***
		0.000		0.000
nivins_sq		-0.017		-0.012
		0.013		0.010
valk_sq		0.000		0.000
		0.000		0.000
ageupi_sq		-0.000		-0.000
		0.000		0.000
W3*m5	-0.0005	0.024 **	-0.001	0.023 ***
	0.002	0.010	0.003	0.009
W3*nivins1	-0.050 *	-0.643 ***	-0.039	-0.788 ***
	0.026	0.221	0.026	0.163
W3*typ_local	0.052	0.202 **	0.007	0.172 **
	0.090	0.088	0.091	0.076
W3*val_k	-0.000	-0.000 **	-0.000	-0.000
	0.000	0.000	0.000	0.000
W3*gender	0.128 **	0.134**	0.097 *	0.086 **
	0.054	0.055	0.054	0.042
W3*part_salar	-0.370	-0.540 **	-0.135	-0.344
	0.250	0.240	0.226	0.211
W3*age_upi	-0.000	-0.01778	-0.000	-0.014
	0.002	0.013	0.002	0.011
W3* Tax_percep			0.163	0.222 *
			0.139	0.119
W3*account			-0.279 **	-0.213 *
			0.126	0.123
W3*en_spirit			0.098	0.244 ***
			0.089	0.079
W3*m5_sq		-0.0002 *		-0.000 *
		0.000		0.000
W3*nivins_sq		0.149 ***		0.184 ***
		0.045		0.039
W3*valk_sq		0.000		0.000
		0.000		0.000
W3*ageupi_sq		0.000		0.000
		0.000		0.000

The dependent variable is the micro-operator pays for the discharged tax.
Standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1.

5. Does business licenses influence the productivity of micro-activities

Next paragraphs will disintegrate this total effect into direct and indirect effects in order to understand well those findings. It should be remembered that the direct effect is the outcome of the own-personal characteristics of an individual (*i*) on its probability to pay tax. The indirect effect represents how the characteristics of an individual (*i*) may affect the decision of payment of other firms.

4.4.2.2 The direct effect

For the following sections, results are presented in terms of categories of micro-activities. Section “Top-performer” displays the findings for firms in the neighborhood of the top-performers. Section “Constrained gazelles” presents results if firms are in the area of constrained gazelles and the “survivalists” subsection do the same consideration when operators are closed to survivalists businesses.

Survivalists

As the own-determinants of tax payments in the firms, the age of the head, the level of education, the value of the capital and the age of the unit do not explain the behavior in the neighborhood of survivalists. Only working in fixed facilities, the gender of the head and the share of salaries in the enterprise may significantly explain the payment of tax. The fact to have a fixed installation increases the probability of paying tax from 14.06% to 17.82%. Having a large part of paid employees strengthens the probability to pay tax from 4.7% to 10%. But compared to men, being a woman decreases the probability to pay tax for 17% to 13%.

As previously indicated, adding squared values (the age of the head, the age of the unit or the level of education etc.) in the regression change the significance of those variables. In this way, the age of the head and the value of capital now explain significantly the payment of tax. The effect is negative.

As explained earlier, this means that a threshold exists for which, the age of entrepreneur decrease the probability to pay tax (Table 4.10). Adding the proxy of the perception of tax

5. Does business licenses influence the productivity of micro-activities

system strongly increases the probability of tax payment. In other words, having a bad perception of the tax system increase to 24% the probability to pay taxation.

Keeping undetailed account raises to 8% this probability and having created the unit to be more independent increase the probability to pay to 3.5%. Those results imply that more than keeping an account, it is the enforcement of taxpayers which may favor tax payment of firms nearest to survivalist businesses. We note in equation (3) that the age of the head and the value of capital are not significant. This may indicate that the fact to introduce squared variables in the regression produces an econometric artifact for significant results (Table 4.10).

Social characteristics of survivalists' business marginally impact the behavior of the other entrepreneurs. Only their level of education and the gender of the heads affect the probability of tax payment of the studied individual. In the surroundings of a survivalist female running a unit, the probability to pay tax increase to around 10% compared to a man.

Apart from the age of the unit which is never significant, adding squared variables affect the significance of all variables. Gender and the level of education have the same signs and amplitude as previously. But a higher level of education in survivalists' business decreases the probability to pay tax to about 58% in the environs.

The fact that the survivalist works in fixed premise increases the probability of tax payment of the observed. A higher share of salaries in the neighborhood unit decreases from 49% the probability to pay tax.

A neighbor, keeping undetailed account reduces the probability of the observed to pay tax. Indeed, if the neighbor pays tax, it may reflect a desire for rigor in managing his company, ensuring its growth. This may indicate that programs for the training of micro-operators in terms of managerial skills only produce an effect on the treated subject, at least for survivalists. There is no spillover effect on the other firms. This means that to get more result in terms of tax compliance in the micro-activities, governments must educate a higher number of them.

5. Does business licenses influence the productivity of micro-activities

This is not beneficial for the government since they have to inject more resources in those kinds of programs in a context where the need of resources for development is increasing. The level of education of the head of the unit does not impact the probability for tax payment, but the level of instruction of the neighbor does it (Table 4.10).

5. Does business licenses influence the productivity of micro-activities

Table 4.10: Survivalist's direct effects

Direct	(1)	(2)	(3)	(4)
m5	0.001	0.013 ***	0.001	0.009 ***
	0.001	0.004	0.001	0.003
nivins1	-0.005	0.061	-0.005	0.047
	0.010	0.049	0.009	0.046
typ_local	0.178 ***	0.171 ***	0.154 ***	0.146 ***
	0.015	0.016	0.014	0.014
val_k	0.000	0.0005 ***	0.000	0.0000 ***
	0.000	0.000	0.000	0.000
Gender	-0.162 ***	-0.176 ***	-0.131 ***	-0.140 ***
	0.020	0.018	0.017	0.018
part_salar	0.100 ***	0.081 ***	0.048 *	0.031
	0.030	0.029	0.029	0.027
age_upi	0.000	0.001	0.000	0.000
	0.000	0.002	0.000	0.002
Tax_percep			0.240 ***	0.228 ***
			0.018	0.015
Account			0.080 ***	0.076 ***
			0.018	0.017
En_spirit			0.036 **	0.037 ***
			0.015	0.012
m5_sq		-0.0001 ***		-0.0001 ***
		0.000		0.000
nivins_sq		-0.015		-0.012
		0.011		0.009
valk_sq		0.000		0.000
		0.000		0.000
ageupi_sq		0.000		0.000
		0.000		0.000
W3*m5	0.000	0.0217 **	-0.001	0.023 ***
	0.002	0.010	0.002	0.008
W3*nivins1	-0.0418 *	-0.588 ***	-0.034	-0.788 ***
	0.022	0.190	0.025	0.172
W3*typ_local	0.045	0.186 **	0.009	0.173 **
	0.072	0.083	0.077	0.077
W3*val_k	0.000	-0.00002 **	0.000	0.000
	0.000	0.000	0.000	0.000
W3*gender	0.105664 **	0.1211 **	0.084 *	0.085 **
	0.044	0.050	0.047	0.042
W3*part_salar	-0.309	-0.494 **	-0.118	-0.344
	0.209	0.229	0.207	0.216
W3*age_upi	0.000	-0.016	0.000	-0.014
	0.001	0.012	0.001	0.011
W3* Tax_percep			0.145	0.221 *
			0.124	0.119
W3*account			-0.246 **	-0.213 *
			0.117	0.119
W3*En_spirit			0.087	0.244 ***
			0.078	0.080
W3*m5_sq		-0.0002 *		-0.0002 *
		0.000		0.000
W3*nivins_sq		0.137 ***		0.184 ***
		0.042		0.041
W3*valk_sq		0.000		0.000
		0.000		0.000
W3*ageupi_sq		0.000		0.000
		0.000		0.000

The dependent variable is the micro-operator pays for the discharged tax.
Standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1.

5. Does business licenses influence the productivity of micro-activities

Constrained gazelles

As the total effects briefly mentioned, variables: age of the head, his level of education, the nature of the facilities and the share of salaries positively stimulate tax payments' decision in the constrained gazelle's environs.

The nature of the installations is a great predictor of the tax payment of constrained gazelles since it remains significant under different specifications and explained about 19% to 24% of the probability to pay tax.

The variable gender also strongly influences the decision to pay tax. If the head of the observed enterprise is a female, the probability to contribute to taxation is reduced from 13% to 17%. The value of the capital and the age of the unit do not explain the tax payment (Table 4.11).

Adding squared variables to the previous equation also confirm the presence of a non-linear effect of the head of unit's age on the probability of tax payment. Initially estimated to vary from 0.02 to 19% increase of the likelihood to pay, an older head of unit will reduce the probability of payments by 0.002% on average.

The new variables added are once again significant. Having a wrong perception of the tax system increases the probability to pay tax by about 22%. Keeping an account even if, it is not detailed increases the probability to pay tax by 7.8%. The fact to have created its company to be more independent or make more money also increases the probability to pay tax by 6.5%. As mentioned earlier, this may indicate that the willingness to see the enterprise grow, drives the head to meet its obligation to the tax administration Table (4.11).

The feedback effect of the personal characteristics of constrained gazelles' on micro-operators reveals that the age of the head, the type of facilities in which he/she works and the lifespan of firms produce spillover effect on the other firms. The older the head of constrained gazelles' unit is, the probability to pay tax of the studied firm increases by 1.14%. If the firm

5. Does business licenses influence the productivity of micro-activities

operates in fixed premises, the probability of payment of the observed is reduced from 38% to 42%.

Knowing that the neighbor is an older enterprise increases the probability to pay on average by 2.8%. The age of the head and also the lifespan of the enterprise got a nonlinear effect on the tax payment, meaning that the older the operator or these firms are, the more the probability to pay taxes will decrease.

However the effect are low (respectively 0.04% or 0.004%). Only the fact that the constrained gazelles keep an undetailed account and its entrepreneurship's spirit may influence the tax payment of the other operators from 14% to 19%. The tax perception variable is still negative but not significant. In general, combining all variables in the same model lead to similar signs and significance than previously (Table 4.11).

5. Does business licenses influence the productivity of micro-activities

Table 4.11: Constrained Gazelle's direct effects

	(1)	(2)	(3)	(4)
m5	0.001 ***	0.019 ***	0.001 ***	0.015 ***
	0.001	0.003	0.001	0.003
nivins1	0.025 ***	0.037	0.018 **	0.025
	0.009	0.047	0.009	0.042
typ_local	0.245 ***	0.230 ***	0.201 ***	0.193 ***
	0.013	0.013	0.012	0.012
val_k	0.000	0.000 ***	0.000	0.000 ***
	0.000	0.000	0.000	0.000
Gender	-0.178 ***	-0.175 ***	-0.142 ***	-0.139 ***
	0.014	0.013	0.015	0.012
part_salar	0.100 ***	0.061 **	0.045	0.018
	0.030	0.028	0.029	0.027
age_upi	0.000	-0.000	0.000	-0.001
	0.000	0.002	0.000	0.002
Tax_percep			0.227 ***	0.216 ***
			0.014	0.014
Account			0.078 ***	0.071 ***
			0.017	0.017
En_spirit			0.065 ***	0.065 ***
			0.013	0.011
m5_sq		-0.000 ***		-0.000 ***
		0.000		0.000
nivins_sq		-0.004		-0.002
		0.010		0.009
valk_sq		0.000		0.000
		0.000		0.000
ageupi_sq		0.000		0.000
		0.000		0.000
W2*m5	0.011 ***	0.0344 ***	0.007 ***	0.029 **
	0.003	0.012	0.003	0.012
W2*nivins1	-0.034	0.080	-0.050 *	-0.010
	0.029	0.238	0.028	0.224
W2*typ_local	-0.422 ***	-0.422 ***	-0.385 ***	-0.392 ***
	0.063	0.062	0.062	0.063
W2*val_k	-0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000
W2*gender	0.041	0.065	0.042	0.052
	0.048	0.046	0.051	0.048
W2*part_salar	-0.127	-0.239	-0.170	-0.222
	0.206	0.215	0.205	0.209
W2*age_upi	-0.004 ***	-0.037 ***	-0.004 ***	-0.024 *
	0.002	0.013	0.002	0.013
W2* Tax_percep			0.067	-0.032
			0.091	0.095
W2*account			0.199 **	0.179 *
			0.097	0.099
W2*en_spirit			0.143 *	0.068
			0.081	0.073
W2*m5_sq		-0.000 **		-0.000 **
		0.000		0.000
W2*nivins_sq		-0.050		-0.026
		0.045		0.055
W2*valk_sq		0.000		0.000
		0.000		0.000
W2*ageupi_sq		0.000 **		0.000
		0.000		0.000

Dependent variables is the micro-operator pays for the discharged tax.
Standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1.

5. Does business licenses influence the productivity of micro-activities

Top-performers

In general, the nature of the facilities where activities are carried out, the number of paid employees and the gender of the head of units explained tax payments of businesses in the environs of the top performers. Although the fixed facilities and the share of the salaries increase this probability respectively from 16.5% to 20.7% and from 5.2% to 7.3%, being a female head of the unit reduce the likelihood to pay taxes.

Here again, a wrong perception of the tax system increases the probability to pay tax by 23%. However, keeping undetailed account or being more independent increase from 5.02% to 7.17% the payment of tax (Table 4.12). The level of education or the age of the unit do not drive tax payments, at least when squared values are not added.

Once introduced, squared value turn the variable “age of the head of the unit” to be significant. Indeed, the probability of paying taxes increases by 1.3% when the leader's age increases by one. However, there is a threshold effect from which, getting another year reduces the likelihood of paying taxes.

Feedback effects from top performers are observed through three variables: the age of the entrepreneur, the type of premises, and the age of the business. Working in fixed facilities and the age of the business have a negative impact on the probability of payment. This means that when firms have top-performing businesses in their neighborhood working in fixed premises, a negative retroactive effect from about 17.68% to 30% on the tax payment is observed.

Knowing that this neighbor has a great number of employees also produce a negative feedback effect too (about 48% to 66%). The older the principal neighbor is, the more the probability to pay taxes of the observed firm is reduced (Table 4.12). These results show that whether the top performer possesses visibility criteria, the probability of the others to pay tax is reduced.

5. Does business licenses influence the productivity of micro-activities

As explained before, the enforcement of tax administration – which has limited resources – on noticeable enterprises favor their tax payment when the dynamics put to enforce the others is reduced. But if we considered the hypothesis of social interactions, we can also explain these results by the fact that the neighbor of top-performers may have some free riding attitudes. It induces other firms to evade taxes and benefit from public goods since they know top-performers pay and the tax administration difficultly succeed to enforce them.

5. Does business licenses influence the productivity of micro-activities

Table 4.12: Top-performer's Direct Effects

	(1)	(2)	(3)	(4)
m5	0.001	0.015 ***	0.001	0.011 ***
	0.001	0.003	0.001	0.003
nivins1	0.002	0.030	-0.002	0.011
	0.008	0.042	0.009	0.040
typ_local	0.207 ***	0.197 ***	0.169 ***	0.165 ***
	0.013	0.013	0.013	0.011
val_k	0.000	0.000 ***	0.000	0.000 **
	0.000	0.000	0.000	0.000
Gender	-0.164 ***	-0.163 ***	-0.127 ***	-0.128 ***
	0.013	0.014	0.013	0.013
part_salar	0.073 ***	0.052 *	0.037	0.022
	0.027	0.031	0.028	0.027
age_upi	0.0001	0.000003	0.000	-0.000
	0.000	0.002	0.000	0.002
Tax_percep			0.230 ***	0.222 ***
			0.013	0.014
Account			0.072 ***	0.065 ***
			0.016	0.018
En_spirit			0.050 ***	0.05 ***
			0.012	0.012
m5_sq		-0.0002 ***		-0.0001 ***
		0.000		0.000
nivins_sq		-0.007		-0.004
		0.009		0.008
valk_sq		0.000		0.000
		0.000		0.000
ageupi_sq		0.000		0.000
		0.000		0.000
W1*m5	0.008 **	0.022	0.005	0.028
	0.004	0.020	0.004	0.018
W1*nivins1	0.081 *	0.067	0.067	-0.225
	0.042	0.314	0.042	0.313
W1*typ_local	-0.303 ***	-0.276 ***	-0.177 *	-0.173 **
	0.080	0.078	0.092	0.087
W1*val_k	0.000 **	-0.000	0.000	-0.000
	0.000	0.000	0.000	0.000
W1*gender	-0.043	-0.073	-0.023	-0.054
	0.066	0.077	0.071	0.069
W1*part_salar	-0.660 **	-0.718 **	-0.487 *	-0.570 *
	0.289	0.281	0.253	0.303
W1*age_upi	-0.005 **	-0.014	-0.004 *	-0.013
	0.003	0.022	0.002	0.021
W1* Tax_percep			0.122	0.153
			0.147	0.143
W1*account			-0.002	-0.015
			0.137	0.162
W1*en_spirit			0.023	0.041
			0.115	0.120
W1*m5_sq				-0.0003
		0.000		0.000
W1*nivins_sq		-0.006		0.063
		0.071		0.070
W1*valk_sq		0.000		0.000
		0.000		0.000
W1*ageupi_sq		0.0001		0.0001
		0.000		0.000

The dependent variable is the micro-operator pays for the discharged tax.

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

5. Does business licenses influence the productivity of micro-activities

4.4.2.3 The indirect effect

This section presents spillover effects of the decision of tax payment of i th observation on the others. Even though they appear significant, the effects are lower than former.

Top-Performers

Equation (4) reveals that very few characteristics of firms working in the neighborhood of top-performers produce a significant spillover effect on the other individuals. Some variables explained more dependence effects than others but the effect is not robust under all specification.

Consequently, for equation (1), the type of facilities, the share of salaries and the gender of the head explained tax payments in the firms in the environs of the top-performers. The age of the observed (firm exerting its activities near to top-performing activities) contribute to increase of 0.3%, the probability to pay by its neighbor. If this firm gets a fixed facility, this situation reduces by 11.6% the probability to pay tax of the studied individuals. Adding the other controls reduce the significance of dependence effects (Table 4.13).

5. Does business licenses influence the productivity of micro-activities

Table 4.13: Top-performer's Indirect Effects

	(1)	(2)	(3)	(4)
m5	0.0001	0.002 **	0.0001	0.001
	0.000	0.001	0.000	0.000
nivins1	0.000	0.003	-0.0001	0.000
	0.001	0.005	0.001	0.003
typ_local	0.024 ***	0.021 **	0.012	0.010
	0.009	0.009	0.008	0.007
val_k	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000
Gender	-0.019 **	-0.017 **	-0.009	-0.008
	0.008	0.009	0.007	0.006
part_salar	0.008 **	0.006 *	0.002	0.001
	0.004	0.003	0.002	0.002
age_upi	0.000	-0.000	0.000	-0.000
	0.000	0.000	0.000	0.000
Tax_percep			0.017	0.013
			0.010	0.010
Account			0.005 *	0.004
			0.003	0.003
En_spirit			0.004	0.003
			0.002	0.002
m5_sq		-0.000 *		-0.000008
		0.000		0.000
nivins_sq		-0.001		-0.0002
		0.001		0.001
valk_sq		0.000		0.000
		0.000		0.000
ageupi_sq		0.000		0.000
		0.000		0.000
W1*m5	0.001 **	0.002	0.000	0.002
	0.000	0.002	0.000	0.001
W1*nivins1	0.009 *	0.008	0.005	-0.014
	0.005	0.040	0.003	0.028
W1*typ_local	-0.035 *	-0.030	-0.013	-0.010
	0.019	0.020	0.015	0.011
W1*val_k	0.000 **	0.000	0.000	0.000
	0.000	0.000	0.000	0.000
W1*gender	-0.004	-0.007	-0.001	-0.003
	0.008	0.009	0.006	0.006
W1*part_salar	-0.076	-0.075	-0.034	-0.034
	0.054	0.054	0.035	0.041
W1*age_upi	-0.001	-0.001	-0.0003	-0.001
	0.000	0.003	0.000	0.002
W1* Tax_percep			0.007	0.008
			0.013	0.009
W1*account			-0.000	-0.001
			0.014	0.013
W1*en_spirit			0.002	0.002
			0.010	0.010
W1*m5_sq		-0.000		-0.000
		0.000		0.000
W1*nivins_sq		-0.001		0.004
		0.010		0.005
W1*valk_sq		0.000		0.000
		0.000		0.000
W1*ageupi_sq		0.000		0.000
		0.000		0.000

The dependent variable is the micro-operator pays for the discharged tax.
Standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1.

5. Does business licenses influence the productivity of micro-activities

Constrained gazelles

A change in the personal characteristics of firms in the environs of constrained gazelles seems to significantly impact the decision of others to pay taxes. The age of the head, the level of education, the type of facilities in which businesses are carried out and the share of salaries may strongly influence the tax payments.

Compared to a male-run units, being in the neighborhood of a female, reduce the probability of the operators from 2% to 5%. Carrying out businesses nearest to constrained gazelles and having a negative perception of the tax system increase the probability to pay tax by 3.2%.

The probability is still positive but less than the one observed for top-performer activities. If the head of this business keep undetailed account and had created its business to be more independent or earn more money, those features should increase the probability for the others to pay tax from around 0.9% to 1.1%.

Concerning feedback effect, a change in the personal characteristics of constrained gazelles will strongly affect the tax payment of the studied individuals. In fact, whether they are older or work in fixed facilities will respectively produce a positive impact of 0.4% and a negative incidence from about 0.1% to 11% on the probability to pay tax (Table 4.14). Once again, contrary to the other categories, having a misperception of the tax system should negatively impact tax payment but the effect is insignificant.

5. Does business licenses influence the productivity of micro-activities

Table 4.14: Constrained Gazelle's indirect effects

	(1)	(2)	(3)	(4)
m5	0.0002 ** 0.000	0.004 *** 0.001	0.0004 *** 0.000	0.002 *** 0.001
nivins1	0.002 ** 0.001	0.008 0.010	0.007 *** 0.002	0.004 0.007
typ_local	0.028 *** 0.010	0.050 *** 0.010	0.067 *** 0.011	0.029 *** 0.009
val_k	0.000 0.000	0.000 0.000	0.000 0.000	0.000 ** 0.000
Gender	-0.020 ** 0.008	-0.038 *** 0.008	-0.049 *** 0.009	-0.021 *** 0.007
part_salar	0.006 * 0.004	0.013 ** 0.006	0.028 *** 0.009	0.003 0.004
age_upi	0.000 0.000	-0.0001 0.000	0.000 0.000	-0.0001 0.000
Tax_percep	0.032 *** 0.012			0.033 *** 0.010
Account	0.011 *** 0.004			0.011 *** 0.004
En_spirit	0.009 *** 0.003			0.010 *** 0.003
m5_sq		-0.000 *** 0.000		-0.000 ** 0.000
nivins_sq		-0.001 0.002		-0.000 0.002
valk_sq		0.000 0.000		0.000 0.000
ageupi_sq		0.000 0.000		0.000 0.000
W2*m5	0.001 ** 0.000	0.007 *** 0.003	0.003 *** 0.001	0.004 ** 0.002
W2*nivins1	-0.007 0.005	0.017 0.049	-0.009 0.009	-0.001 0.039
W2*typ_local	-0.054 ** 0.027	-0.091 *** 0.022	-0.116 *** 0.027	-0.059 ** 0.025
W2*val_k	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
W2*gender	0.006 0.007	0.014 0.010	0.012 0.013	0.008 0.007
W2*part_salar	-0.024 0.036	-0.050 0.047	-0.034 0.057	-0.033 0.039
W2*age_upi	-0.000 * 0.000	-0.008 ** 0.003	-0.001 ** 0.000	-0.004 0.003
W2*Tax_percep	0.008 0.013			-0.006 0.018
W2*account	0.028 ** 0.014			0.027 * 0.015
W2*en_spirit	0.020 * 0.011			0.010 0.010
W2*m5_sq		-0.000 ** 0.000		-0.000 * 0.000
W2*nivins_sq		-0.011 0.011		-0.004 0.010
W2*valk_sq		0.000 0.000		0.000 0.000
W2*ageupi_sq		0.0001 ** 0.000		0.000 0.000

The dependent variable is the micro-operator pays for the discharged tax.

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

5. Does business licenses influence the productivity of micro-activities

Survivalists

Fixed facilities of survivalists' neighbor increase the probability to pay by 3.6%. A female-run enterprise contributes to reducing the probability of the neighbor to pay tax of 3.2% less than a male. An increasing share of salaries in the environs of survivalist enterprise raise by 2.01% the probability of others to pay tax.

Regarding the feedback effect of survivalists' personal characteristics, only the fact that the neighbor is a female increases by 2.22% the probability to pay tax. The nature of installations of those neighbors increases from 0.1% to 0.6% the probability to pay. A negative perception of the tax system of the neighbor increases the probability to pay by 3.3%. The fact the survivalists keep account (not detailed) increase by 1.1%, the probability of payment of neighbors. However, those results are not robust under all the specification (Table 4.15).

5. Does business licenses influence the productivity of micro-activities

Table 4.15: Survivalist's indirect effects

	(1)	(2)	(3)	(4)
m5	0.0001	0.001	0.0001	0.000
	0.000	0.001	0.000	0.001
nivins1	-0.001	0.006	-0.001	0.0004
	0.003	0.006	0.002	0.005
typ_local	0.036 ***	0.017	0.022 *	0.0005
	0.014	0.012	0.012	0.009
val_k	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000
Gender	-0.033 **	-0.017	-0.018	-0.0004
	0.013	0.015	0.012	0.009
part_salar	0.020 **	0.008	0.007	0.000
	0.008	0.006	0.004	0.003
age_upi	0.000	0.0001	0.000	-0.000
	0.000	0.000	0.000	0.000
Tax_percep			0.034*	0.0001
			0.018	0.014
Account			0.011 *	0.0003
			0.006	0.005
En_spirit			0.005 *	0.000
			0.003	0.003
m5_sq		-0.000		0.000
		0.000		0.000
nivins_sq		-0.001		-0.0001
		0.002		0.001
valk_sq		0.000		0.000
		0.000		0.000
ageupi_sq		-0.000		0.000
		0.000		0.000
W3*m5	-0.0001	0.002	-0.0001	0.000
	0.000	0.001	0.000	0.002
W3*nivins1	-0.008	-0.055	-0.004	-0.001
	0.006	0.049	0.004	0.048
W3*typ_local	0.007	0.015	-0.001	-0.001
	0.018	0.013	0.014	0.014
W3*val_k	0.000	-0.000	0.000	0.000
	0.000	0.000	0.000	0.000
W3*gender	0.022 **	0.013	0.013 *	0.0005
	0.010	0.009	0.007	0.006
W3*part_salar	-0.062	-0.045	-0.017	-0.0001
	0.054	0.057	0.037	0.025
W3*age_upi	-0.0000	-0.001	-0.000	0.0001
	0.000	0.002	0.000	0.001
W3* Tax_percep			0.018	0.0004
			0.017	0.015
W3*account			-0.033	-0.0002
			0.031	0.014
W3*en_spirit			0.011	0.0001
			0.012	0.016
W3*m5_sq		-0.000		-0.000
		0.000		0.000
W3*nivins_sq		0.013		0.0002
		0.009		0.012
W3*valk_sq		0.000		0.000
		0.000		0.000
W3*ageupi_sq		0.000		-0.000
		0.000		0.000

The dependent variable is the micro-operator pays for the discharged tax.
Standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1.

4.5 Conclusion

The paper analyzed tax compliance behaviors of Cameroon micro-operators. Its principal goal is to specify that spillover exist which could facilitate the mobilization of taxes by reducing the level of resources injected by tax authorities during the process of collection. Indeed, we assumed that social interactions if they exist in the micro-activities may favors positive spillover effects in terms of tax compliance.

This chapter differs from its predecessors in literature by the use of an innovative spatial econometric model to apprehend social dependences. The approach was to construct closest link between individuals which may explain social interactions between micro-operators.

Different weight matrices have been tested to assess the concept of proximity. Most of them pass the LM-tests meaning that spatial autocorrelations cannot be ignored in the analysis of tax compliance in the Cameroon micro-activities. But the combination of the geographical level, the participation to a branch of activity and the membership to a category according to the [Grimm *et al.* \(2012\)](#) typology seems to describe a strong and robust link for businesses.

Concerning the channels of transmission of those interactions, both heads of the unit and firms' visibility criteria continue to explain tax payments in the Cameroonian micro-activities. If the motivation for the creation of the business was the desire to be more independent and earn more money were the main goals of operators, the probability of tax payment increased.

Then we can conclude that firms who want to grow their business comply with the tax administration. In addition, those kinds of firms seems to have spillover effects on others since, this entrepreneur spirit tends to influence the decision of their neighbor to pay taxes. Looking at the fact that entrepreneur keeps undetailed account or not reinforce this view.

Unfortunately, the variable of perception of the tax system which should represent a more accurate indicator in terms of taxation produces some ambiguous results. As a personal characteristic of the observed firm, a misperception of the tax system boosts its tax payment.

5. Does business licenses influence the productivity of micro-activities

This is counterintuitive since as [Andreoni, Erard, and Feinstein \(1998\)](#); [Armah-Attoh and Awal, \(2013\)](#) claimed, “*an increase in the perception that the tax system is unfair or that taxes are higher or unfordable increases the odds to evade taxes.*” It may reveal that in Cameroon, micro-activities which pay their taxes are enforced by the tax administration.

However, looking at the spillover effect of this variable on the other firms, only survivalist and top performer’s firms with a misperception of the tax system seem to encourage the neighboring firms. The effect is only significant in the case of survivalist activities. For the constrained gazelles, having a misperception of the tax system, decrease the probability of tax payment for the nearest firms.

Even if this finding requires more investigations (the effect is non-significant across specifications), this effect combine to the fact that the desire to see its firm growth encourage tax payments, let us believe that constrained gazelles should be the group of micro-operators we are looking for. Indeed, as the study indicated, the behavior towards the tax of a micro-operator is the sum of the change in its firm characteristics and its environment which may influence the decision to pay tax or not.

The existence of businesses in the neighborhood of firm i , with a negative perception of the tax system and which may have a negative impact on the probability of paying for taxes is, therefore, a greater risk for the mobilization of public resources.

As a reminder, the calculation of the rho showed that spillover effects coming from constrained gazelle businesses’ decision on tax payment, strongly impact the others. The effect is robust across specifications.

Tax authorities should pay more attention to this category. Building a close relationship with constrained gazelles could help the government keep an eye on them, reduce their negative perception of the tax system, and favors positive feedbacks effects.

5. Does business licenses influence the productivity of micro-activities

In addition, the constrained gazelles possess a high potential for growth. Giving them access to credit may help them improve their business and being voluntarily compliant with the tax system.

What happens now when those constrained gazelles pay taxes? How their productivity and efficiency are affected by tax payments? These are the questions; next chapter will answer to ensure the implementation of policies exposed in the third chapter is possible.

4.6 Annex: Description of studied variables

Variables	Description
M5	Age of the promoter
Nivins1	Level of studies
Tax_percep	Perception of the tax system (1=too more tax)
Typ_local	Type of location
Val_k	Capital
Gender	Gender (1=female)
Account	Book-keeping not detailed (1=yes)
En-spirit	Entrepreneurship spirit
Part_salar	Part of salaries
Age_upi	Age of the unit
Imp_lib	Discharged tax

5. Does business licenses influence the productivity of micro-activities: an evaluation of the gender bias in Madagascar⁵⁹?

⁵⁹ Joint research program with Iary Rakotonradany (INSTAT-Madagascar) and Jean-François Brun (CERDI/CNRS-UCA)

5. Does business licenses influence the productivity of micro-activities

5.1 Introduction

Researchers have long been interested in how taxation impacts informal firms and economic growth in developing countries. For example, [Friis-Hansen and Kyed \(2009\)](#) or [Fajnzylber, Maloney and Rojas \(2009\)](#) found that tax designs favoring relationship between informal firms and tax administrations or resulting in the supply of better local public goods and services increase the incentives to become formal. In the opposite, inadequate policies may lead to adverse effects such as an impoverishment of an already vulnerable population ([Chambas, 2005](#)), the reinforcement of tax evasion practices ([de Soto, 1989](#)) or an incentive to remain in the informal sector ([Maloney, 2004](#)).

More generally, [Bahigwa, Ellis, and Iversen \(2004\)](#), [Devas and Kelly \(2001\)](#) or [Sander, \(2003\)](#) found that *many local taxes have a distorting effect on resource allocation decisions and may create an inhibiting effect on the start-up of new enterprises and the achievement of economic growth* ([Fjeldstad, Chambas, and Brun, 2014](#)).

In this chapter, we discuss the fact that paying for local taxes, for our “game-changer” should not have a negative impact on its growth. If that was the case, lack of tax compliance could emerge in the “game changer” category. Then, the existence of spillover effect in the process of tax payments should worsen tax evasion especially for constrained gazelles’ neighbors. Therefore, the objective of this section is to assess empirically the incidence of local taxes⁶⁰ (especially business licenses⁶¹) on the profitability of micro-operators.

To investigate this impact, we use a very-detailed database on Malagasy informal firms in 2012. The original database is nationwide and provides information on the owner, the characteristics and the performance of the firm.

⁶⁰ A set of taxes is defined by the law 94-007.

⁶¹ Law 94-007 displays a set of revenue that can be collected by local authorities in Madagascar. Among this group of taxes, only business licenses and market fees are applied to the micro-activities. Other taxes such as tax on land, property tax, non-salaried income tax, etc. are not collected from micro-activities. According to the available data, the study proposes to analyze only the effects of business licenses on the performance of the micro-activities. Indeed, market fees seem to encompass a combination of taxes that may have non-homogenous consequences for the business.

5. Does business licenses influence the productivity of micro-activities

We put a particular emphasis on the study of the gender gap in firm performance. Actually, [de Mel et al., \(2008\)](#), [Grimm et al. \(2012\)](#), [Fafchamps et al., \(2014\)](#), [Ravelomanantsoa et al. \(2016\)](#), etc., revealed that female-run enterprises underperformed subsequently compared to male-run businesses. This underperformance may be explained by lower levels of human and physical capital for female-run activities, a higher concentration in underperforming activities and/or a difficult access to credit.

In the Malagasy case, [Nordman and Vaillant \(2014\)](#) indicated that the existence of strong social norms (family pressure, sharing norms, etc.) and also the presence of children or elderly in the family may discourage female work, out of the household. In this chapter, descriptive statistics tend to confirm those facts.

Female-run business are mostly underperforming activities (58%). Women work fewer hours than men in the week and allocated at least 7 hours (versus 2 per male), at home, babysitting children and taking care of elderly. Accordingly, the size of the human capital is higher in a male-run firm than others.

In addition, men employ at least one employee. Around 30% of them work in dedicated facilities against less than 25% for women. Turnover and return on capital of male-running firms are also higher than in female businesses. These stylized facts seem to forecast some underperformance into female-run companies.

However, very little attention has been paid to the potential gender bias than local taxes may create. A priori, local taxation should be gender neutral as the tax rates are independent of gender. However, women and men may have a different perception of taxes leading to a non-neutral gender effect. [The National Employment and Informal Sector survey in Madagascar \(2012\)](#) suggests that attitude vis-à-vis taxation differs from male to female run-firms. Women (7%) are less than men (9.5%) considering registering their business with the tax administration. Their willingness to pay taxes is lower compared to men (40% against 70% for men).

5. Does business licenses influence the productivity of micro-activities

We could then assume that male firms could be more impacted by local taxation than female-run businesses. But, we notice that female-run companies pay on the average more taxes than men (1480 Ariary versus 1135 Ariary for men). This point may contribute raising gender bias regarding profitability.

We rely on propensity score matching to examine the impact of business licenses on the productivity of the micro-activities in Madagascar. Following the work of [Fajnzylber et al. \(2006\)](#), [Kere et al. \(2017\)](#) or other authors, we choose this methodology to design a group of control which possesses similar observable features than the treated of the study. Indeed, the Malagasy database does not display the information of micro-operators before and after receiving the treatment.

Appeared in the study of [Rosenbaum and Rubin \(1983\)](#), Propensity Score Matching (PSM) allows the comparison of a participant to treatment with non-participant according to their probability to receive the treatment, conditionally to similar pre-treatment observable characteristics. Here, we consider as propensity score, the probability of paying for taxes given the observable characteristics. This probability is estimated using probit regression. The treatment is the business license variable which takes 1 if the firm pays for taxes and 0 otherwise.

Based on the idea that the groups of comparison must be as comparable as possible of the treated, various assumptions are tested in the chapter. First, the analysis is completed distinctly on male and female-run firms.

As mentioned earlier, female-run firms underperformed compared to male-run enterprises. Allowing in the group of comparison, a female-run firm as a control of a male-run firm may introduce some bias since the same amount of taxation applied to those both enterprises may lead to a greater gap of performance for female-run firms.

5. Does business licenses influence the productivity of micro-activities

Another problem may arise since the treatment variable takes 1 if the firm pays taxation and 0 otherwise. In this way, a firm paying 500 Ariary and another paying 5 Ariary are treated similarly. They can both be assigned a control which should have to pay 5 Ariary as tax if the counterfactual is not strictly defined.

According to the level of firms' performance, the amount of tax to pay may not be similar, and the effect of business license may vary distinctly. The sample is then divided into subcategories of performance using [Grimm *et al.* \(2012\)](#) as explained in chapter 4.

Based on the finding of [Nordman and Vaillant \(2014\)](#) that an important time allocation of women in the household may favor underperformance of the firms they run, we assume that married women will allocate more time to household chores than others. Firms run by married women and single women may not have the same level of performance. Then, the group of female-run firms is also divided into two subsamples.

Findings of the section are quite interesting. It appears that: (i) local tax payments lead to significant profits within micro-activities. These results are consistent with the findings of [Fajnzylber *et al.*, \(2006\)](#) which concluded that paying taxes leads to a significant rise of firm profits. (ii) However, taking into account membership of categories of micro-activities mitigated those results. More performing firms are negatively and significantly impacted by tax payments while survivalists' productivity is strongly stimulated by tax payments. Results are mitigated into constrained gazelle firms. (iii) The results reveal a gender bias created by local taxation in the Madagascar micro-activities. Indeed, compared to male, female head of a tax-paying unit are more productive.

The remainder of the chapter is structured as follows. Section 5.2 presents the database and the framework of local taxation in Madagascar in 2012. Section 5.3 displays the empirical strategy and the results of the analysis and we conclude in section 5.4.

5. Does business licenses influence the productivity of micro-activities

5.2 Data

As in the previous chapter, we rely on 1-2-3 surveys as recommended by DIAL-IRD to apprehend the composition and the functioning of micro-activities. We remind that 1-2-3 surveys are carried out in three phases. In the first phase, the national employment survey allows distinguishing (1) unregistered from registered firms and (2) firms that do not keep detailed accounts from firms that do so. In the second phase, a specific survey⁶² is applied only to production units⁶³ (unregistered or undetailed accounting firms) again at the national level. The last survey evaluates population living conditions.

Here, we employ the National Employment and Informal Sector survey in Madagascar (ENEMPSI) in 2012. As the study assesses the productivity of informal firms, the analysis is essentially based on the second part of the survey.

Phase 2 of the Malagasy 1-2-3 survey covers 6000 informal production units among which 5121 enterprises are retained for this analysis. These businesses are chosen considering their turnover. According to the Tax Book of Madagascar, firms with a turnover superior of 20 million Ariary must be enrolled in the actual earnings taxation or the simplified taxation system. We then considered as informal firms in this study, firms with an annual turnover, lower than 20 million Ariary ([Direction Générale des Impôts, 2012](#)).

This second phase of the [National Employment and Informal Sector survey in Madagascar \(2012\)](#) reveals that the informal sector size has significantly increased, due to the political crises, during the decade 2002-2012. The informal sector contributes to 24% of GDP creation and 93% of job creation (75% in the agricultural sector) in 2012 against 59.8% in 2002 ([INSTAT, 2013](#)).

⁶² This survey assesses the functioning and the characteristics of the informal firms.

⁶³ A production unit may be an establishment where the economic activity is carried out a permanent premise (shop, workshop, etc.) or a pseudo-establishment when the activity is not exercised in an appropriate premises (itinerant activities, on public roads, in homes, etc.) See the manual of the interviewer ([INSTAT, 2013](#)).

5. Does business licenses influence the productivity of micro-activities

Descriptive statistics show that the micro-operators are, on average 38 years old. Their production units typically exist for 10 years. The sample is composed of 54% of women. Among them, 63% are married. 58% of low performing activities are carried out by women. In general, operators went to secondary school. Unmarried women go beyond the secondary school; unmarried female running constrained gazelles firms generally undertake university studies.

Professional experience is on the average 9 years. Non-married women normally work for 10 years while others have worked for 9 years. However, married women in the top performers' category have worked since 6 years while others have usually, 8 years of professional experience. Non-married female-running constrained gazelles' activities have a professional experience of 13 years while other women and men work respectively since 7 and 10 years. Survivalist are aligned with the sample average.

Operators worked, on the average 157 hours, women relatively work less (152) than men (161). However, distinguishing according to the level of performance, it seems that some women in high performing categories work more than the sample mean and tend to exceed men average. For example, non-married women in top performers' category work 207 versus 196 hours for men; constrained gazelles' women work 163 hours while men work 159 hours per month.

The discrepancy between married and non-married women seems to persist. Actually, non-married women top performer work around 10 hours more than married women. Only survivalists' activities managed by men work subsequently longer than women (136 against 150 hours).

A study of the time used for domestic activity mitigated the previous statistics. Women worked at least 7 hours per week, at home, babysitting children and taking care of the elderly. Men allocated only 2 hours per week to these tasks. A comparison between married and non-

5. Does business licenses influence the productivity of micro-activities

married women revealed that the formers' work on the average 9 hours at home while the latter allocate 6 hours to those tasks. These statistics are similar across the micro-activities.

Men employed at least one employee more often than women. Their share of salaries is larger than the average of the sample (12% versus 7%) and represents more than 6 times the number of female-run firms with at least one employee. This difference persists even if the sample is divided by category of performance. Apart from the subsample of top performers, married women are greater in employing at least one paid worker than others.

The main reason for the creation of micro-activity in Madagascar is the entrepreneurial spirit (72%), meaning that firms were created to yield more revenue, become independent or follow the family tradition. Married women are generally greater in number to have created their activity because of their entrepreneurship.

Industry, commerce, and services are more attractive for micro-operators. In fact, around 36 % of them are found in industry, 36.83% in commerce and around 15% in services. Men also work subsequently (15%) in construction and transport, but less represented in service sector. Married and non-married women are not different on the average than the full sample. However, top performers' female-run firms are more involved (64%) in commercial activities. Constrained gazelle or survivalist women generally operate in industry, commerce, and services. However, survivalist women work more in industry (around 50%). Men (around 30%) work more than women (21-23%) in a dedicated facility.

Only 7.77% of the operators, aware of the role of micro-finance institutions, requested and received a credit. Among them, women and especially married women usually obtain the credit. Fourteen out of hundred performing women obtain credit while 3.03% of non-married women do; 7.56% of men have received the requested credit. In the constrained gazelles' category, both married and unmarried women obtain more than 10 times requested credits.

5. Does business licenses influence the productivity of micro-activities

Survivalists are lesser than the other categories to receive a loan: only 5-6% requested and received one.

Men's turnover is generally higher than women with a gap, typically equal to 40,272 Ariary. Unmarried women realized less profit than married. The gap is around 45,118.8 Ariary. As expected, top performer enterprises generate a higher level of profit. However the gap between the three categories is sensibly high. For example, married women running the more performing activities made more than 5 times the profit of survivalists and at least twice, the profits of constrained gazelles.

Earnings before removing interest, depreciation, and taxes are on the average 121,303 Ariary. A mean gap of 47,375 is recorded among females and males-runs firms. Apart from performing enterprises, women generally recorded a level of EBITDA lower than the average sample. Men also have higher levels of capital than female run activities. Married women possess a higher level of capital than others. Only the survivalist category seems to be different.

As a strategy to develop their activity, more than 50% of the sample do nothing to improve their revenues. Unmarried women and men prospected for new customers, changed supplier to reduce their cost, moved to a less expensive facility or limited salary increase to improve their firm profits.

Previous statistics showed that female-run firms present different features than the male-run activities. These differences can introduce a gender bias on the performance of the micro-activities. Moreover, the National Employment and Informal Sector survey in Madagascar (2012) suggests an attitude vis-à-vis taxation of both men and women, which are different and may also create a gender bias regarding profitability. Indeed, women (7%) are less prone to consider registering their business with tax administration than men (9.5%). Their willingness to pay taxes is also lower (40% against 70% for men). But, on the opposite, they pay on the average higher taxes than men.

5. Does business licenses influence the productivity of micro-activities

Although they seem to be less compliant, women pay more tax per capita (1480 Ariary versus 1135 Ariary for men). Moreover, men are greater in number than women considering regulation or taxation as a barrier to the growth of their activity. 7.32% of the sample pays the business license. Among them, 57% are men; 70% of women who pay their taxes are married; around 48.8% are top-performers, 37% are constrained gazelles and only 14% of those who pay the business license are survivalists. The high level of standard deviation revealed a great heterogeneity in the sample of the study.

According to the [Malagasy tax book \(2012\)](#), micro-activities should be subject to the synthetic taxation. However, until 2012, synthetic taxation planned by the Tax Book was not effective yet. Taxes paid by the micro-activities were still defined by the Law 94-007 on the powers and competencies of decentralized (local) authorities. Law 94-007 displays a set of revenue that can be collected by local authorities. Among them, only two taxes are applied to the micro-activities: the business licenses and the market fees.

Other taxes such as taxes on land, property tax, non-salaried income tax, etc. are not collected for micro-activities. Market fees are composed of a different range of taxes⁶⁴. In the Malagasy database, no distinction has been made according to the type of market fees, known as “other taxes”. For this reason and given the variety of effects which may arise from those taxes, the paper will only focus on the effect of the business license on the firm performance. The business license is defined according to several combinations of indicators⁶⁵. An annex of the Malagasy tax book summarizes the amount of business license to be paid in each category.

5.2.1 The Dependent variable

Measures of performance are built to appreciate the economic soundness of the firms. They allow evaluating the accurate level of production of the firm. According to [OECD \(2001\)](#),

⁶⁴ Tax on license of sales for spirits and alcoholic products or taxes on motor vehicles which concern various field of activity, for example.

⁶⁵ The nature of the activity, the level of population of the locality, the share of salaries or the importance of the material used.

5. Does business licenses influence the productivity of micro-activities

productivity is commonly defined *as a ratio of a volume measure of output to a volume measure of input use* (OECD, 2001 p11).

Various measures⁶⁶ of productivity exist. Among them, financial indicators⁶⁷, ratio of productivity⁶⁸, the stochastic frontier and Data Envelopment Analysis (DEA) approaches are the most used. As mentioned by OECD (2001), the choice will be defined by the purpose of productivity measure and the availability of the data.

For example, Amin (2009) used the average productivity of labor defined as *(log of) total sales in a regular month (in USD) divided by the total number of employees*, when assessing how the motivation of creation of an enterprise may affect the labor productivity of micro-activities. Ravelomanantsoa et al. (2016) used the monthly added value in their study on the technical efficiency of micro-activities in Madagascar.

McKenzie and Sakho (2010) used the ‘profit’ as the dependent variable for their study. They assume that the impact of firm registration on the profit is a key determinant of the decision of being formal. Another justification of this choice is that estimations of the firm’s productivity rely on assumptions which may be credible or not according to the types of firms surveyed (de Mel et al., 2007). Indeed, as the latter revealed, in their experiments, studies on Sri Lankan microenterprises, direct reports of profits are more reliable to proxy informal firm profitability.

Trying to understand the difference between the profits calculated with revenue-expense⁶⁹ data and the reported profit⁷⁰, they found that unreported information⁷¹ may bias the

⁶⁶ See OECD (2001), Diagne (2013)

⁶⁷ (value added, profit, return of equity (ROE))

⁶⁸ which represents a measure of output to a (or multiple) specific measure of input : the ratio of added value on labor or (and) capital

⁶⁹ See de Mel, McKenzie, and Woodruff, 2007 for an example.

⁷⁰ In this paper, the reported profit is the answer to the question: “*What was the total income the business earning during the month of March after paying all expenses including the wages of employees, but not including any income you paid yourself. That is, what were the profits of your business during March?*”

⁷¹ (i) the existence of categories of expenses or forms of profit not captured by basic survey’s — goods and material recorded as enterprises’ expenses but used for the domestic consumption or given by non-household members; salary paid by business owner but not reported in the firms’ profits, business revenues used to finance household

5. Does business licenses influence the productivity of micro-activities

result obtained for the former. Among them, the fungibility of resources between the business and the household is the main concern. Informal firms use goods and material from their business for household consumption and do not remove them from the business expenses.

In this chapter, the performance is measured by its earnings before removing Interest, Taxes, Depreciation, and Amortization (EBITDA). It expresses *the level of wealth released by the company through its operating cycle*.

Reasons for this choice are twofold. First, EBITDA only takes into account turnover and excludes exceptional expenses or those related to the investment and depreciation policy of the company. This is particularly interesting in the paper since micro-activities do not keep a detailed account and cannot provide, for example, information about the amortization and the depreciation of their assets. Using EBITDA allows excluding expenses other than those strictly related to the operating cycle.

Second, EBITDA is retained because, compared to other indicators of performance as value added, the amount of taxes is excluded from its calculation.

5.2.2 Explanatory variables

Explanatory variables retained for the analysis allow the sample to respect the balancing property. They have been grouped into three categories.

(i) Firm's characteristics

Three variables "*localtyp*", "*lheur*", "*capital*", have been taken as indicators of firms characteristic. "*Localtyp*" represents the type of facilities where micro-activities operate. Firms without a dedicated facility may be subject to adverse impacts of weather conditions which may negatively impact their productivity. In opposite, a dedicated facility increases the visibility of the firm and favors its taxation by the local administration.

expenditures and not included as profit (also known as fungibility issues); (ii) the timing of the transactions: inputs purchased in one period may not be sold until another month; (iii) recall errors; (iv) lack of bookkeeping; (v) deliberate misreporting.

5. Does business licenses influence the productivity of micro-activities

“*Lheur*” is the log of the number of working hours in the firm during the month before the survey. As the previous variable, the more the number of working hours in a firm increases, the more its visibility rise for the administration. A wide number of working hours may be subject a large number of employees in the firm.

“*Capital*” is the value of all equipment used by the firm during the previous year at replacement cost. It measures the size of the firm and as the two others increase the visibility of the firm.

(ii) Owner characteristics

Variables “agechief” (age of the head of unit) and the number of years of study are retained for the study. These variables are used as proxies of the experience of the production unit which may lead to an increase of firm benefits. To be conformed to the balancing property in our sample, agechief and its squared, the number of years of studies and its squared are first kept.

(iii) Attitude vis-à-vis taxation

Variables traducing the perception of the tax system are added to the equation of treatment. In fact, as specified by [Diagne \(2013\)](#) in addition to visibility indicators, firms' perception of the tax system can explain tax payment. Willingness to pay taxes is measured via the question: “would you be willing to pay taxes on your activities?”

5.3 Empirical strategy

Sections below explain the methodology and display the findings of the analysis.

5.3.1 Methodology

We estimate propensity score matching to examine the impact of business licenses on the productivity of the micro-activities in Madagascar. As mentioned before, the nature of the

5. Does business licenses influence the productivity of micro-activities

information available in the ENEMPSI (2012) does not allow us to observe the productivity of a firm before and after participating in the treatment (paying for taxation).

Following Fajnzylber et al. (2006), Kere et al. (2017) etc., we use the matching techniques to design a group of control for our observations. The purpose of this strategy is to define a population which possesses similar observable characteristics than the treated of the study.

Here, we define as the treated (Y1), the group of operators paying for taxes (treatment T) and the group of control (Y0) refers to individuals who do not pay the business license but possess similar characteristics than Y1.

As Fajnzylber et al. (2006), our treatment variable is binary and takes 1 if the micro-activity pays for the business license and 0 otherwise. We created this variable by considering the following questions asked to the operators during the survey: (i) "Are you ready to pay taxes on your business?" and (ii) What is the total amount of your institution's expenses in the last month: Business-license? All operators who reported an amount of business license are assigned "1". Those who have not recorded an amount of business license, but who have stated they want to pay a tax on their activities are marked "0". Anyone who does not answer the question "Are you ready to pay taxes?" is transformed into a missing value.

The propensity score matching is performed through the two steps described below:

1. Estimation of the probability to pay the business license conditional on observable characteristics of the firm.

$$\text{prob}(T = 1/x) = E(T/x)$$

2. These probabilities are used to match observations within the two groups. Then the difference between the outcome of the treated and the outcome of its matched is computed. The treatment effect on the sample of treated is calculated by averaging the differences. It is

5. Does business licenses influence the productivity of micro-activities

called the Average treatment effect on the treated (ATET)⁷² – the difference between the outcome Y before and after receiving the treatment.

$$ATET = Y1 - Y0$$

The propensity score procedures differ from the others by combining *all the covariate information into estimate treatment probabilities known as propensity score matching and use this single continuous variable as the matching variable* (Cerulli, 2014).

Different techniques of matching exist. Here, the method of the nearest neighbor is retained⁷³. This means that a treated observation is matched to the control unit with the closest propensity score matching. In this analysis, observations are successively matched with the first nearest neighbor; the three nearest neighbors and the five nearest neighbors.

As mentioned above, one concern of the analysis is to ensure that the group of comparison is similar as possible. Then, once applied the treatment on the full sample, we divided the database into several subsamples.

First, we distinguished between male and female-run firms to appreciate the existence of gender bias in the process of tax payment in Madagascar. Second, we study the impact of business license inside micro-activities' categories as defined by Grimm et al. (2012) to question the progressivity of the tax in Madagascar.

We also distinguish within men and women inside those categories to see if the gender bias exists not depending on them.

⁷² In opposite to the studies of Fajnzylber, Maloney, and Rojas (2006) or Kere et al. (2017), we use ATET instead of ATT. Indeed, as shown in a post of the University of Wisconsin (2015), ATET and ATT represent the average treatment effect on treated. ATT is obtained using a command written by Leuven and Sianesi (2018). ATET is the outcome of a command based on the work of Abadie and Imbens (2016) on PSM estimations. Compared to the first, the second command allows to correct the standard errors taking into account that the propensity score is estimated.

⁷³ The command retained for the analysis does not allow the calculation of the traditional Kernel or radius matching.

5. Does business licenses influence the productivity of micro-activities

Based on the finding of [Nordman and Vaillant \(2014\)](#) we also analyze the effect of the business license on married women and unmarried women. We assume that the corresponding estimates capture the pure effect of the treatment for each group considered.

5.3.2 Findings

5.3.2.1 Probability to participate to the treatment

The results for the estimation of the probability to pay taxes are shown in Table 5.1. We report the marginal effect on the probability of participating in the treatment. The results are in line with the literature on determinants of tax payments.

We notice that apart from the lifetime of the firm, all the characteristics explain the probability to pay the business license. As showed [Backiny \(2009\)](#) or [Diagne *et al.* \(2008\)](#), visibility criteria increase the probability of micro-activities to pay taxes. Indeed, working in dedicated facilities increases the probability to pay the business license to 3.5%. Firms with higher levels of labor and capital pay more in taxes than others (around 2%).

Whether the firm is old, the probability to pay taxes also strengthens. This may be explained by the fact that the cost of the collection of revenues from the micro-activities is high, compared to the expected gain. So tax administration of developing countries hold limited resources. They identify more detectable firms and enforce them to pay taxes. The willingness to pay taxes expands the probability of payments. Necessity firms pay fewer taxes than opportunity firms.

5. Does business licenses influence the productivity of micro-activities

Table 5.1: probability to pay the business license

Variables	Business license	Marginal effects
Agechief	0.0434*** (0.0130)	0.00518*** (0.00155)
Agechief2	-0.000382** (0.000151)	-4.56e-05** (1.80e-05)
Volpay	0.941*** (0.0908)	0.112*** (0.0110)
Localtyp	0.291*** (0.0620)	0.0347*** (0.00739)
Lheur	0.177*** (0.0425)	0.0212*** (0.00509)
Lcapital	0.181*** (0.0152)	0.0216*** (0.00182)
Ageupi	0.0122 (0.0102)	0.00146 (0.00122)
Ageupi2	-0.000763** (0.000321)	-9.10e-05** (3.83e-05)
Motiv	-0.140** (0.0681)	-0.0167** (0.00813)
Constant	-6.281*** (0.393)	
Observations		4,815
Pseudo R-squared		0.194

Robust standard errors in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01

5.3.2.2 Propensity score matching

Operators are matched on the basis of the previously predicted probability. One of the most important step, when implemented propensity score matching, is to ensure that the covariates are balanced⁷⁴ on the sample of the study. Indeed, as discussed by [Imai, King, and Stuart \(2008\)](#), in their “*propensity score tautology*”, *the estimated propensity score is appropriate if it balances covariates* ([Imai and Ratkovic, 2014](#)). [Rubin \(2008\)](#) added to this statement by recommending that the model which balances the covariates must be found before looking at the results of the estimated treatment effect ([Cerulli, 2014](#)).

To deal with this issue, [Imai and Ratkovic \(2014\)](#) proposed a test for checking the balance of covariates *by viewing the restrictions imposed by balance as over identifying conditions*.

⁷⁴ A covariate is said to be balanced when its distribution does not vary over treatment levels ...Covariates are balanced in experimental data because treatment assignment is independent of the covariates because of the study design. In contrast, covariates must be balanced by weighting or matching in observational data because treatment assignment is related to the covariates that also affect the outcome of interest. ([Treatment Effect Manual, 2017](#))

5. Does business licenses influence the productivity of micro-activities

However, this test is not available for matching procedures. In this paper, as recommended by Cerulli (2014), we look at the descriptive statistics of the covariates to evaluate the good balance.

Density and box plots of the estimates propensity score are scrutinized. We also look at the standardized difference and the variance ratio in the sample since, Austin (2009) reveals that *a perfectly balanced covariate has a standardized difference of zero and variance ratio of one* (Cerulli, 2014).

As we can see, Table 5.2 shows a balancing of the covariates. Using the Austin (2009) methodology, it appears that all the covariates are near to the expected values, meaning that they are perfectly balanced.

Table 5.24: Covariate balance summary

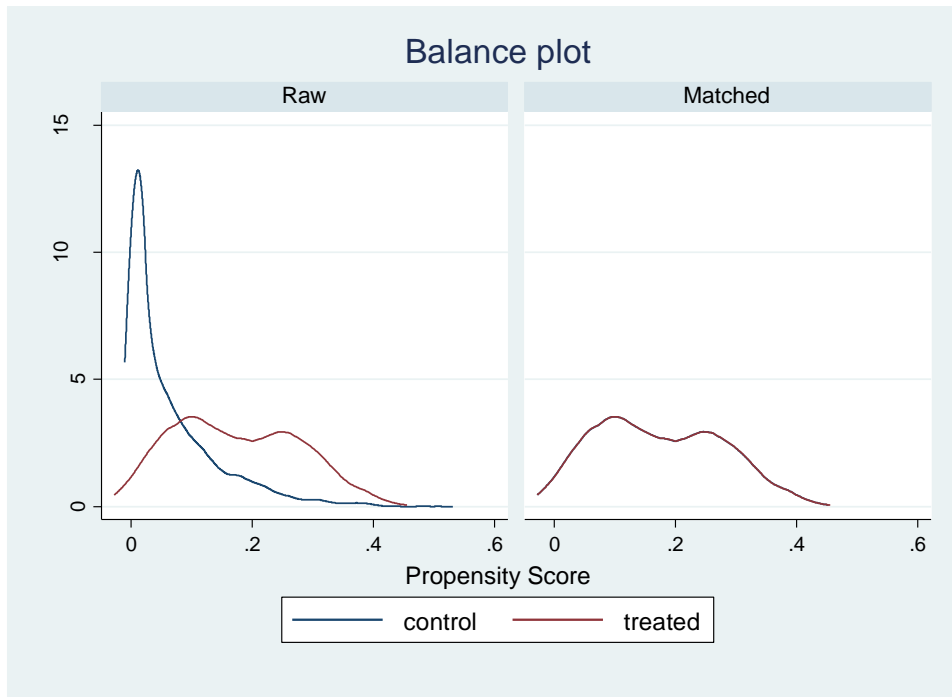
		Raw	Matched
N. of obs =		4,672	672
Treated =		336	336
Control =		4336	336

	Standardized Raw	Differences		Variance Raw	Ratio Matched
		Matched			
Agechief	0.133	0.863	0.774	1.145	
Agechief2	0.081	0.096	0.833	1.329	
Volpay	-0.886	-0.023	0.263	0.926	
localtyp	0.448	-0.143	1.299	1.003	
Lheur	0.449	0.046	0.625	0.918	
Lcapital	0.856	0.014	0.787	1.047	
Ageupi	-0.188	0.083	0.527	1.061	
Ageupi2	-0.237	0.059	0.302	1.354	
Motiv	-0.055	0.006	1.058	0.994	

Source: Authors calculation using data from ENEMPSI (2012).

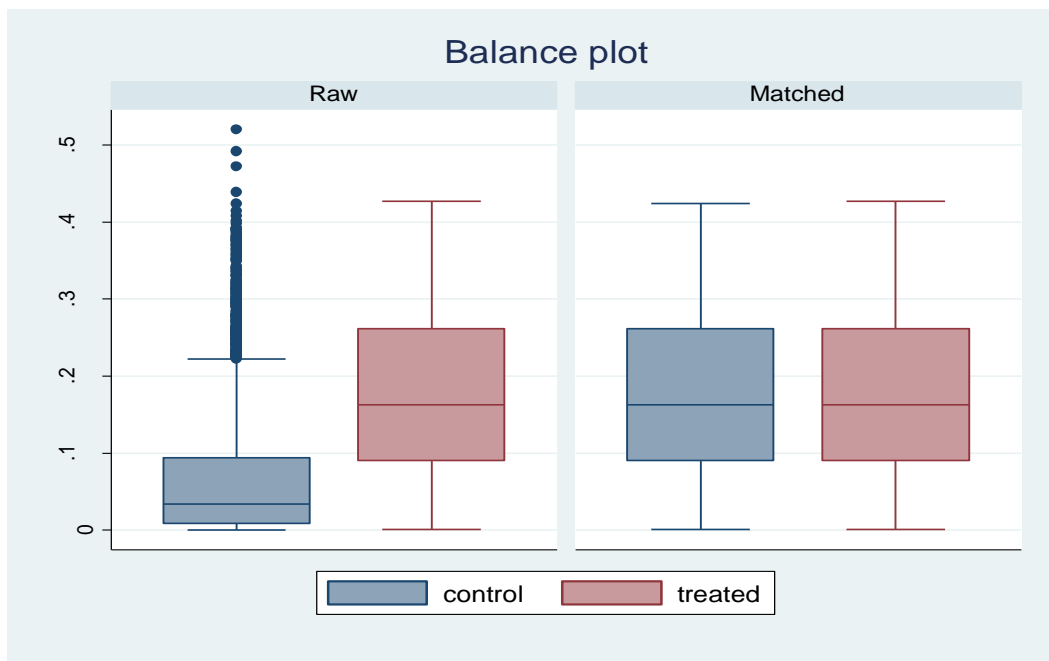
The plot of kernel density reveals that control and treated lines are equivalent in the matched sample, meaning that matching on the estimate propensity score also balanced all covariates.

5. Does business licenses influence the productivity of micro-activities



Source: Authors calculation, using data from ENEMPSI (2012)

The distribution of the covariates seems to be the same on all levels of the matched sample. In fact, the box plots are similar in the second part of the table, meaning that, the covariates are also balanced on the matched sample.



Source: Authors calculation, using data from ENEMPSI (2012)

5. Does business licenses influence the productivity of micro-activities

5.3.2.3 Results

The results of the incidence of local taxation on the performance of the firm are enclosed in Table 5.3. The estimated coefficient refers to the percentage of change in the output given the treatment. Business license payments globally boost the productivity of micro-activities. The effect is similar in terms of signs with the findings of [Fajnzylber et al. \(2006\)](#). However, the amplitude is more important and seems to double in the Malagasy case.

This difference may be explained by the fact that firms studied in the [Fajnzylber et al. \(2006\)](#) paper completed the registration process. Apart from the business license, they deal with other payments as social security contributions, etc.

Looking at the gender impact of local taxation, a positive increase in productivity is also observed for both women and men. However, it seems that business payments influence more significantly women than men. Around 19-36.5% increase in the firm's productivity is noticed for women-run businesses while men-run record only 21-28% rise in their productivity.

Once dividing the sample into categories of micro-activities, many disparities appear. Only the top performer and survivalist seem to be impacted by tax payments. While a strong negative effect is recorded for the former, the latter seems to benefit significantly for tax payments. Top performer productivity is reduced from 16-23% when they pay the business license. Constrained gazelles seem not to be affected, at least significantly by tax payments.

Gender distinction reveals that the profitability of women's top performer is reduced almost half of the value when they do not pay the business license. This effect is more significant than the one registered for the entire sample of top-performer (47-80%).

Survivalist men also increase their productivity compared to those who do not pay the business license. But this increase is lower than in the women's case. The incidence of taxation in top performer activities seems to be relevant only for married women. They realized a reduction of at least 52% of their productivity.

5. Does business licenses influence the productivity of micro-activities

In summary, paying for business license generally, has a positive effect on the performance of the micro-activity. However, discriminating between female and male-run firms or according to the level of performance reveals that (i) the impact is different for men and women, but generally more significant and important in terms of amplitude for the latter; (ii) both married and unmarried women are affected by the payment of local taxes; (iii) lowest categories are strongly stimulated by the payment of the business license.

Table 5.3: Impact of business license of firm productivity

Outcomes per samples	Near neighbor 1	Near neighbor 3	Near neighbor 5
All	0.475 (0.101)***	0.325 (0.073)***	0.323 (0.070)***
<i>N</i>	4,672	4,672	4,672
Women	0.365 (0.137)***	0.211 (0.106)**	0.190 (0.105)*
<i>N</i>	2,613	2,613	2,613
Men	0.283 (0.126)**	0.216 (0.105)**	0.220 (0.099)**
<i>N</i>	2,059	2,059	2,059
unmarried women	0.528 (0.288)*	0.461 (0.244)*	0.412 (0.222)*
<i>N</i>	924	924	924
top performer	-0.234 (0.112)**	-0.175 (0.094)*	-0.167 (0.089)*
<i>N</i>	615	615	615
Survivalists	0.456 (0.201)**	0.483 (0.157)***	0.493 (0.130)***
<i>N</i>	2,421	2,421	2,421
women top performer	-0.804 (0.190)***	-0.561 (0.183)***	-0.472 (0.173)***
<i>N</i>	271	271	271
men constrained gazelles	0.466 (0.218)**	0.270 (0.183)	0.342 (0.155)**
<i>N</i>	675	675	675
women survivalists	0.363 (0.245)	0.434 (0.185)**	0.422 (0.178)**
<i>N</i>	1,667	1,667	1,667
men survivalists	0.186 (0.259)	0.538 (0.217)**	0.456 (0.150)***
<i>N</i>	754	754	754
married women top performer	-0.586 (0.219)***	-0.607 (0.191)***	-0.524 (0.218)**
<i>N</i>	196	196	196
unmarried women constrained gazelles	0.834 (0.356)**	0.709 (0.264)***	0.766 (0.209)***
<i>N</i>	235	235	235
married women survivalists	0.468 (0.341)	0.556 (0.246)**	0.755 (0.229)***
<i>N</i>	1,053	1,053	1,053
unmarried women survivalists	0.572 (0.439)	0.643 (0.363)*	0.694 (0.329)**
<i>N</i>	614	614	614

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

5.4 Conclusion

The chapter investigates the impact of business licenses on productivity of micro-activities in Madagascar in 2012. The analysis revealed that business license mainly acts as a stimulus to informal firm productivity. These results are consistent with those of [Fajnzylber et al. \(2006\)](#) in terms of sign and significance.

However, the average treatment effect found in the Malagasy case is higher than the former. These findings may be explained by the fact that firms interviewed in the Mexican case have completed the formalization procedures, meaning they are subject to other payments like social security contributions.

The study also shows that the business license in Madagascar is progressive. Indeed, more vulnerable activities are stimulated by the local tax payments while more performing firms benefit less of those payments. These latter record a negative and significant impact of tax payments while survivalists, constrained gazelle male-run firms and unmarried female-run firms seems to be positively influenced by business licenses.

Putting a particular emphasis on gender bias, it appears that the effect of local taxation is stronger for women than men. Indeed, women chiefs of a unit, which pay taxes, got higher levels of productivity- around 19-36.5% increase versus 21-28% for men. Finally, the marital status of a woman chief of production unit also matters in terms of productivity.

In general, unmarried women benefit more than the others about the positive effects of local taxation. This situation may be explained by the fact they get more flexibility in terms of time to develop a strategy to attract customers. Only in the top performer category, married women seem to be more successful.

To conclude, business license payments in Madagascar generally help firms to increase their productivity. The fact that top-performer activities are negatively impacted by the taxation suggests there is a threshold beyond which firms do not have additional rooms to develop their

5. Does business licenses influence the productivity of micro-activities

activity using traditional strategies as customer prospecting. Increase in taxation leads to a loss of profitability.

A policy recommendation, coming from this study is to help top-performers registering their activities and develop new strategies to sustain their business' profitability.

For the others, the current policy seems to be appropriate since it allows operators to pay the business license while remaining profitable. However, in the way to develop voluntary tax payments in the sector, we recommend to Malagasy rulers to support them (especially constrained gazelles).

These strategies may be included in a framework of collaboration between local government and informal operators, where paying for taxation gives the right to a set of support policies as described in chapter 3.

Giving constrained gazelle, access to financial institutions may favor a better access to credit and lead them to diversify their activity or client base. Moreover, by building close relationship between those operators and local government, rulers may encourage their tax compliance.

As indicated in the previous chapter, spillover effects – if they exist in the case of Madagascar- could strengthen voluntary tax payments, reducing the cost of taxation for the tax administration and improving in the long term, the national tax base.

5.5 Annexes

Annex 5.5.1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Agechief	5,121	38.11267	13.26068	5	99
agechief2	5,121	1628.387	1144.102	25	9801
Volpay	5,121	0.5996876	0.4900095	0	1
Localtyp	5,121	0.2642062	0.4409527	0	1
Lheur	5,121	4.814419	0.8410956	0	6.898715
Lcapital	4,815	11.43129	2.295408	0	18.83525
Ageupi	5,121	9.685608	10.2626	0	74
ageupi2	5,121	199.1115	421.9073	0	5476
Motiv	5,121	0.7211482	0.4484783	0	1

Source: Authors calculation, using data from ENEMPSI (2012)

5. Does business licenses influence the productivity of micro-activities

Annex 5.5.2: Descriptive statistics (2)

	All	Male	Female	Top performer	Constrained gazelle	Survivalist
Owner Characteristics						
Age (years)	38.11	38.02	38.19	38.03	37.77	38.37
No education	13.14	10.44	15.36	4.21	4.85	21.43
Primary education	53.88	53.29	54.35	39.94	39.89	67.52
Secondary education	30.32	33.06	28.09	49.99	50.08	11.06
Higher Education	2.66	3.21	2.2	5.86	5.2	
Firms characteristics						
Capital (Ariary)	911 660.8	1 171 495	701 686	3 935 707	500 725.6	398 106.5
Turnover (Ariary)	316 671.2	338 792.9	298 520.9	699 313.7	314 797.4	209234.4
value added	143 549.8	186 058.1	108 672.8	301111.6	140935.6	104647.2
Age UPI (years)	9.68	9.81	9.58	7.86	7.49	11.72
Fix premises	26.42	31.85	21.97	37.36	31.98	19.46
Labor hours of owner (Month Average)	156.52	161.96	152.06	198.30	155.94	145.05
Motivation (1=entrepreneurship spirit)	72.11	71.23	72.84	72.69	75.77	69.42
Would register firm	40.68	45.58	36.65	58.02	45.18	32.63
Would pay tax	59.97	64.69	56.10	76.36	64.96	51.85
Pay local tax yet	20.91	13.43	27.05	22.69	18.44	22.12
Pay for discharge tax yet	7.32	9.27	5.72	24.86	7.02	2.55
Sector						
Other Industry	35.64	29.35	40.21	24.56	19.25	46.99
Construction	6.28	14.75	0.11	2.65	0.67	10.12
Commerce	36.83	31.72	40.55	45.59	53.93	25.71
Transportation	6.41	14.29	0.68	13.53	13.78	0.73
Services	14.85	9.9	18.45	13.68	12.36	16.45
Strategy adopted						
Prospection for new clients	34.41	36.40	32.78	33.15	33.54	35.37
Change of supplier to reduce costs	3.59	2.86	4.19	5.98	3.84	2.74
Installation in cheaper facilities	1.54	1.65	1.46	1.49	2.06	1.20
Limitation of the salary increase	0.55	0.87	0.28	0.95	0.39	0.54
None of these strategies	59.91	58.23	61.29	58.42	60.17	60.15

Source: Authors calculation, using data from ENEMPSI (2012)

Annex 5.5.3: Grimm classification of Madagascar informal sector

Informal categories	Frequencies	Percent
Top performer	736	14.37
Constrained gazelles	1,795	35.05
Survivalists	2,590	50.58
Total	5,121	100.00

Source: Authors calculation, using data from ENEMPSI (2012)

5. Does business licenses influence the productivity of micro-activities

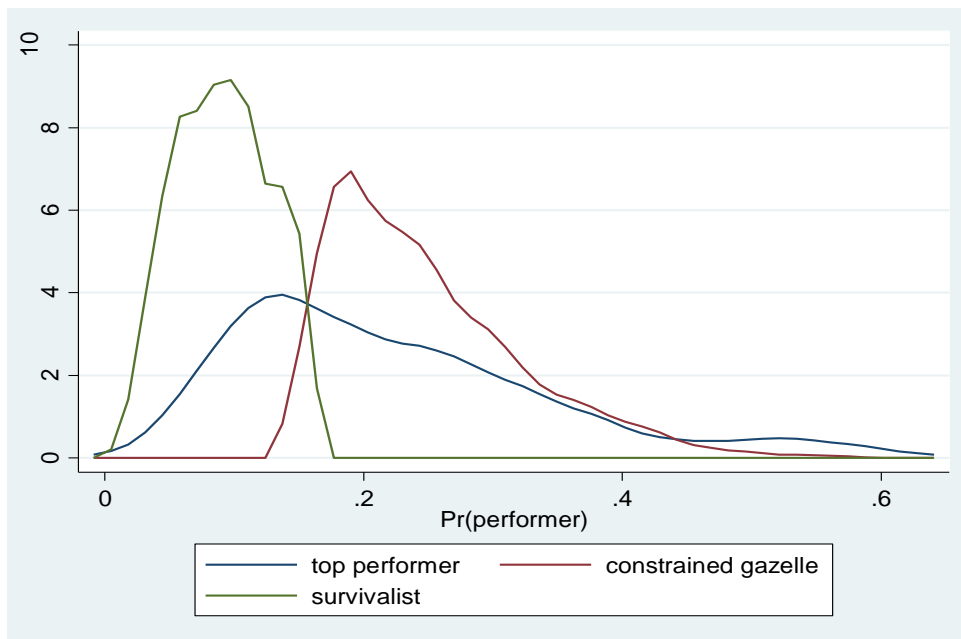
Annex 5.5.4: Probability of Becoming top-performer

VARIABLES	Top Performer	Marginal effects
Agechief	0.0353*** (0.0100)	0.00728*** (0.00207)
Sqage	-0.000382*** (0.000119)	-7.87e-05*** (2.44e-05)
Gender	-0.210*** (0.0525)	-0.0433*** (0.0108)
Ageupi	-0.00709** (0.00305)	-0.00146** (0.000628)
entrep_spirit	0.145*** (0.0547)	0.0299*** (0.0113)
French	0.136*** (0.0500)	0.0280*** (0.0103)
1.educ	0.238 (0.192)	0.0304 (0.0270)
2.educ	0.267* (0.139)	0.0347* (0.0189)
3.educ	0.319*** (0.118)	0.0431*** (0.0157)
4.educ	0.365*** (0.116)	0.0509*** (0.0157)
5.educ	0.534*** (0.115)	0.0836*** (0.0174)
6.educ	0.484*** (0.139)	0.0734*** (0.0229)
7.educ	0.732*** (0.134)	0.130*** (0.0263)
8.educ	0.679*** (0.121)	0.116*** (0.0212)
9.educ	0.935*** (0.123)	0.186*** (0.0255)
10.educ	0.811*** (0.172)	0.151*** (0.0403)
11.educ	1.045*** (0.136)	0.220*** (0.0328)
12.educ	1.139*** (0.137)	0.251*** (0.0351)
13.educ	1.234*** (0.316)	0.283*** (0.106)
14.educ	1.546*** (0.221)	0.397*** (0.0762)
15.educ	0.991*** (0.322)	0.203** (0.0953)
16.educ	1.501*** (0.424)	0.381** (0.156)
17.educ	1.262*** (0.421)	0.293** (0.145)
20.educ	1.200 (0.769)	0.271 (0.263)
2.branche	-0.591*** (0.134)	-0.0778*** (0.0136)
3.branche	0.292*** (0.0595)	0.0627*** (0.0126)
4.branche	0.605*** (0.0982)	0.148*** (0.0277)
5.branche	-0.0437 (0.0812)	-0.00788 (0.0145)
Constant	-2.463*** (0.225)	
Observations	4,588	
Pseudo R-squared	0.107	

Source: Authors calculation, using data from ENEMPSI (2012)

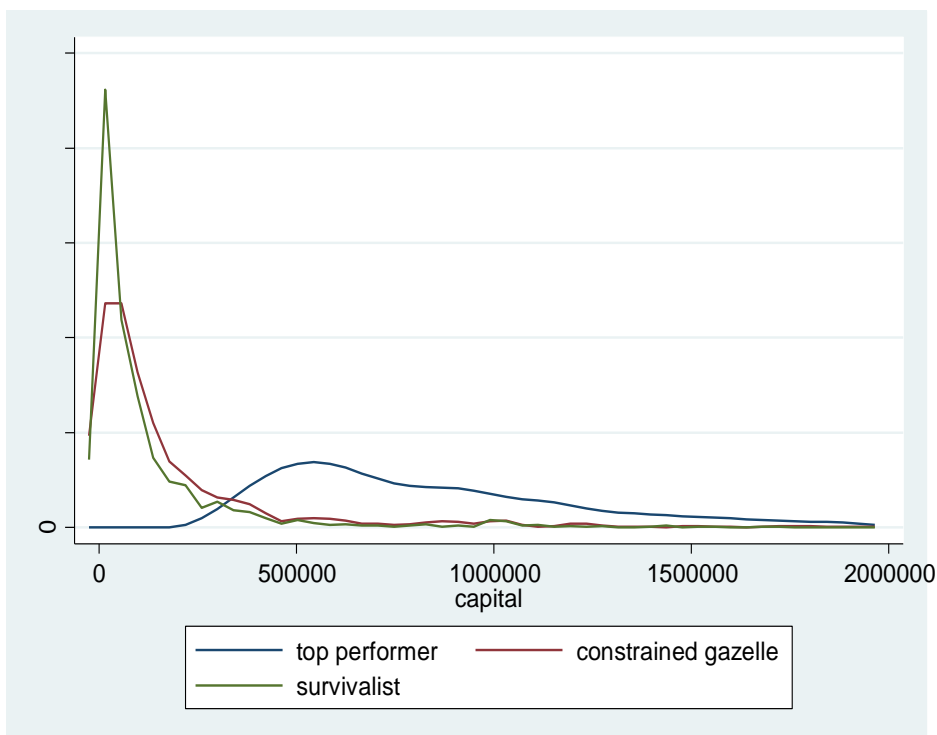
5. Does business licenses influence the productivity of micro-activities

Annex 5.5.5: Distribution of the probability of being Top performer within informal categories



Source: Authors calculation, using data from ENEMPSI (2012)

Annex 5.5.6: Distribution of capital within the informal categories



Source: Authors calculation, using data from ENEMPSI (2012)

5. Does business licenses influence the productivity of micro-activities

Annex 5.5.7: List of variables

Variables	Description
EBITDA	Earnings before removing Interest, Taxes, Depreciation and Amortization
lebe	The logarithm of EBITDA
otpatent	The business License
Capital	The value of all equipment used by the firm during the previous year at replacement cost.
lcapital	The logarithm of the capital
lheur	The logarithm of weekly working hour in the firm.
ageupi	The age of the firm
agechief	The age of the chief of the unit
sqage	The squared of the chief of unit age
educ	The number of years of study
gender	The gender of the chief of the unit (1 if the chief is a woman and 0 otherwise).
branche	The sector of activity of the firm
region	The region where the activity of the firm is realized.
Volpay	"Would you be willing to pay taxes on your activities?" (1: yes; 0 otherwise)
Motiv	The motivation for the creation of a unit (1: necessity firms, 0: opportunity firms)
Localtyp	The type of facilities where informal entrepreneurs operate their activity.
French	Do you speak or write in French?
Top-performer	Operators who belong to the upper (75th) quartile of capital and realized at least a turnover equivalent to 60% of the capital amount is considered as a top performer.
Constrained – Gazelle	Firms with similar managerial abilities than top-performer in running their firm, but they operate with substantially lower capital stocks.
Survivalist	Firms with lowest capital amounts and capital productivity.

6. General Conclusion

6.1 Main results

The purpose of this thesis is to add to the debate on tax mobilization in developing countries, by analyzing policy strategies, governments should apply to improve the contribution of the non-observed economy to tax revenues.

After reviewing theoretical and economical concepts, we choose to apply our analysis on the field of micro-activities. As a reminder, the non-observed economy as defined here, is composed of illegal, fraudulent and micro-activities. For taxation purposes, we believe that only fraudulent and micro-activities could be targeted. Both carry out legal activities: fraudulent activities evade taxes while some micro-activities do contribute, to some extent, to tax mobilization.

We argue that tax administration should track and enforced fraudulent activities to comply with legislation. For micro-activities, which are more numerous, the dissertation suggest to promote voluntary tax compliance.

In doing so, we divided our analysis into two parts. First, we examine the impact of two policy strategies namely financial institutions access and a more precise policy of accountability on the contribution of the informal economy⁷⁵ to countries' tax revenues. The ultimate objective of this strategy is to show that the more micro activities grow, the more they will be willing to pay taxes. In addition, providing them with clear information on the collection and use of taxes will simplify the tax collection process and reduce countries' inefficiency in terms of public mobilization.

We use a sample of 33 developing countries through the period 1984-2010 and apply the stochastic frontier methodology of [Kumbhakar, Wang, and Horncastle \(2015\)](#) to a diverse set of tax revenues.

⁷⁵ Here, informal economy is as defined by [Elgin et al. \(2012\)](#) and composed of micro and fraudulent activities.

6. General Conclusion

We find that access to financial services has a significant effect on indirect, corporate and personal taxes. Current levels of financial development have a positive impact for indirect taxes and negative impact on the corporate taxes. By improving levels of financial access to institutions, the corporate taxes are expected to increase as indirect taxation diminishes. When governments facilitate informal operators' access to financial institutions, the effect is positive for non-resource taxes, corporate taxes, direct and individual taxes, but negative for indirect taxes.

Building a more accountable relationship between informal operators and the authorities intensified previous results by reducing countries' inefficiencies in terms of tax collection. However, the effect differs according to the nature of the country and the type of tax. Only corporate taxes, indirect taxes and individual taxes produce significant results.

Both persistent and short-term inefficiency seem to be concerned. In non-aid dependent countries, increasing the level of democratic accountability has a uniform impact on all types of revenues. Greater democratic accountability to the informal sector has yielded excellent results for indirect taxes and corporate taxes (non-aid dependent countries). In low-income countries, this appeared to reduce countries' inefficiencies, but the effect is not significant. For resource-poor, aid-dependent and low-middle-income countries, more investigations should be conducted because of the lack of available information.

In the second part of the thesis, we looked for a category of informality in which tax administration of developing countries should concentrate their efforts to reach a greater part of taxpayers and reduce the cost of the collection. Here, the objective of taxation policies is not to maximize countries' revenues, but to strengthen voluntary compliance with tax obligations, at least in the short term.

We assume that the policy strategies shown above – especially the access to financial institutions – could not be implemented for the entire informal sector. Indeed, not all informal

6. General Conclusion

activities fulfill the requirements to request for credit from banks. With this in mind, we postulate that the informal category we are looking for should satisfy three necessary conditions.

First, companies must present sufficient growth potential to apply for credit. The return on capital should be higher so that they can repay the credit. Second, when these firms pay taxes, the global spillover effects that they exert, should not worsen the behavior towards taxation of their neighbors. In other terms, when these businesses pay taxes, operators in their neighborhood should be encouraged to pay as well. Finally, the effect of taxes should not reduce the productivity of these micro-activities.

Chapter 4 analyzed the tax compliance of Cameroon micro-activities. We found that spillover effects exist, which could facilitate the mobilization of tax revenues. The approach was to construct a close link between individuals which may explain social interactions between informal operators. Among all specification of the matrices of proximity, the combination of the geographical level, branch and membership to a category according to the [Grimm et al. \(2012\)](#) typology seemed to be better adapted to the Cameroonian case. In light to the traditional literature on the taxation of informal sector, visibility criteria (age of the entrepreneur, the longevity of the firm, the share of salaries etc.), explain firms tax payments.

However, the motivation for the creation of the firms and the desire to see it grow, increase the probability of tax payments. For those types of firms, paying for taxes seems to have spillover effects on others. The variable of perception of the tax system which is a more accurate indicator in terms of taxation produces some ambiguous results. As a personal characteristic of the observed firm, a misperception of the tax system boosts its tax payment.

This appears to refute the claim of [Andreoni, Erard, and Feinstein \(1998\)](#); [Armah-Attoh and Awal, \(2013\)](#), *an increase in the perception that the tax system is unfair or that taxes are higher or unfordable increases the odds to evade taxes*. Coupled with the fact that visibility

6. General Conclusion

criteria are the main drivers of tax payments, these results show that in the Cameroonian informal sector, firms pay taxes because they are enforced by the tax administrations.

Nevertheless, looking at the spillover effect of this variable on the other firms, only feedbacks effects of constrained gazelles, having a misperception of the tax system seemed to decrease the probability of tax payment for the nearby firms. Even if the effect is non – significant, it let us argue that tax authorities should pay more attention to the constrained gazelle category.

As a reminder, the rho displays that spillover effects coming from constrained gazelles businesses' decision on tax payment, strongly impact the others. The effect is robust across specifications. The existence of those businesses with a negative perception of the tax system, in the neighborhood of firm i , represents a greater risk for the mobilization of public resources. Building close relationship with constrained gazelles could help the government keep an eye on them, reducing their negative perception of the tax system, and favors positive feedbacks effects.

Chapter 5 revealed that business licenses primarily stimulated the productivity of micro-activities in Madagascar. The Average Treatment Effect (ATE) found in the Malagasy case is higher than the ATE found by [Fajnzylber, Maloney, and Rojas \(2006\)](#) in terms of sign and significance.

The fact that the companies interviewed in the Mexican case completed the formalization procedures and pay other types of payments, such as social security contributions, may explain these results. In the Malagasy case, the most vulnerable activities are stimulated by local tax payments, while more performing businesses benefit less from these payments. It seems that the effect of local taxation is stronger for females than males in terms of productivity.

The marital status of a female head of production unit is also important in terms of productivity. Unmarried women benefit more than others from the positive effects of local

taxation. Constrained gazelle's enterprises run by men and unmarried women appear to be positively influenced by business licenses. Controlling for the motivation for setting up the business or the number of hours spent doing housework does not radically change the results.

As a matter of fact, business license payments in Madagascar generally help firms to increase their productivity. The negative impact of local taxation on top-performer businesses suggests a threshold beyond which firms do not have additional rooms to develop their activity in the micro-activities.

6.2 Policy implications

The main challenge for countries with higher levels of non-observed economy is to design policies to improve the contribution of this sector to public revenues.

In this dissertation, we show that most of the micro-activities paying taxes in Cameroon, for example, do so because they are forced by the tax administration. This situation is not optimal because governments will have to finance costly expenses to reach the entire micro-activities. Then, it seems important to strengthen the level of tax compliance in order to encourage voluntary tax payments. In doing so, it could be useful to design appropriate tax policies for the micro-activities. These strategies should not deteriorate the productivity of micro-activities.

Chapters 4 and 5 suggest that the focus should be made on the constrained gazelles' category. Indeed, even if the results are observed in different countries, it appears that decisions of tax payments of constrained gazelles positively and significantly influence tax compliance in their neighborhood (Chapter 4). In addition, local tax payments do not present a risk (at least significantly) in terms of productivity for constrained gazelles' enterprises (Chapter 5).

As a reminder, constrained gazelles are micro-activities with a strong capacity for growth. Despite their capital stock that is almost as low as that of survivalists, constrained gazelles are

6. General Conclusion

much more productive and can earn much higher returns on capital than survivalists ([Grimm et al., 2012](#)).

However, the tax potential of constrained gazelles firms – as those of the other micro-activities - is limited ([Chambas, 2009](#)), at least in the short term. Due to the small amount of revenues expected compared to the cost of collection, we propose to let them manage by local governments. In the way to strengthen the contribution of constrained gazelles and ultimately, the contribution of micro-activities to tax revenues, we recommend local authorities to support them.

Chapter 3 shown that a better access to financial institutions and building more accountability relationship between informal operators and authorities should have a positive impact on their contribution to public resources. Indeed, entrepreneur could invest in their businesses and develop their activities. As [AfDB \(2010\)](#) indicated, business expansion will create a need for public infrastructure and the willingness to pay it.

Based on these conclusions, we believe that giving access to financial institutions to constrained gazelles can support the growth of their business and increase their willingness to pay taxes. All other things being equal, we expect spillover effects of their decision to pay taxes on other firms to be greater and that voluntary compliance with tax obligations in micro-activities will increase.

Nevertheless, as explained above, the misperception of the tax system by constrained gazelles could negatively influence the attitude towards taxation of micro-activities in their neighborhood. By establishing a more accountable relationship with constrained gazelles, local authorities could ensure that they have a good understanding of the tax system and thus promote voluntary tax compliance by other companies.

In summary, the policy recommendations emerging from this study are as follows:

6. General Conclusion

- (i) Governments need to improve the current level of financial development to enable the growth of micro-activities. In doing so, they could encourage the reduction of fees to get an account.
- (ii) As outlined in Chapter 4, we assume that the desire to grow their business makes it easier for constrained gazelles to comply with tax legislation. Moreover, the probability of paying tax is also increasing, when the entrepreneur keep an account (even if it is not detailed). This is an important finding, because by providing accounting training, local government could teach constrained gazelles to save money and improve their management skills. This could be useful for obtaining credit from banks.

Additionally, by encouraging constrained gazelles to keep account, tax authorities will have a basis to estimate the amount of taxes to be paid.

- (iii) The adoption of complementary policies such as improving the level of democratic accountability may also be useful since they provide the public with information on the collection and use of taxes. It could reinforced the state-citizens relationship and introduce tax bargain in the supply of public goods.

Giving local authorities the responsibility of managing taxes from micro-activities can create additional challenges. Firstly, the question of the rate of presumptive taxes to be applied to constrained gazelles may arise. At this stage, further studies are required. But, the rate must be set in a way that local taxes does not negatively affect the productivity of micro-activities in general and especially the constrained gazelles. To achieve this, and as indicated above, accompanying measures (see Chapter 3) have to be implemented.

Secondly, the question of who should set the rate is also raised. Allow central administration to set the rate may ensure to not erode central government credibility. However, if the local authorities set the rate, this may introduce horizontal competition between local governments. This is interesting since, as explained by [Tiebout \(1956\)](#) mobility of individuals

6. General Conclusion

allow to compare the performance of local authorities and choose more attractive areas to live or establish their activities (Fjeldstad, Chambas and Brun, 2014). In accordance to this view, constrained gazelles will choose localities with better support plans to install their activities. Anyway, as mentioned by Fjeldstad, Chambas and Brun (2014), local and central tax systems should be coordinated to avoid undermining tax reforms or aggravating economic distortions.

In this dissertation, it should be underlined that the tax management of the micro-activities takes into account not only the collection but also the use of the funds collected. Indeed, as Fjeldstad, Chambas and Brun (2014) pointed out, business licenses are part of local own revenues. In this respect, local authorities should decide on the type of collection but also on the use of taxes. This situation is likely to generate additional challenges.

a. The concentration of constrained gazelles in cities or agglomeration with high level of own local revenues. As Tiebout (1956) explains, ‘foot voting’ can generate the relocation of constrained gazelles from one city to another. This can worsen the situation in the poorest communities by reducing the level of own local revenues. These own local revenues are already low and poorest community are largely dependent on fiscal transfers from the central government. They cannot finance their public expenditure without it (Fjeldstad, Chambas and Brun, 2014). It is therefore necessary to ensure that the central government continue to provide them with financial and technical support for tax collection.

Nevertheless to ensure that there is no free-riding behavior⁷⁶, it is necessary to put in place incentives like the organization at the national level of a competition for the better local authority’s revenue collector. The bonus being an additional percentage of tax revenue, or assistance in financing a public good of great utility.

b. The corruption and clientelism problem. As Cantens et al. (2011), we propose the implementation of a system of financial or non-financial incentives (price of the best

⁷⁶ Meaning that to avoid collecting taxes and not be able to reduce their electorate, local decision-makers mobilize less revenue fulfill the gap with central governments’ transfers.

6. General Conclusion

monthly collector, congratulations letter, etc.) to encourage tax collection by agents. In addition strong control policies must be adopted to ensure to limit corruption and bad practices⁷⁷.

For the remaining part of the non-observed activities, we ask for more collaboration between customs and tax administrations to facilitate the enforcement process of fraudulent activities. Illegal activities should be tracked by national security force to eliminate them.

Ultimately, the recommendation above mentioned should be taken with cautious. Indeed, as demonstrated along the study, specificities exist according to the nature of the country, the type of tax studied etc. For example, it seems that in non-aid-dependent countries, indirect and corporate taxes are best suited for the success of an accountability-based policy. For the others, the dissertation did not allow to conclude, hence there is a need for additional investigations.

In addition, the available data did not allow us to conduct an exhaustive analysis. Chapter 5, for example did not allow to estimate the impact of business license on some categories (married women, men top performer, unmarried women top performer etc.). This makes it difficult to assess the gender bias in a comprehensive way. It therefore seems difficult to make relevant policy recommendations on this subject. Further research are necessary and field experimentation analysis could be conducted to clarify the results.

⁷⁷ See [Lavallée, Razafindrakoto and Roubaud \(2010\)](#), for a brief overview of the role and nature of control to be adopted to reduce corruption.

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Table of Contents

Remerciements - Acknowledgments.....	i
Abstract	iii
Main contents	vi
List of Tables.....	viii
Acronyms	x
1. General Introduction.....	1
2. Conceptual framework and literature review	8
2.1 Introduction	9
2.2 Conceptual framework	13
2.2.1 Activities Not Registered in Tax Administrations' Records: A review of literature .	13
2.2.1.1 The concept of Informal Sector: History and evolution.....	14
2.2.1.2 The concept of Non-Observed Economy: Definition and categorization	16
2.2.2 How to measure the Non-observed Economy? A review of literature.....	23
2.2.2.1 Measuring the Non-observed Economy using direct methods.....	23
2.2.2.2 Measuring the Non-observed Economy using indirect methods	25
2.2.2.3 Comparison of methods	30
2.2.3 Motivation for the choice of the retained concepts and indicators.....	34
2.3 Literature review	35
2.3.1 Taxation and the Non-Observed Economy	36
2.3.2 Taxation, Financial development, and the Non-observed Economy.....	40
2.3.3 Taxation, Democratic accountability and the Non-observed Economy	43

2.3.4 Informal firms, productivity, and efficiency	46
2.4 Conclusion.....	54
3. Improving informal economy’s Contribution to Tax in Sub-Saharan Africa: Do Financial Development and Democratic Accountability matter?	57
3.1 Introduction	58
3.2 Empirical analysis	61
3.2.1 Variables	61
3.2.2 Data.....	64
3.2.2 Methodology.....	64
3.3 Empirical results.....	66
3.3.1 Does the access to financial institution of informal operators affect developing countries tax revenues?	66
3.3.2 Does building a more accountable relationship with informal operators matter in reducing inefficiency in terms of tax mobilization?.....	71
3.4 Conclusion.....	91
3.5 Annexes	92
Annex 3.5.1: Likelihood ratio tests	92
Annex 3.5.2: List of variables, sources and definition	94
Annex 3.5.3: Descriptive statistics	95
4. Tax compliance in the micro-activities: independent act or spillover effect? The case of Cameroon.	96
4.1 Introduction	97
4.2 Data	100

4.2.1 Define Micro-activities' categories.....	101
4.2.2 Characteristics by groups.....	104
4.3 The model.....	108
4.3.1 The Data Generating Process.....	108
4.3.2 The theory of proximity.....	110
4.4 Results.....	112
4.4.1 The coefficient « rho ».....	113
4.4.2 Spatial interactions.....	116
4.5 Conclusion.....	138
4.6 Annex: Description of studied variables.....	140
5. Does business licenses influence the productivity of micro-activities: an evaluation of the gender bias in Madagascar?.....	141
5.1 Introduction.....	142
5.2 Data.....	146
5.2.1 The Dependent variable.....	150
5.2.2 Explanatory variables.....	152
5.3 Empirical strategy.....	153
5.3.1 Methodology.....	153
5.3.2 Findings.....	156
5.4 Conclusion.....	162
5.5 Annexes.....	164
Annex 5.5.1: Descriptive statistics.....	164
Annex 5.5.2: Descriptive statistics (2).....	165
Annex 5.5.3: Grimm classification of Madagascar informal sector.....	165

Annex 5.5.4: Probability of Becoming top-performer	166
Annex 5.5.5: Distribution of the probability of being Top performer within informal categories.....	167
Annex 5.5.6: Distribution of capital within the informal categories	167
Annex 5.5.7: List of variables	168
6. General Conclusion	169
6.1 Main results	170
6.2 Policy implications.....	174
7. Bibliography	179