Housing Decisions and Public Finances: An Emerging Market Perspective

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An Emerging Market Perspective

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Abstract

The implications of housing tenure and non-pecuniary motives for property tax compliance decisions are scant in the literature. This becomes even more apparent when one considers the limited focus on administrative data and a developing economy context, where non-compliance is rife. This thesis analyses how property tax arrears are related to housing tenure, behavioural influences among taxpayers (peer effects), and derived benefits from tax payment (reciprocity). The study utilizes unique administrative data from Accra, Ghana and makes several revenue-enhancing policy recommendations.

The first essay examines whether compliance depends on dwelling unit type. The study finds that owner-and-tenant-occupied (mixed) dwelling units are more likely to be in arrears than owner-occupied units, with tenant-occupied units also being at more risk of incurring long-term arrears, relative to owner-occupiers. Also, the risk of non-compliance is most pronounced for mixed dwelling units which are distant from local public amenities. Policy interventions must therefore recognize the susceptibility of the mixed category to non-compliance whilst ensuring the equitable distribution of public amenities.

The second study investigates the role of peer effects in property tax arrears outcomes of individual dwelling units. The main results point to a positive association between peer and individual dwelling units, in terms of both the arrears period and probability of being in arrears. Consequently, local authorities may have the benefit of multiplier effects when policy interventions aimed at improving payments are targeted at those who are usually

non-compliant.

The final essay explores the existence of a reciprocal relationship between actual local capital expenditure and property tax arrears. The findings suggest an inverse relationship between capital expenditure and property tax arrears levels thereby showing that reciprocity affects compliance. Also, security-related capital expenditure appears to be the most valued by the taxpayers. Policy-wise, local authorities should more actively engage with taxpayers so as to be better informed about essential public services, which should also be adequately and timeously delivered to boost property tax compliance and local public revenue levels.

Declaration

I, Precious Angelo Brenni, declare that the material contained in the thesis has not previously been submitted for a degree in this or any other institution. Except for other references duly acknowledged in the text, this thesis is my own work.

Acknowledgements

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A heartfelt thank you also goes to the Accra Metropolitan Assembly (AMA) for making its data available for this study and for providing me the opportunity to present my findings at the Policy Dialogue Forum in May 2019. I would particularly like to acknowledge the efforts of: Ms. Lydia Sackey (retd.), Ms. Georgina Mensah, Mr. Michael Adamah, and Mr. Philip Quantson. Dr. Wilfred Anim-Odame (NDPC, Ghana) and Mr. Benjamin Arthur (Lands Commission, Ghana) also deserve special mention for their support.

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To Henrietta, my wife - your sacrifices made this possible.

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Chapter 1

Introduction

1.1 Background

Property taxes are a significant revenue source for many local governments, especially those in developing countries. This is due in part to the fewer local tax options available to local governments in developing countries, in comparison with OECD countries (Bahl and Martinez-Vazquez, 2008). Typically, property taxes contribute about 40% of the total sub-national (local) revenues in developing countries (Bird and Slack, 2002). In spite of the key contribution property taxes make to these local economies, developing economies are generally plagued with numerous challenges which affect the exploitation of the property tax revenue potential. Many of the challenges have been widely discussed in the extant literature and include: weak regulatory enforcement and minor punitive measures for tax delinquency (Bahl, 2009); poor record-keeping systems, land and property title challenges, and the absence of a full cadastre (Bahl and Wallace, 2008; Payne, 1997); lack of flexible payment options and a tax payment mentality, in addition to taxpayers' reservations about the proper use of property tax revenues (Kelly, 2013); and the lack of political will (Bahl and Wallace, 2008; Slack, 2013). The overall effect of the above-mentioned difficulties is a high level in the incidence of property tax non-compliance, which plays out in the property tax collection ratio – between 30% to 60% for developing countries versus nearly 100% for OECD countries (Bird and Slack, 2004). The adequate

provision of local public amenities in developing countries is therefore severely hampered. Consequently, local authorities in developing countries are faced with the arduous task of designing policies which will help improve property tax compliance and boost their finances.

1.2 Problem Statement

Over and above the above-mentioned administrative challenges of developing countries, which give rise to widespread non-payment of property taxes, it is important to also recognize that the effectiveness of policies, aimed at improving property tax compliance, requires an understanding of the motives driving taxpayer behaviour. However, this literature, especially on dwelling unit-level non-pecuniary motives for property tax compliance, remains minimal within the fast-growing wider body of studies on tax compliance. That aside, the existing studies on general tax compliance are predominantly based on experimental approaches, rather than on administrative data, which raises concerns around external validity of their findings.

1.3 Research Objectives and Key Findings

The research broadly seeks to analyse how motivations for property tax compliance by dwelling units in Accra are shaped by housing tenure as well as other non-pecuniary motives, which are generally classified under the tax morale literature. All the analysis is based on data from the Accra Metropolitan Assembly (AMA), the foremost local authority in Ghana with oversight responsibility for the capital city, Accra. This overarching objective is broken down and studied as three separate empirical research chapters. What follows is a specific discussion of each of those chapters, whilst touching on their respective main results.

The first of the three chapters investigates the risk of property tax non-compliance for dwelling units and with respect to their responses to property rate[1] increases and

[1]The terms 'property rate' and 'property tax rate' are used interchangeably in this thesis. The former

proximity to public amenities. Thus, this chapter seeks to ascertain three main things. First, the dwelling unit type which is more likely to be in arrears. Second, the relationship between the likelihood of dwelling unit arrears and the magnitude of property rate increases. Third, whether dwelling units are more likely to be compliant when they live closer to public amenities.

Three dwelling unit types are considered: owner-occupied (solely occupied by the homeowner)[2], tenant-occupied (solely occupied by the tenants), and owner-and-tenant-occupied (jointly occupied by the homeowner and tenants). The proximity to public amenities is a direct reference to the non-pecuniary motive of "reciprocity", where "tax payments are made in exchange for services provided by the state." (Luttmer and Singhal, 2014, p. 157). We define reciprocity in terms of how property tax compliance behaviour varies with the physical distance of dwelling units to public amenities: hospitals and suburban police stations. Thus, property tax compliance is expected to be inversely related with distance to the amenities. Property tax compliance is defined in terms of the arrears period i.e. the number of years of missed property tax payments.

Using multinomial logistic regressions, the main results of this chapter indicate that owner-and-tenant-occupied dwelling units are more likely to be non-compliant than owner-occupied units. This is in line with the hypothesis that owner-and-tenant-occupied dwelling units are more likely to be income-constrained, relative to the two other dwelling unit types, which informs the decision to sacrifice full enjoyment of their home in exchange for rental income in the first place. Further, when analyzing the response of dwelling units to property tax rate increases, owner-and-tenant-occupied dwelling units are more likely to accumulate arrears than owner-occupied dwelling units, regardless of the magnitude of the rate increase. Tenant-occupied units are more likely to be in long-term arrears, relative to owner-occupiers. We also find evidence for reciprocity: being distant (low access) from amenities serves to increase property tax arrears for occupancy categories. Specifically, across the owner-and-tenant-occupancy type, the risk of non-compliance is more pronounced among dwelling units with low access to amenities.

is what is commonly used in Ghana.

[2]This includes the homeowner's immediate family when captured in the data.

There are several policy implications of these results. First, interventions aimed at enhancing local property tax revenues need to take into account the fact that owner-and-tenant-occupied dwelling units are more sensitive to property tax increases. Second, tenant-occupied dwelling units are more likely to be in long-term arrears, and for this occupancy category, property tax efficiency and compliance could only be improved with stricter tax enforcement policies. Third, local authorities must ensure that the distribution of public amenities is spatially equitable to encourage a reduction in property tax delinquencies.

The second empirical chapter examines the role of peer effects, another element of the non-pecuniary motives for tax compliance, in explaining individual dwelling unit property tax compliance behaviour. Within this context, peer effects is the tendency of an individual dwelling unit being more compliant, conditional on observing high levels of compliance by other dwelling units. The peer group is defined as the suburb in which the dwelling units are located, with property tax compliance again measured in terms of the arrears (non-payment) period. The main objective here is to analyse the relationship between peer dwelling unit influences and individual dwelling unit compliance outcomes, both in terms of their arrears period and the probability of being in arrears.

Standard linear-in-means models of social interactions are employed for the analysis. For this study, the mean is based on the arrears period. The reduced-form results show a strong positive relationship between dwelling units' arrears outcomes (arrears period and probability of being in arrears) and those of their peers. Using an instrumental variable approach to estimate the magnitude of the peer effects, we find that a 1-year increase in the arrears period for peer dwelling units is associated with an 11.8 month rise in an individual dwelling unit's arrears period and a 16 percentage point increase in its probability of being in arrears.

The results reveal multiplier effects which local authorities can benefit from. For example, policy measures aimed at improving property tax compliance for the worst culprits will not only improve their compliance levels but also for all other residents in the suburb, whose further improved compliance could trigger even more improved

compliance by the original recipients of that policy intervention.

The third and final chapter explores whether actual capital expenditure made by the AMA affects property tax compliance. We analyse whether capital expenditure affects property tax compliance, whilst accounting for the potential endogeneity between capital expenditure and property tax arrears. This is also to reflect the possibility of tax payments showing a lagged response to capital expenditure investments, which response time is expected to be a year. Capital expenditure is looked at both in terms of the aggregate value and the breakdown into four sub-components: economic, social, environmental, and security. Property tax compliance is based on the yearly property tax arrears amount, normalized by property (rateable) value. The aims of this chapter are threefold. First, to ascertain whether capital expenditure translates into reduced property tax arrears. Second, to study how property tax arrears are affected by the interaction between capital expenditure and occupancy status. Third, to investigate how the different sub-classifications of local capital expenditure affect property tax arrears outcomes.

The results of this chapter indicate that an increase in capital expenditure is associated with a fall, both in the probability of a dwelling unit incurring arrears as well as in their arrears levels. This is especially the case when the capital expenditure ratio is lagged 1 year. However, results for the 2-year lag of the capital expenditure ratio are either not statistically significant or positively associated with arrears. This suggests that dwelling units are unlikely to factor into their current property tax payment decisions, projects that were delivered a while ago. Also, the results show that owner-and-tenant-occupied dwelling units could be susceptible to property tax delinquency, even with an increase in the overall capital expenditure. Security-related capital expenditure appears to be the most valued capital expenditure sub-classifications, compared with the economic, social, and environmental sub-classifications. However, as the sub-capital expenditure-occupancy type interaction terms mostly have a significantly positive sign,it calls into question the adequacy of the investments made, particularly when it comes to environmental- and security-related capital spending. It also hints at a possible reconsideration of the "better citizens" tag for homeowners, arising from a study based on

data from the United States and Germany (see DiPasquale and Glaeser, 1999. In emerging economies, particularly where weak regulatory enforcement and poor property tax administration systems incentivize non-compliant behaviour, the story may be different.

A key policy suggestion is for local authorities to engage more with taxpayers under their watch through public fora and focus group discussions, among others. This will facilitate the provision of the most essential public services and possibly help reduce the incidence of property tax arrears. Also, capital infrastructure projects should be continuous, adequate, and timeous in delivery to encourage greater property tax compliance.

1.4 Contribution of Study

This research contributes to the growing tax morale literature, particularly on the non-pecuniary motives (peer effects and reciprocal relationships) for property tax compliance, and from a developing country perspective, where property tax administration challenges are rife. It also broadly contributes to the wider Urban Economics field as regards housing and local government finance and policy.

In particular, it makes novel contributions regarding the inclusion of the owner-and-tenant-occupied dwelling units in the analysis of property tax compliance decisions. Arbel et al. (2017) also study property tax compliance differences between owner-occupiers and tenants but without considering the owner-and-tenant-occupied category. Additionally, their study is based on data from Israel, where the property occupier is liable for payment of the property tax. In Ghana, the legal obligation for property tax payment rests with the homeowner. Alm et al. (2014) also study property tax delinquency among residential units in Detroit, differentiating between homestead (owner-occupied) and non-homestead (non-owner-occupied) properties but again, without a consideration for owner-and-tenant-occupancy. The relevance of studying owner-and-tenant-occupied dwelling units in this research cannot be overemphasized especially as such mixed housing tenure arrangements have become increasingly popular in recent times. This is due to increased housing costs and economic challenges which limit the prospects of one getting onto the

property ladder.[3] In emerging economies such as Ghana, it is also not uncommon to find this housing arrangement, even in the capital city of Accra. This departure from the usual owner-occupier versus tenant-occupier comparison means policymakers will have to think carefully about this mixed category, especially as regards whether the homeowner under this arrangement is treated as a landlord or a pure owner-occupier in property tax-related issues.

The study also makes a new contribution as regards the use of distance estimates to public amenities in understanding property tax compliance. Distance to public amenities have been used in prior studies but mainly to analyse how it affects property values i.e. capitalization effects (see for instance Chin and Foong, 2006; Dubé et al., 2013; Dronyk-Trosper, 2017). Incorporating distance to public amenities in the analysis is important in showing that such measures are not only useful in understanding their effect on housing values, but also for property tax compliance, particularly as the tax payments made today go a long way towards affecting the future sustainable delivery of local public amenities. Particularly, this will cause policymakers to give more serious consideration to spatial equity when planning the distribution of public amenities.

Finally, the study makes an original contribution by exploring the relationship between different local capital expenditure sub-categories and property tax compliance. This offers useful insights to policymakers to not only focus on the number of infrastructure projects delivered but also the type and adequacy of the investments, especially as residents may not attach the same level of importance to all projects.

Overall, the use of real-world administrative data in this research is a departure from the experimental methods which often characterize prior studies.

1.5 Organisation of Thesis

The rest of the thesis is structured as follows. Chapter 2 gives an overview of the local governance system and property rating (taxation) in Ghana, including a brief profile of the AMA. Chapter 3 touches on key issues confronting the housing sector in Ghana. The

[3]See for instance Arundel and Doling (2017) and Huang et al. (2020).

three main empirical research studies are presented in Chapters 4 to 6. Chapter 4 explores how property tax compliance depends on occupancy status of dwelling units as well as their responses to property tax rate changes and proximity to public amenities. Chapter 5 investigates the extent to which peer effects help explain dwelling unit property tax compliance behaviour. Chapter 6 analyzes the effect of local capital expenditure, as well as its sub-classifications, on property tax compliance. Chapter 7 is a summary of the research as well as limitations and ideas for future research.

Chapter 2

Local Governance and Property Rating in Ghana: A Brief Overview

2.1 Local Governance

2.1.1 Legal and Regulatory Background

The twentieth chapter of the 1992 constitution of Ghana serves as the basis for the current local governance system in Ghana. One of its main tenets is the stipulation that the system of local governance and administration be decentralized, as far as is practicable. The Local Government Act, 1993 (Act 462) was thus enacted to serve as the regulatory framework within which local governance operates, as enshrined in the Constitution. This has since been replaced by the Local Governance Act, 2016 (Act 936), an amended version which still retains the key provisions of the former. Some of such key provisions relate to the establishment of district assemblies and the empowerment given them to generate their own revenues through avenues such as property taxation.

2.1.2 Structure of Local Governance in Ghana

The local government system in Ghana follows a tiered-structure as shown in Figure 2.1. It starts off with the Regional Coordinating Councils (RCCs), from which the 3 main local government authority types, Metropolitan, Municipal, and District Assemblies

(MMDAs), are further created. The MMDAs in turn have sub-district structures to further facilitate the decentralization process.

[Insert Figure 2.1 about here]

2.1.2.1 Regional Coordinating Councils (RCCs)

The territories of Ghana are classified into administrative units known as regions, with the constitution giving the president the mandate to create more regions if need be. For over three decades, Ghana had 10 regions until in early 2019 when the president gave effect to 6 new regions, following a referendum for their creation. This brings the current total to 16 regions as shown in Figure 2.2 below.

To further deepen local governance, Section 186 of Act 936 makes provision for the establishment of Regional Coordinating Councils (RCCs), in line with Article 255 of the 1992 Constitution of the Republic of Ghana. The regional minister, who is appointed by the President, is the chairperson of the RCC. Other members of the RCC include the: deputy regional minister(s), district chief executive (DCE) of each MMDA in the region, and two chiefs from the regional house of chiefs.

The primary responsibility of the RCCs is to oversee the activities of the MMDAs. For example, the RCCs are expected to: evaluate the performance of the MMDAs, monitor the use of moneys generated or allocated to them, approve their by-laws, and resolve any conflicts involving MMDAs in their region.

[Insert Figure 2.2 about here]

2.1.2.2 Metropolitan, Municipal, and District Assemblies (MMDAs)

To facilitate local governance, Ghana has been divided into smaller units generically termed as districts. The Act allows the president, by executive instrument, to create and name additional districts acting mostly on the recommendations of the Electoral Commission. This is geared towards achieving greater decentralization so more people in those areas can participate effectively in issues pertaining to them. Consequently, the

number of districts has increased steadily over the years – from 110 districts in 1992 to 260 districts in 2018. Three main types of "districts" can be created based on the main criterion of population size. A district is one that has a minimum population of seventy-five thousand people; a municipality has a minimum population of ninety-five thousand people; and a metropolis has a minimum population of two hundred and fifty thousand people. Consideration is also given to the geographical contiguity and economic prospects of the area in the district creating decision. New districts are formed by splitting or carving them out of an already existing one. They can also be formed by an upgrade in status e.g. from a municipality to a metropolis.

A District Assembly is defined by Act 936 as "the highest political authority in the district". The Local Government minister, an appointee of the president, is vested with power to establish District Assemblies for each district, municipality, and metropolis. The political authority for a district is a District Assembly, that of a municipality is a Municipal Assembly, and that of a metropolis is a Metropolitan Assembly. Together, they are known as Metropolitan Municipal and District Assemblies (MMDAs), though it is not uncommon for them to also be referred to by the generic "district assemblies" tag.

Sections 12 (1) and (2) of Act 936 mandate the MMDAs to exercise political and administrative authority, as well as deliberative, legislative, and executive functions. The specific functions the MMDAs are expected to undertake in their respective districts are spelt out in Section 12(3), most of which are summarized below as follows:

- formulating and executing programmes and strategies for effective resource mobilisation which will ensure the overall development of the district.
- promoting and supporting productive activity and social development, whilst eliminating barriers to initiative and development.
- sponsoring the education of students, especially to fill vacancies in the social sectors of education and health, whilst ensuring gender balance in allocating sponsorship packages.
- initiating programmes which will ensure the development of basic infrastructure,

and the provision of municipal works and services in the district.

- developing, improving, and managing human settlements and the environment.
- cooperating with the relevant national and local security agencies so as to maintain security and public safety.
- ensuring ready access to courts for the promotion of justice.
- preserving and promoting the cultural heritage.

The executive functions are carried out by an executive committee which must be established for each district assembly (Section 19). Among other persons, this committee is composed of the District Chief Executive (DCE), an appointee of the President and chairman of the committee, and chairpersons of the following sub-committees of the executive committee – Development Planning, Social Services, Works, Justice and Security, and Finance and Administration.

As at the end of 2018, there were 6 Metropolitan Assemblies, 109 Municipal Assemblies and 145 District Assemblies in Ghana, making a total of 260. All the 260 MMDAs and by extension Districts, are spread across all the 16 regions, under the supervision of the RCCs. Figure 2.3 shows the district map of Ghana whilst Table 2.2 presents the regional distribution.

[Insert Figure 2.3 about here]

[Insert Table 2.2 about here]

2.1.2.3 Sub-District Structures

Towards ensuring even greater decentralization, the minister, in establishing the MMDAs, is also required to set up Sub-Metropolitan District Councils, Urban Councils, Town or Area Councils, and Unit Committees, to correspond with the area of authority for each MMDA (Section 3(4) of Act 936). This is again in line with the provisions of Act 936, specifically Section 15, which allows the MMDAs to delegate any of its functions to the aforementioned sub-district structures.

Metropolitan Assemblies have the full complement of all the sub-district structures and thus have a four-tier local governance structure, as shown in Figure 2.1 above. Both municipal and district assemblies however, have three-tiers and are without sub-metropolitan district councils. Descriptions of these structures are shown in Table 2.1, with classifications primarily based on the population size. The unit committees, which are the lowest rung of the sub-district structure, are common to every MMDA.

[Insert Table 2.1 about here]

2.1.3 Brief Profile of the Accra Metropolitan Assembly (AMA)

The information on which this section is based mainly derives from Ghana Statistical Service (2014a), Accra Metropolitan Assembly (2016) and the AMA website, although a few details are modified to reflect current known information.

2.1.3.1 Background

The Accra Metropolitan Assembly (AMA) was established in 1898 and is one of the 260 MMDAs in Ghana.[1] It is also among the 29 MMDAs in the Greater-Accra region and one of only 6 metropolitan assemblies in the entire country. The AMA's jurisdiction is over the Accra metropolitan area, which includes Accra, Ghana's capital city. Its vision statement is "A smart, sustainable, resilient city" whilst the mission is "To improve the quality of life of people living within the city of Accra by providing leadership and opportunities for social and economic development whilst maintaining a clean, attractive and secured environment."[2]

The 2010 Population and Housing Census pegs the population of the Accra metropolis at 1,665,086, with 51.9% females, 48.1% males, and 67.4% of the population aged between 15-64 years. However, the AMA estimated the 2018 population to be 2,036,889, based on a population growth rate of 3.1% for the Greater-Accra region. Accra has a daily influx of over 2 million commuters to the city for various socio-economic activities, and

[1] The current name has evolved from several name changes over the years

[2] These are the current known vision and mission statements per *ama.gov.gh*, as they have also changed over the years.

is therefore expected to have a daily population of around 4 million, comprising both residents and visitors.[3]

2.1.3.2 Legal Framework

Following the return of Ghana to constitutional rule in 1992, the AMA, like all other MMDAs, derived its legal backing from the Local Government Act, 1993 (Act 462) as well as the Legislative Instrument (L.I.) 1615 which also established 6 sub-metropolitan district councils (sub-metros) in 1995. Over the years however, the AMA has undergone several changes with respect to size and number of sub-metros and is now underpinned by the Local Governance Act, 2016 (Act 936), an amended version of Act 462, and Legislative Instrument (L.I.) 2034. The AMA currently has 3 sub-metros, after having reached a high of 10 sub-metros, as shown in Figure 2.4. The reason for the drop was the recent carving out of other MMDAs from the AMA, in line with the legal provisions.

2.1.3.3 Administrative Structure

The AMA has 16 departments and other units whose heads report directly to the Metropolitan Coordinating Director (MCD) and ultimately to the Metropolitan Chief Executive (Mayor of Accra). There are General Assembly meetings which are presided over by the Presiding Member (PM). The PM is elected from amongst and by members of the AMA. The General Assembly has a membership of 55 comprising 41 elected members, 14 government appointees, 6 members of parliament and the Mayor of Accra, who chairs the Executive Committee meetings.[3]

The performance of the AMA's functions is through 14 sub-committees, including Social Services, Finance and Administration, Development Planning, Revenue Mobilization, Justice and Security, Education, Works, Environment, Youth and Sports, Culture, Trade, Tourism and Industry, Disaster Management, Food and Agriculture, Health, Women and Children. These sub-committees are tasked with submitting their recommendations to the Executive Committee for further consideration and then to the General Assembly

[3]See *ama.gov.gh*

which takes the final decisions around implementation.[3]

[Insert Figure 2.4 about here]

2.2 Property Rating

As the MMDAs bear direct responsibility for the overall development of respective districts, Act 936 empowers them to generate their own revenues. One of such key internally generated funds is from property rating. Some of the key processes and matters related to this, as detailed by the legislation, are discussed below:

Rateable values: These are the monetary values of the properties which the property tax rates are charged to. The Lands Commission of Ghana, a parastatal, is tasked with determining these values and preparing a valuation list for every MMDA. The Lands Commission uses a depreciated replacement cost (DRC) method of property valuation. The DRC works by estimating the cost of the building as though it were new and then allowing for depreciation and other improvements. However, owing to the huge outlay, these valuations are infrequently carried out. The rateable value shall not exceed 50% of the replacement cost for owner-occupied properties and not be less than 75% of the replacement cost for any other occupancy arrangement. Owner-occupiers therefore enjoy a greater discount than other occupier types.

Rate Determination: Section 145(1) of Act 936 specifically states that "A District Assembly shall levy sufficient rates to provide for the total estimated expenditure to be incurred by the District Assembly during the period in respect of which the rate is levied." The rate levied is usually at a specified rate per the local currency (Ghana Cedi) on the rateable value of the property. An MMDA would typically have "rating zone classes" especially for residential property rating purposes. This classification is done to reflect differences in location quality within an MMDA. Thus, properties in a rating zone class for prime locations usually attract a higher rate impost than those in other rating zone classes. Property rates are deemed to be levied by the publication of a notice as defined by the regulations of the MMDA. There is also a Rate Assessment Committee to which

persons aggrieved by their rateable values or by their property tax rates can apply for a review.

Tax burden: The property owner has the legal obligation for payment of property taxes.

Tax exemptions: The Act exempts certain properties from property assessment and rating, including those designated as public worship centres, cemeteries, charities, public hospitals, and diplomatic missions. The MMDAs also have the power to reduce or cancel payment of the property rate due to the poverty of the person liable for payment.

Non-payment of property rates: If the property rate amount due is not paid within a period of 42 days, after first serving default notice to the person liable for payment, the MMDA can apply to the courts for an order to sell the property. In reality though, the bottlenecks in the court system mean that many of these cases are not promptly adjudicated on or not sent to court in the first place by the MMDAs concerned. This in itself can help to perpetuate the non-payment of property taxes.

Collection of property taxes: The MMDAs are expected to appoint suitable persons as rate collectors whose job is to collect property taxes due and pay the amounts collected to their respective local authorities. They are also to report to the MMDA, any person who failed to pay the property rate. Penalties exist for offending rate collectors.

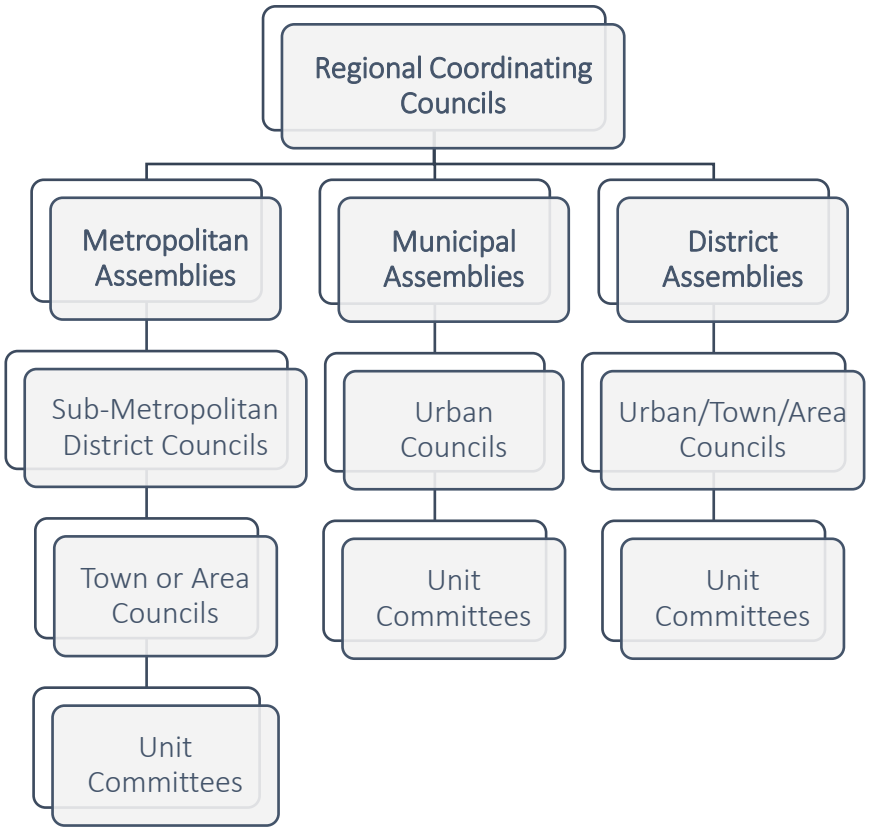


Figure 2.1: Structure of the Local Governance System - Ghana

The figure displays the structure of the local governance in Ghana. It shows a 4-tier set-up for Metropolitan Assemblies, and a 3-tier set-up for both Municipal and District Assemblies.

(Source: Adapted from Institute of Local Government Studies(ILGS), Ghana, 2008.)

Figure 2.2: Regional Map of Ghana

The figure shows the demarcation of Ghana into administrative units called regions. There are 16 regions in total, including 6 new regions which were created in early 2019.

(Source: Ministry of Local Government and Rural Development, Ghana, August 2019)

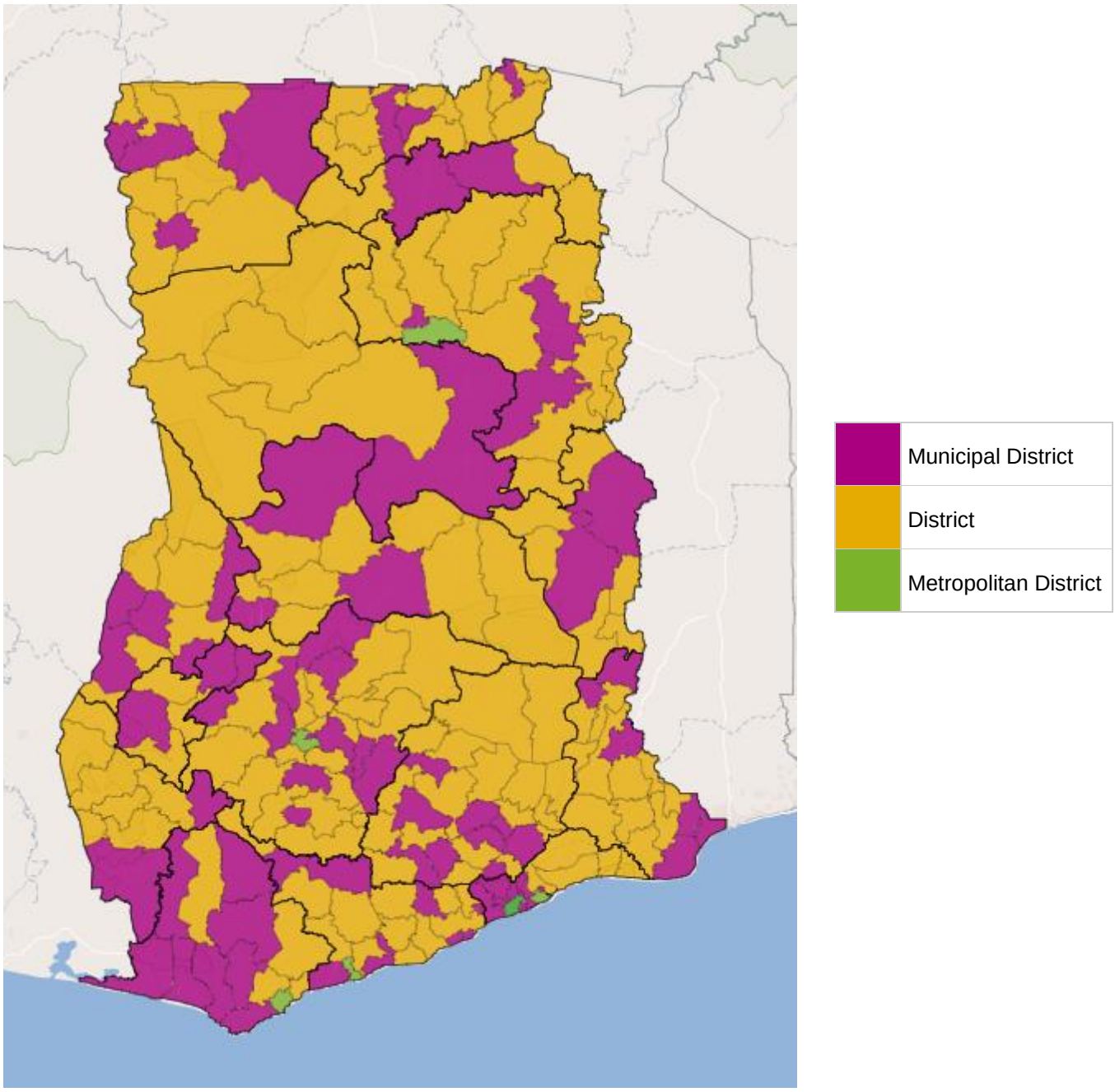


Figure 2.3: District Map of Ghana

The figure shows the distribution of metropolitan, municipal, and district areas across the regions of Ghana. For each of these areas, there is a metropolitan, municipal, or district assembly, respectively, which is the governing local authority.

(Source: City Population (map reference date: 26 September 2019))

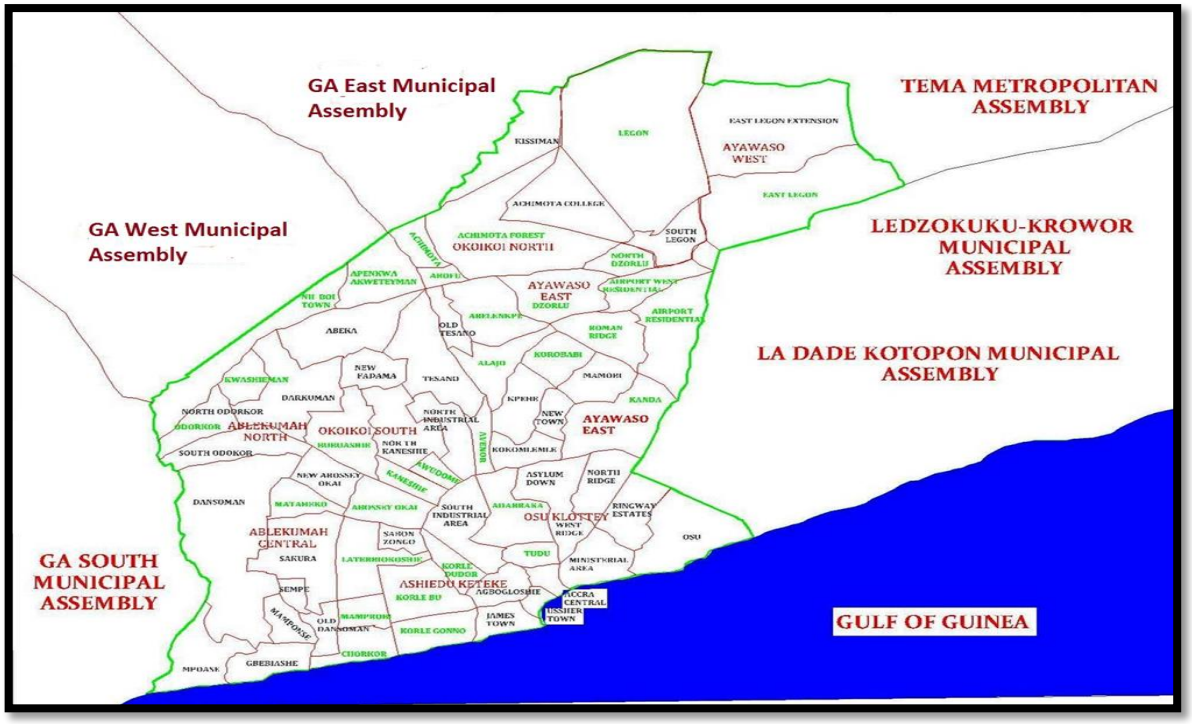


Figure 2.4: Map of the Accra Metropolitan Assembly (old)

The figure shows the old map of the AMA (with 10 sub-metros). The current number of sub-metros however, has changed following the carving out of other district assemblies from the AMA. Thus, the current map, which is non-existent, should in reality cover a smaller area than what is shown. (*Source: Urban Land Management Institute, Ghana*)

Table 2.1: Description of Sub-District Structures

Sub-Structure	Description
Sub-Metropolitan District Councils	Found in Metropolitan Assemblies and established for cosmopolitan areas, with identical urbanization and management problems.
Urban Councils	Peculiar to settlements of "ordinary" District Assemblies with populations above 15,000 and which are cosmopolitan in character.
Town Councils	Established for settlements with population exceeding 50,000 people (Metropolis). Established for settlements with populations between 5,000 and 15,000 people (Districts).
Area Councils	Exists for a number of settlements and villages which are grouped together but whose individual settlements have populations of less than 5,000 people.
Zonal Councils	Are found in the "one-town" Municipal Assemblies with population of 3,000.
Unit Committees	Rural Areas: Group of settlements with a population of between 500 and 1,000 (rural areas). Urban Areas: Population of 1,500 and above.

The table describes sub-district structures, in terms of population-based definitions, for the Metropolitan, Municipal, and District Assemblies (MMDAs) in Ghana.

(Source: ILGS and FES (2016). A Guide to District Assemblies in Ghana, Second Edition.)

Table 2.2: Regional Distribution of MMDAs in Ghana

Regions	Metropolitan Assemblies	Municipal Assemblies	District Assemblies	Total
Ashanti	1	19	23	43
Bono	-	5	7	12
Bono East	-	4	7	11
Ahafo	-	3	3	6
Central	1	7	14	22
Eastern	-	13	20	33
Greater Accra	2	23	4	29
Northern	1	5	10	16
North East	-	2	4	6
Savannah	-	1	6	7
Upper East	-	4	11	15
Upper West	-	4	7	11
Volta	-	6	12	18
Oti	-	2	6	8
Western	1	8	5	14
Western North	-	3	6	9
Total	6	109	145	260

The table shows the distribution of the 260 local political authorities in Ghana, known collectively as Metropolitan, Municipal, and District Assemblies (MMDAs), across all the 16 regions of the country.

(Source: Ministry of Local Government and Rural Development, Ghana, August 2019.)

Chapter 3

Housing in Ghana: Highlights of Key Issues

3.1 Legal and Regulatory Framework for Housing in Ghana

Table 3.1 presents a snapshot of the various regulations which underpin housing in Ghana. Among other things, it shows that all public lands vest in the President of Ghana, on behalf and in trust for all Ghanaians. This is stipulated in the 1992 Constitution of the Republic of Ghana, which is the overarching legal document to which all the others must align.

While at first glance it appears there is comprehensive legal coverage of the main issues, there is in fact the lack of a harmonization among these various pockets of laws (Ghana Statistical Service, 2014b). Another challenge lies in the fact that some of the laws are outmoded and do not reflect happenings on the ground. For instance, the Rent Act, 1963 (Act 220) allows landlords to take up to 6 months of advance rental payments from tenants. In reality though, it is not uncommon for tenants to pay up to 2-3 years in advance due to the limited housing supply, which is a blatant disregard for the law (Gough and Yankson, 2011; Ghana Statistical Service, 2014b). Also, CAP 84, which was enacted as far back as 1945 when Ghana was still under colonial rule, is still one of the main laws

governing land use planning today although the housing market has significantly evolved over the last seven decades. More specifically, Konadu-Agyemang (2001) notes that CAP 84 centres around planning schemes, layouts, and minimum plot sizes which may have proved relevant in the 1950s but are currently cost ineffective as regards building houses in cities. Owusu (2008) also touches on how the limitations of CAP 84 have led to an inordinate demand for space particularly in the big cities of Ghana.

An additional challenge worth noting is the fact that there is no clear-cut indication as to which agency drives housing policy and regulation in the country. For instance, (UN-Habitat, 2011, p. 32) reveals the absence of a "dedicated Ministry of Housing in Ghana", with the Ministry of Water Resources, Works, and Housing (MWRWH) often being tasked to provide the necessary leadership.

The MWRWH is supported in their role by the Ministry of Local Government and Rural Development (MLGRD), which helps provide neighbourhood infrastructure, zoning and planning through the MMDAs. However, the effective performance of this responsibility by the MMDAs has been called into question owing to the growing number of slums and poorly serviced neighbourhoods (Ghana Statistical Service, 2014b).

[Insert Table 3.1 about here]

3.2 Land Tenure System

Land tenure systems control how individuals and groups gain access to land and determine the rights and duties associated with land use and ownership (Finnegan, 2015). The 1992 Constitution of Ghana recognizes two main land tenure systems: public and customary.

Public lands constitute about 20% of all lands in Ghana and could either be vested or state in nature. Vested lands are those which are managed by the government in trust for the owners who still maintain their customary landownership. State lands are lands which have been compulsorily purchased by the government in the wider public interest, with compensation given to the original landowners (WaterAid and UN-Habitat, 2009; UN-Habitat, 2011).

Customary lands are those which are primarily owned by stools, skins, families, and clans, typically held in trust by the chief, family head, or some other designated representative, for the benefit of all persons in the aforementioned groups. The vast majority of lands in Ghana, about 80%, are customary in nature, predominantly reflecting the traditional heritage of Ghana where land was communally owned (ibid).

The administration of customary lands in particular is fraught with numerous bottlenecks, often resulting in conflicts which are inimical to the development of the housing sector. Fiadzigbey (2006) mentions some of these challenges including the following. First, there are fuzzy boundaries of many customary lands resulting directly from old and inaccurate maps. This accounts for the high number of land-related litigations. Second, individuals seeking to privately acquire or lease customary lands from the owners, often encounter situations of previous multiple sales or leases of those same land parcels, due to poor record-keeping. Third, disputes often arise as to who is the rightful person to authorize land transactions especially in the case of stool lands. These conflicts often put off prospective land developers from making any purchases. Finally, there is the lack of accountability from some chiefs and clan heads regarding proceeds from customary lands sold. This causes them to incur the displeasure of their community members, sometimes resulting in retaliatory and aggressive behaviour towards these traditional authorities (see also Ubink, 2008). This accountability problem towards community members is also true of MMDAs which, by law, are entitled to about 55% of all customary land sale revenues.

3.3 Housing Shortage

One of the main challenges facing Ghana's housing sector is the growing housing deficit. As of 2010, there was a deficit of 717,059 in the housing stock for 2-bedroom units with 6-persons per household and a deficit of 2,771,961 units for 2-bedroom units with 4-persons per household (ISSER, 2013). Ghana was expected to require 5.7 million new rooms which translates into nearly 600,000 new housing units annually, by the year 2020 (World Bank, 2015).

One major reason for this housing gap is the inability of housing stock increases to keep up with the rapid rate of population and urban growth over the years. This is particularly true of the major cities of Ghana, Accra and Kumasi, with each, in 2010, accounting for 72% of the entire housing deficit in the Greater-Accra and Ashanti regions, respectively (ibid).

3.4 Emergence of Slums

Closely linked to the housing shortfall in the major cities is the creation of slums. The rapid urban growth in the cities such as Accra and Kumasi is predominantly down to a rural-urban drift, where people migrate from deprived rural areas to cities in search of better opportunities. This gives rise to many informal settlements and slums as the migrants often do not have the means to buy or rent housing units, which are already in short supply. Accra alone is thought to have 43% of its residents living in slums (Informal City Dialogues, 2013). These slums are often characterized by the absence of basic public amenities such as toilets, bathrooms, and water supply, whilst also facing poor environmental and sanitary conditions (ISSER, 2013; Ghana Statistical Service, 2014b). These slums also tend to be associated with crime and promiscuity, with government's efforts at evicting slum residents often being rendered futile due to the fierce resistance from locals and other stakeholders (Informal City Dialogues, 2013).

3.5 Housing Affordability

Though housing affordability is measured in several ways, one of the most popular approaches is to use the housing cost-to-income ratio benchmark (see for instance Stone, 2006). In Ghana, the issue of housing affordability mainly comes up in the major cities, particularly Accra, where housing costs are high. Among the reasons for the increased housing prices in Accra are constraints placed on the housing market through policies including minimum plot sizes which only few can afford and excessive demand for self-contained accommodation, which have high welfare costs, by persons in the formal sector

(UN-Habitat, 2011). Owusu (2008) corroborates this by showing a huge disparity in housing land prices between lands in peri-urban Accra and those in other parts of the country.

UN-Habitat (2011) construct a housing affordability pyramid for urban households in Ghana. This is presented in Figure 3.1. The affordability estimates are based on a maximum housing cost (HC) to income (Y) ratio of 3 and a monthly maximum rent (R) to income ratio pegged at 10%. It shows that 35% of the households can only afford housing which costs a maximum of GHS 12,000, with 85% of them not being able to afford anything above GHS 72,000.[1] Furthermore, when considering the price of formal housing targeted at specific income ranges (column 5), it shows that only the top 20% - 25% of the households can afford any house available, even when housing costs is a third of income. The levels of rent at the rent-to-income ratio of 10% or less, remain very low, with 50% of urban households being able to pay up to GHS 300 a month and 35% of households being able to afford GHS 10 or less in monthly rents.

Although the above estimates appear dated, the affordability situation in Ghana has generally not seen much improvement. In actual fact, it appears to have worsened with the passage of time, as house price and housing cost increases have far outstripped income levels. This stands in sharp contrast to what pertains to countries like the UK. For instance, the median house price in England (Wales) increased by 0.02% (2.6%), from 2018 to 2019, whilst earnings rose by 2.7% (4.4%) over the same period (ONS, 2020). Additionally, the UK has considerable government interventions in the housing market, mainly through many social housing schemes. As of April 2018, the UK had around 5 million homes in the social housing sector, representing nearly a sixth of all properties, and this proportion has been stable over the last decade (ONS, 2019). This helps to make housing more affordable for low-income earners.

In Ghana however, there are very little of these interventions in the housing market by way of providing housing subsidies or social housing.There have been several attempts

[1]The GHS amounts work out to about USD 7,319 and USD 43,916, respectively, based on a USD/GHS exchange rate of 1.6395 at the end of 2011. The GBP/USD exchange rate for the same period was 1.5537 (`investing.com`).

by successive governments of Ghana to provide affordable housing but without any real significant headway made. The most recent, of such interventions, is the agreement between the government of Ghana and the United Nations Office for Project Services (UNOPS) to supply 100,000 new affordable housing units near Amasaman in Accra. The project is expected to be completed by 2022 and estimated at USD 5 billion.[2]

[Insert Figure 3.1 about here]

3.6 Housing Finance

The availability of financing for home purchases in Ghana is an emerging area at best, as institutional capacity and structures have not been adequately developed over the years to provide prospective homebuyers with enough funding opportunities. As noted by UN-Habitat (2011), the historical practice has been for governments to set-up institutions with the aim of providing housing finance to the ordinary Ghanaian, particularly those in urban areas such as Accra. These institutions however, fail to meet this objective resulting in the establishment of new ones which also end up failing. The failures lead these institutions to gravitate towards the high-income market segment which is relatively safer in terms of the lending business. The reality therefore is that the average Ghanaian has little or no access to formal-sector/institutional financing towards fulfilling their dreams of purchasing a house. Warnock and Warnock (2008) confirm the existence of smaller housing finance systems in emerging economies, including Ghana, relative to developed countries. They show that Ghana's maximum mortgage debt-to-GDP ratio (proxy for housing finance) is a paltry 0.5%, which is the lowest among all the 62 countries analysed. The estimated mortgage debt-to-GDP ratio for Ghana, as of 2020, was about 2.2%, which is still relatively low.[3]

[2]See http://housingfinanceafrica.org and https://www.globalpropertyguide.com [Accessed 20 April 2020].

[3]The computation is based on a total outstanding mortgage debt figure of USD 1,084 million for 2020 (`statista.com/statistics/1068887/outstanding-mortgage-debt-africa-by-country/`) and a projected GDP estimate of USD 50 billion for 2020 (`https://tradingeconomics.com/ghana`) [Accessed 1 April 2021].

Ghana Statistical Service (2014b) lists the main sources of formal and informal housing financing in Ghana. This is shown in Figure 3.2. Although the banking sector appears as one of the main formal sources of lending, it is quite apparent from the above discussion that the mortgages given are insignificant (in number and amounts disbursed), in relation to their total lending portfolio. The reasons accounting for the underdeveloped mortgage market in Ghana include the following. First, there are only a few major banking institutions in the mortgage business including Ghana Home Loans, HFC Bank, CAL Bank, Fidelity Bank, and Stanbic Bank (Teye et al., 2015). Among the mortgage products on offer are the Home Purchase Mortgage, Home Completion Mortgage, Home Improvement Mortgage, and Home Equity Mortgage (ibid). Second, is the existence of supply-side constraints such as the lack of litigation-free and appropriate collateral security for mortgage loans, lack of reliable information on the creditworthiness of mortgagors, capital inadequacy of banks, and instability in the macroeconomic environment (ibid). Finally, there are demand-related factors such as high mortgage interest rates, high house price levels, low-income levels, and a cultural aversion for debt, all of which limit the overall extent of mortgage financing for the prospective homebuyer (ibid). It is worth adding that despite the overall low-levels of mortgage financing in Ghana, the use of mortgages is generally higher in Accra than in other urban areas, owing to the western-orientation and more expensive houses in the former (UN-Habitat, 2011).

Microfinance institutions typically provide financial services (such as housing microloans), manage small sums of money, and act as intermediaries on behalf of primarily low-income clients. These institutions include rural and community banks and savings and loans institutions (UN-Habitat, 2011). These low-income groups are able to access this microfinancing with or without a credit history, as these institutions seek to help meet all the housing needs and services of the beneficiaries (Ghana Statistical Service, 2014b). However, the interest rates charged by these institutions are extremely high due to the high risk profile of the borrowers.

The intervention of NGOs in housing finance is mainly centred around supporting efforts aimed at improving the housing conditions of the urban poor. In line with this,

they typically facilitate and mediate between low-income households and the MMDAs, financial institutions and the central government to obtain funds which they in turn use for housing and community development (Ghana Statistical Service, 2014b).

On the informal housing finance front, self-financing is perhaps the most notable source. UN-Habitat (2011) reveals that majority of the housing projects in Ghana are undertaken by individual households acting out of their own will to provide a home for themselves and their family members. The financing for these privately built houses is predominantly from personal savings accumulated over several years. In some cases, personal savings were supplemented with monies received from relatives, friends, and retirement lump-sums, for houses built in urban areas such as Accra and Kumasi (see Tipple et al., 1999).

Remittances, the other informal source, into Ghana are one of the largest foreign exchange earners, featuring prominently in housing financing in Ghana for many years (UN-Habitat, 2011). What typically happens is that non-resident Ghanaians remit funds to family members, friends or other persons to put up a house on their behalf. In places like Accra, the proportion of such houses is quite significant, with Grant (2009) for instance, estimating that nearly 47% of new builds in Accra were owned by non-resident/returned migrant Ghanaians. This occurrence has also led to the denomination of land and house prices in USD, popularly referred to as "dollarization" in places like Accra, thereby exacerbating the housing affordability situation (see ISSER, 2013).

[Insert Figure 3.2 about here]

3.7 Private Real Estate Developers

The 1990s saw the emergence of a number of private real estate developers in Ghana, mainly as a response to capitalist- and privatisation-friendly policies introduced by the government of the day.[4] Among these early developers were Regimanuel Estates, Manet, Trasacco Valley, and EMEFS. However, the number of private real estate developers

[4]This section is largely based on UN-Habitat (2011), Teye et al. (2015), and Broll Ghana (2019)

has grown significantly over the years with the addition of relatively newer ones such as Clifton Homes, Imperial Homes, Gold Key Properties, among others. Most of these developers are under the umbrella group known as the Ghana Real Estate Developers Association (GREDA).

In the past, most of the developers did not have already built houses for sale but required the prospective homebuyer to typically pay half of the required amount for construction to start, paying the remainder once the building reached the roofing level. Nowadays however, many of the developers pre-finance the construction of the houses and require the buyer to make full payment upfront, before ownership passes to them. In some cases also, these developers sell serviced land plots as well. These lands are generally considered "safer" compared with an individual directly buying a customary land, as the developers would have done all the due diligence work to ensure that all potential encumbrances such as those related to land title, disputes, and multiple sales were fully resolved or at best, non-existent.

In reality, the impact of these private real estate developers on reducing the housing deficit is minimal. This is because they are driven by a profit motive which means that they do not cater to the housing needs of all segments of society but only those who can afford. Their property developments are therefore concentrated in the prime locations of Accra, where the wealthy reside. Figure 3.3 highlights the main prime areas in the city of Accra. Notable among these locations are the Airport Residential Area, Cantonments, East Legon, Labone and Roman Ridge. Areas such as Airport Hills, East Legon Hills, Burma Hills, and East Airport are considered as emerging prime residential locations.

Broll Ghana (2019) identifies 3 major housing classifications in Ghana's residential market namely: high-end, mid-end, and low-end. The high-end market mainly comprises townhouses and penthouses whose prices range between USD 450,000 and USD 2,500,000, with rents within the neighbourhood of USD 4,000 - USD 6,500 per month. About 98% of the high-end property pipeline, expected to be delivered by 2021, is concentrated in the notable areas mentioned above but mostly in Airport Residential Area and Cantonments (ibid). The mid-end market commands house sale prices ranging from USD 56,000 to

USD 350,000, with rental values around USD 100 to USD 1,000. It also attracts the highest demand. Low-end properties are however, in short supply as the developers tend to leave that market segment to the government and quasi-governmental bodies to provide affordable housing (ibid). This reaffirms the earlier point that the private real estate developers are mostly incentivized by huge profit margins, which probably explains why they supply about only 2% of Ghana's urban housing stock (UN-Habitat, 2011).

[Insert Figure 3.3 about here]

As regards funding for their projects, private real estate developers also surprisingly self-finance their projects in most cases, despite being in a better position than the average individual to access mortgage financing. A field survey carried out by the Bank of Ghana revealed that nearly 73% of developers finance their housing projects while only 18% relied on mortgage financing (Bank of Ghana, 2007). The main takeaway from these findings is that there is a lot of room for growth and improvement in Ghana's mortgage industry towards helping to increase the housing stock.

Figure 3.1: Housing Affordability Pyramid - Ghana

Income range	Income GHC/month	Percentage of all households	Maximum affordability HC: Y=3	Housing cost aimed at the thresholds*	Monthly maximum rent levels affordable at R: Y of 10%
Very high	> 4,000	**5%**	180,000	476,000 & 204,000	500+
High	3,001 – 4,000	**10%**	144,000	163,200	400
Mid-high	2,001 – 3,000	**50% of households can afford housing costing between GHC12,001 - GHC72,000**	108,000	95,200	300
Middle	1,001 – 2,000		72,000	Up to 54,000	200
Moderate	501 – 1,000		36,000		100
Low income	101 – 500		18,000		50
	51 – 100	**35% of households can afford housing costing GHC12,000 or less**	12,000		10
No wage income	0 – 50				

(Source: UN-Habitat, 2011)
*Karley (2008: 10) adjusted for 2010 values and assuming one-third of income as housing payments; "HC:Y=3" refers to a housing cost (HC) to income (Y) ratio of 3; "R:Y of 10%" denotes a monthly rent (R) to income ratio of 10%.

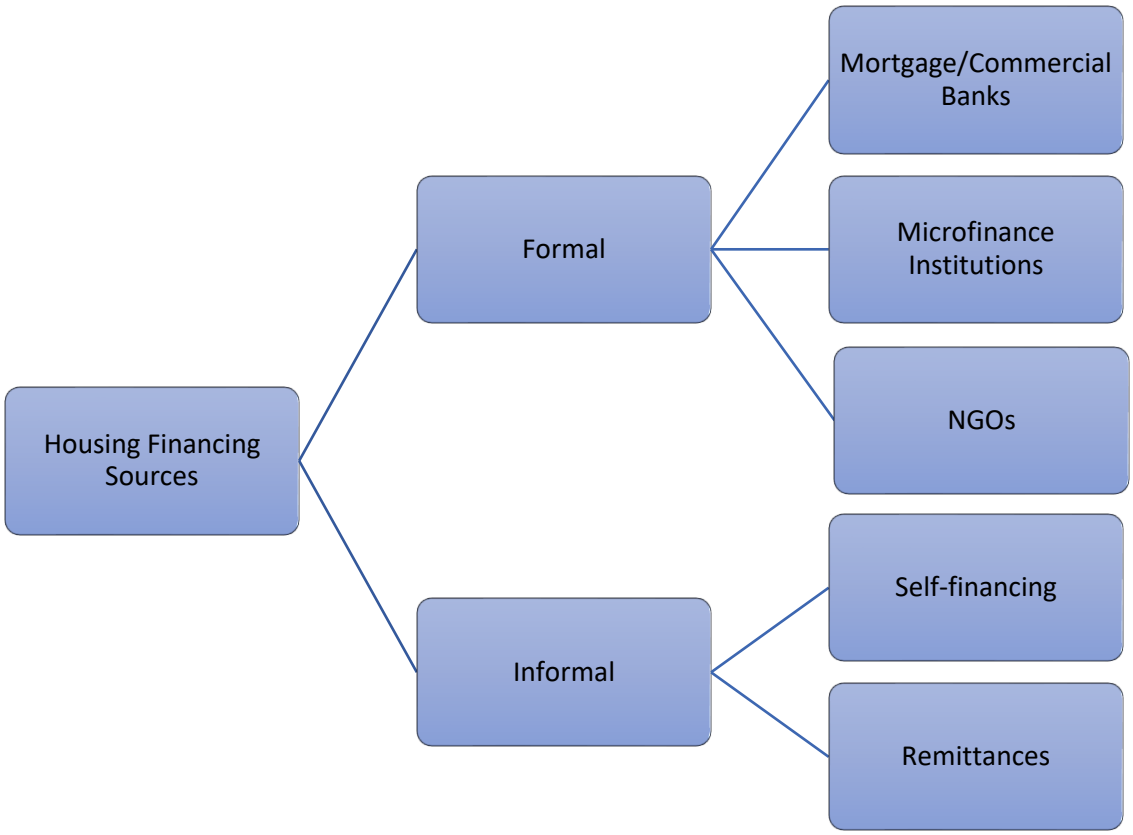
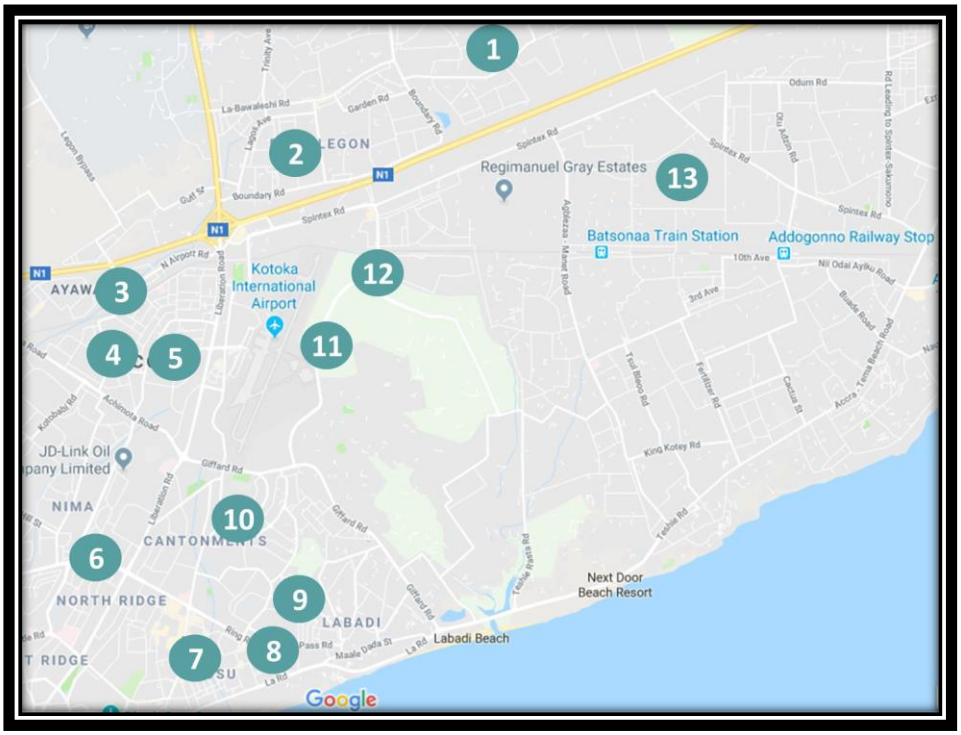


Figure 3.2: Sources of Housing Finance - Ghana

(Source: Author's construct based on Ghana Statistical Service (2014b))



1. East Legon Hills
2. East Legon
3. Dzorwulu
4. Roman Ridge
5. Airport Residential
6. Ridge
7. Airport Hills
8. Nyaniba Estates
9. Labone
10. Cantonments
11. Burma Hills
12. East Airport
13. Spintex

Figure 3.3: Prime Residential Locations in Accra

(Source: Broll Ghana, 2019)

Table 3.1: Summary of Legal and Regulatory Framework on Housing and Land Use

Housing Sub-Sector	Law/Legal Instrument
Land Ownership and Management	1992 Constitution: Chapter 21 Clause 257 (1-5) – Vestment of public lands in President Chapter 21 Clause 266 (1-5) – Exclusion of foreigners from freehold leases Chapter 21 Clause 267 (1-9) – Stool and Skin Lands and Property State Lands Act, 1962 (Act 125) – Compulsory acquisition of land by the state Stamp Duty Act, 2005 (Act 689) Office of the Administration of Stool Lands, 1994 (Act 481) Lands Commission Act, 2008 (Act 767)
Land Use Planning	Town and Country Planning Ordinance, 1945 (CAP 84) Town Ordinance 1951 (CAP 86) Land Planning and Soil Conservation Ordinance, 1953 (No. 32) Tema Development Corporation (Miscellaneous Provisions) Decree, 1966 (NLCD 108) Volta River Development Act, 1961 (Act 46) as amended Local Government Act, 1993 (Act 462)* and MMDAs relevant bye-laws National Development Planning Commission (Cap 86 & Act 33) Act, 1994 (Act 479) National Development Systems Act, 1994 (Act 480)
Development Control	Local Government Law, 1993 (Act 462 Sections 49 to 57) Town and Country Planning Ordinance, 1945 (CAP 84) Environmental Protection Agency Act, 1994 (Act 490) Environmental Assessment Regulations, 1999 (L.I. 1652)
Housing Finance and Mortgage	Building Society Ordinance, 1955 (No.30) Co-operative Societies Act, 1968 (NLCD252) Home Mortgage Finance Law, 1993 (PNDCL 329 Home Mortgage Finance Act, 2008 (Act 770) Credit Reporting Act, 2007 (Act 726) Long-Term Savings Scheme Act, 2004 (Act 679) Borrower and Lenders Act, 2008 (Act 773)
Construction	LI 1630 National Building Regulations, 1996 Building materials standards as set by Ghana Standards Authority
Rent	Rent Act, 1963 (Act 220) Rent Tax (Act 592), Internal Revenue Act, 2000

Source: "Housing in Ghana" report (Ghana Statistical Service, 2014b), the Ministry of Local Government and Rural Development (MLGRD), and UN-Habitat (2011).

*Local Government Act, 1993 (Act 462) has been replaced by the Local Government Act, 2016 (Act 936), an amended version.

Chapter 4

Residential Occupancy, Local Amenities and Property Tax Compliance

4.1 Introduction

Property tax arrears pose a significant challenge to local governments aiming to provide public services at sustainable levels. Tax revenue shortfalls are particularly endemic in economies undergoing democratic decentralization where local authorities enjoy a higher level of fiscal autonomy, yet struggle to administer and enforce the collection of taxes.[1] In such areas, local property tax authorities grapple with the design of policies aimed at improving property tax compliance. The success of such efforts requires an understanding of the motives driving taxpayer behaviour. This notwithstanding, the literature on property taxes remains minimal, relative to the large and quickly evolving general body

[1] In developing countries, property taxes account for about 40% of total sub-national tax revenues (Bird and Slack, 2002), yet they constitute less than 4% of all tax revenues and on average only about 0.6% of GDP (Olowu, 2004). In developed economies, in contrast, property tax revenues are much larger even in relative terms as they account for about 2% of GDP (Bahl and Martinez-Vazquez, 2008). Part of this discrepancy can be explained by differences in the inability of local governments to collect property taxes (Bahl, 2009).

Even in developed economies, some cities have been plagued by property tax delinquencies, especially in areas which have experienced prolonged economic decline in the aftermath of the global financial crisis (see e.g. Alm et al. (2014) for an analysis of property tax delinquency in Detroit.

of literature on tax compliance.

The aim of this chapter is to narrow this gap by exploring how the motives for property tax compliance depend on occupancy status of residential units and neighborhood characteristics, with reference to their responses to property rate increases and proximity to public amenities. The latter in particular, is based on the concept of "reciprocity" where "tax payments are made in exchange for services provided by the state." (Luttmer and Singhal, 2014, p. 157).[2] We examine the role of reciprocity by studying how compliance behaviour varies with the distance of the taxpayer's residence to public amenities (hospitals and suburban police stations).

The empirical analysis is based on a large administrative dataset obtained from the Accra Metropolitan Area (AMA). The data contains information on cumulative property tax arrears, which span the 2007-2018 time period, and for nearly 53,000 dwelling units in Accra. It also records whether a dwelling unit is owner-occupied, tenant-occupied, or owner-and-tenant occupied. The latter "mixed" category represents owner-occupiers who rent out part of their dwelling to a tenant.[3] The dataset exhibits significant variability in occupancy characteristics and compliance behaviour of dwelling units. For the studied time period, about 35% of the dwelling units are in long-term arrears, which is indicative of the challenges the AMA faces in its property tax collection efforts.

Using multinomial logistic regressions, and reporting relative risk ratios based on arrears periods as of 2018, we find that owner-and-tenant-occupied dwelling units are more likely to be non-compliant. Furthermore, conditional on being non-compliant, they have generally longer accumulated arrears compared to owner-occupied units.[4] For example, the risk of the owner-and-tenant-occupied dwelling units being up to one year in arrears is about 11% higher than that of owner-occupied dwellings. Further, we analyze the responses of dwelling units to property tax rate increases, after classifying them into two

[2]Early experiments by Alm et al. (1992c) find that tax compliance is much higher than what the theory predicts in instances where tax revenues are used to fund public amenities.

[3]In Ghana, regardless of occupancy type, the legal owner of the house is liable for the payment of property tax. Yet, as we will show, the occupancy characteristics of dwelling units is an important determinant of compliance.

[4]Regression coefficients have the expected sign across all arrears periods and are statistically significant across all arrears periods except for the 1yr-2yrs arrears period, where result is not significant.

groups based on whether they experience high or low rate increases. The study finds a significantly higher likelihood of being in short-term arrears (up to 1 year) for owner-and-tenant-occupied dwelling units with high increases in property rates, compared with those who attract low rate increases. As regards long-term arrears, these differences disappear and delinquency levels are similar for all owner-and-tenant-occupied dwelling units, regardless of the level of tax rate changes experienced. This suggests the existence of possible financial constraints faced by this occupancy type. The study further establishes that the tenant category of dwelling units are more likely to hold long-standing arrears whereas there are no significant differences in relatively recent arrears, in comparison with owner-occupiers.[5] We also find evidence for reciprocity: being distant (low access) from amenities serves to increase property tax arrears for occupancy categories. Specifically, differences in arrears across the owner-and-tenant-occupancy types are more pronounced for the dwelling units with low access to amenities.

The analysis also adds to the literature studying non-pecuniary motives for tax compliance, by considering actual rather than perceived access to public goods. That is, unlike the previous literature, in which households are differentiated by the messages accompanying their tax bills or payment reminders, we measure access by the proximity of the suburb in which the residence is located to amenities such as hospitals and suburban police stations. Prior studies have analyzed how the distance to such amenities affects property values, i.e. they focus on capitalization effects (see for instance Chin and Foong, 2006; Dronyk-Trosper, 2017; Dubé et al., 2013). To our knowledge, we are the first to explore how distance to amenities affects property tax compliance for different dwelling unit types.

The findings bear policy implications for local governments in similar emerging markets. In particular, policy interventions aimed at enhancing local property tax revenues need to take into account the fact that owner-and-tenant-occupied dwelling units are more sensitive to property tax increases. Furthermore, properties in suburbs with lower

[5]In Ghana, it is the homeowner who is legally liable for the payment of property tax regardless of the occupancy status of the dwelling. Thus, the owners of rented dwelling units might not reside in the same residential area which could potentially be the reason for the observed tendency of these dwelling units to be either fully compliant or in long term arrears.

access to public amenities are more likely to be in arrears. Tenant-occupied dwelling units are more likely to be in long-term arrears and for this occupancy category, property tax efficiency and compliance could only be improved with stricter tax enforcement policies. Finally, local authorities must ensure that the distribution of public amenities is equitable as it influences property tax compliance decisions.

The remainder of the chapter is structured as follows. Section 4.2 presents a review of the literature. Section 4.3 highlights some underlying hypothetical considerations. Section 4.4 discusses the data and variable construction. Section 4.5 presents the empirical analysis and results while Section 4.6 concludes the chapter.

4.2 Literature Review

4.2.1 Property Taxation Challenges in Developing Countries

Though the overall relevance of property taxes to local governments is not in doubt, developing countries are particularly seen to be more reliant on them for purposes of funding subnational government expenditures, compared with more developed economies. For instance, Bahl and Martinez-Vazquez (2007) show that the average ratio of property tax revenues to total subnational government expenditure is about 17% for developing countries versus 11% for Organisation for Economic Cooperation and Development (OECD) countries.[6] This comparatively greater reliance is due in part to the fewer tax options available to local governments in the former (Bahl and Martinez-Vazquez, 2008; Bahl and Wallace, 2008).

This notwithstanding, developing countries are also characterized by informal structures which encourage non-compliance and lead to low revenue pools. Some of the specific issues relate to lapses in the manner the tax is administered leading to incomprehensive property tax coverage. For instance, low income households are given excessive tax concessions, whilst government properties are completely exempt from any property tax payment (Bird and Slack, 2006; Bahl and Wallace, 2008). Additionally, there are is-

[6]The original ratios are categorized into four-year groupings: 1970s, 1980s, 1990s, and 2000s, based on IMF data. We simply take the average of the four ratios for each set of countries.

sues related to poor cadastre systems, property title challenges and property assessment biases, among others, which are often symptomatic of developing countries (Bahl and Wallace, 2008; Payne, 1997). Kelly (2013) also cites citizens' mistrust of the government regarding how the revenue will be spent, citizens' perceived inequities associated with the property tax system, the inability to pay in instalments, citizens' lack of a tax payment mentality, and the knowledge that governments will ultimately not enforce the property tax payment obligation as occurrences which are characteristic of developing countries.

The issue of weak regulatory enforcement is particularly a major problem in developing markets and gives rise to numerous cases of non-compliance. As Bahl (2009) notes, weak enforcement and minor penalties for non-compliance account for the low property tax collection rates for developing economies. This is amply demonstrated in Figure 4.1 which shows a comparative analysis of property tax collection rates for eight developed and developing countries. Whereas developed countries like France and the United Kingdom achieve near perfect collection rates, developing countries such as Kenya and Macedonia only manage 60% and 15% respectively.

[Insert Figure 4.1 about here]

This situation is worsened by the political undertones associated with the weak enforcement which make it very tricky to handle. For example, not wanting to jeopardise their political future, elected local politicians may be reluctant to come down hard on defaulters and could also face immense pressure to give exemptions to politically powerful individuals (Bahl and Wallace, 2008). Thus, many of the decisions regarding property tax policy are based on politics, often favouring one group over another, rather than on robust economic principles and analysis (Slack, 2013). Therefore, to improve upon property tax collections and enforcement, governments need to understand the reasons for the low collections and taxpayer non-compliance, whilst developing human and systems capacity and the right political will (Kelly, 2013).

4.2.2 Related Literature

The past four decades of research have amply shown that Becker's (1968) economics-of-crime model, which Allingham and Sandmo (1972) applied to tax compliance, does not square well with the empirical evidence. In the Allingham and Sandmo (1972) seminal model, the tax payment decision is solely based on a trade-off between the benefits of evasion and the costs payable if caught. Perhaps the most conspicuous failure of the model is its inability to explain why people pay their taxes in situations where, based on purely financial motives, tax evasion would be optimal (Alm and Torgler, 2011). Building on insight from behavioural economics, subsequent contributions – partly with the aim to resolve this paradox – have expanded the scope of motives for tax compliance. In a comprehensive summary of the recent tax compliance literature, (Alm, 2019, p. 358) reviews "[n]otions that arise from group considerations such as fairness, altruism, reciprocity, empathy, sympathy, trust, guilt, shame, morality, alienation, patriotism, social norms, social customs, social capital, tax morale, intrinsic motivations and many other objectives." Of particular importance for the empirical tests conducted in the present study are the effects of two distinct, yet interrelated notions – "reciprocity" and "fairness" – on tax compliance.

Thus, alternative explanations for tax compliance behaviour, often steeped in behavioural economics, have emerged. In a recent study, Alm (2019) undertakes a comprehensive review of the tax compliance literature, including on aspects related to behavioural economics. He notes that taxpayer behaviour is not only driven by financial considerations but also by group-related factors. Luttmer and Singhal (2014), in another review of the tax compliance literature, use the term "tax morale" to denote all non-pecuniary motivations for tax compliance as well as other factors which fall outside the standard tax compliance model. They highlight a number of tax morale channels including peer effects and social influences, in which an individual's own tax compliance decisions are influenced by peer tax compliance behaviour.

Recently, significant progress has been made in assessing the contribution of alternative motives for compliance using field experiments. Castro and Scartascini (2015)

expose approximately 23,000 property tax payers in Argentina to different messages included in their tax bill that account for reciprocity, peer effects, and deterrence related to enforcement. They find that deterrence is most effective in increasing compliance. Dwenger et al. (2016) study extrinsic and intrinsic motives for compliance with church tax payments of approximately 10,000 members of the Catholic and Protestant churches in Germany. In this setting, in which tax compliance is not enforced, they find, in contrast to the aforementioned study, that intrinsic motives such as duty-to-comply or social recognition are more important than pecuniary motives. In another large scale field experiment, Hallsworth et al. (2017) send messages to 200,000 tax payers in the United Kingdom who have established but not yet paid their income tax liabilities. They find that short messages referring to social norm and public goods could substantially increase compliance though their impact on moral cost.

There is a small body of related literature on property tax compliance using naturally occurring field or administrative data. Alm et al. (2014) study tax compliance in the city of Detroit in the years after the financial crisis – a period of steady deterioration in employment, earnings and property values, marked also by high levels of delinquencies and uncollected tax revenues. While the institutional context of enforcement in Detroit is different, some of their results conform to our findings. In particular, they find that (homestead) owner-occupiers have lower default rates, and that delinquency increases in the police response time.

Arbel et al. (2017) evaluate the social benefits of homeownership by focusing on property tax compliance. Using data from the Jerusalem municipality, covering the 2012-2014 time period, they find that tenants in general, but particularly those of young age without children, are more likely to be property tax non-compliant compared to owner-occupiers. Among others, they argue that the short-term nature of the Israeli "free-market rent contract" increases the likelihood of an early termination of the rental agreement or non-payment of property taxes and other charges, both of which effectively ensure that landlords are not fully insured. Thus, an enabling default-environment for free-market renters is created. Therefore, government programs encouraging renters to become owner-

occupiers would raise tax revenue at the local level. There are some differences across countries in the way property tax is administered, although there are two typical arrangements governing property tax collection. In Ghana and the United States, for example, homeowners are liable for the payment of property tax regardless of whether they occupy the property. In Israel and the United Kingdom, in contrast, it is the current property occupier who is liable for the property tax. Additionally, we emphasize a third dwelling unit type - owner-and-tenant-occupancy, which their research does not investigate.

In spite of these institutional differences, we also find that owner-occupied properties are more tax compliant albeit for different reasons. This corroborates prior studies which show that homeowners are more likely to invest in local social capital than renters (see for instance DiPasquale and Glaeser, 1999; Hilber, 2010). However, there is scant evidence on the specific relationship between dwelling unit types and property tax default or compliance levels.

4.3 Hypothetical Considerations

We make the assumption that the housing tenure decision is long-term in nature. So, for owner-occupied dwelling units, the homeowner makes a one-time decision to occupy the entire house whilst in the case of tenant-occupied dwelling units, the homeowner makes a long-term decision to fully rent out the entire space to tenant. The third scenario, owner-and-tenant-occupied dwelling units, is where the homeowner consumes a portion of the property and rents out the remaining space in the same property to a tenant. The current dispensation in Ghana, where rental contracts span multiple years, makes such an assumption not untenable (see for instance Gough and Yankson, 2011).

The homeowner, who is legally obliged to pay the property tax, receives rental inflows when they fully or partly rent out a property. This is in addition to labour income, which the homeowner in all three dwelling units would also have. However, each time the property tax bills fall due, the homeowner decides whether to pay or not, depending on whether their income is adequate and/or is potentially affected by factors such as

property tax rate changes. Moreover, that decision could also be affected by reciprocal considerations, due mainly to how accessible locally provided public services are to them.[7] These assumptions are set within a weak regulatory enforcement regime, which is the case in Ghana as in many other developing economies, thus creating further incentives for non-compliance with property tax payment obligations.

The study posits that the decision of a homeowner to self-select into the owner-and-tenant-occupied dwelling unit category reflects a labour income shortfall situation for them, compared with the income positions of the homeowner who chooses either of the two other dwelling unit types. It is this shortfall which informs the decision to sacrifice full enjoyment of their home in exchange for rental income in the first place. Thus, the prediction is that this rental inflow only comes in as a support and is unable to totally offset the deficit in their labour incomes. All else equal, one would therefore expect owner-and-tenant-occupied units to have less money to spend on property tax payments and other non-housing expenditures. This makes them more susceptible to non-compliant behaviour, relative to owner-occupied and tenant-occupied dwelling units. By extension, they are also likely to be more sensitive to property tax rate increases and may use their reduced access to public amenities as an excuse for not paying their property taxes.

The hypotheses can be summarized as follows:

H1: Owner-and-tenant-occupied dwelling units are more likely to be property tax non-compliant, relative to owner- and tenant-occupied dwelling units.

H2: Owner-and-tenant-occupied dwelling units' property tax payments are sensitive to property tax rate increases.

H3: Owner-and-tenant-occupied dwelling units' property tax payments are sensitive to reduced access to public amenities.

[7] This directly feeds into the empirical analysis, where we use distance to hospitals and suburban police stations as a proxy for reciprocity, towards estimating the effect on compliance behaviour. Empirical research has shown that greater physical distance negatively affects social interactions, whilst the presence of "familiar landmarks" helps in building social cohesion (see e.g. Festinger et al., 1950; Mok et al., 2007; Forrest and Kearns, 2001).

4.4 Data and Variable Construction

The data is from the Accra Metropolitan Assembly (AMA), in the Greater-Accra region of Ghana. It is a very strategic MMDA because it has oversight responsibility over Accra, the capital city, which is the center of economic activity and seat of government in Ghana.

The final sample provides information on 52,786 dwelling units and for the 2011-2018 period.[8] Table 4.1 presents summary statistics of the main variables used in the analysis. It shows descriptive statistics for the full sample as well as across the three dwelling unit types. Owner-occupiers make up 60% of the observations, with owner-and-tenant-occupiers and tenant-occupiers making up 18% and 22%, respectively.

[Insert Table 4.1 about here]

We also observe the monetary amounts of property taxes that dwelling units had to pay as of 2018. This is termed cumulative arrears as the arrears are accumulated instead of being individual annual records.[9] The average cumulative arrears figure is GHS 377.[10] However, the data also reveals that there are some dwelling units which have paid-up or even prepaid their property taxes. Owner-and-tenant-occupied dwelling units have the lowest arrears amount, an average of about GHS 336. The mean rateable value is GHS 32,803 while the property rate impost ranges between 0.05% and 1.65%.[11] Again, for both variables, owner-and-tenant-occupied units have lower average estimates compared with those for owner- and tenant-occupied units. The minimum rate is a fixed amount paid by a dwelling unit when its property tax fee is lower than that fixed threshold.[12]

[8]Full dataset includes non-residential properties which are excluded. We also leave out all residential properties with indeterminate occupancy status, rate imposts of zero, and rating zone classes that are not defined. The number of sub-metros was 10 until recent reduction in number, following the carving out of new Municipal Assemblies from the AMA. As the dataset is from 2011 however, it includes observations across all the initial 10 sub-metros. Thus, all our analyses comprise all the intial 10 sub-metros. See `https://https://ama.gov.gh/sub-metro-details.php?s=Mg==` [Accessed 21 August 2019].

[9]Officials at the AMA noted that computerized recording of the data began in 2007. This suggests that the earliest arrears records can be deemed to go 12 years back, from 2007.

[10]This works out to about USD 77, using a USD/GHS exchange rate of 4.9139 at the end of 2018 (`bloomberg.com`).

[11]This range is consistent with prior research which shows that the rates are typically low, ranging between 0.5% - 1% (Slack, 2013).

[12]The minimum rate is determined by the AMA on an annual basis and varies with the rating zone class, much like the property rate imposts. This minimum rate information can be deduced from the data and the official AMA Local Government Bulletin on the imposition of rates.

For this sample, the minimum rate ranges from a low of GHS 10 to a high of GHS 600.

The rating zone classes differentiate among suburbs in terms of their quality, and are correlated with the property tax rate levels. Rating zone class 1, which comprises the most prime suburbs within the AMA and so attract the highest property tax rates, make up 13% of all the observations. Nearly 18% of all tenant-occupied units are in rating zone class 1, which is the highest concentration among the occupancy types for this rating zone class. Rating zone class 3 defines the least prime locations and accounts for about 55% of the full final sample. Within this rating zone class, we find 67% of all owner-and-tenant-occupied units - the highest when compared with the other dwelling unit types.[13] Figure 4.2 provides a visual representation of the rating zone classes using three suburbs in the Accra metropolis, one for each class. More visual descriptive analysis of the data is shown in Appendix A (A.1 to A.8).

[Insert Figure 4.2 about here]

4.4.1 Effective Property Tax Rates

As previously highlighted, a dwelling unit's property tax could either be the minimum rate or based on the rate impost. This is given by the expression below:

$$PT_{it} = max\{q_{jt}, PV_i * r_{it}\} \tag{4.1}$$

where subscripts i, j, and t denote dwelling unit, rating zone, and year respectively. PT, q, PV, and r correspondingly stand for property tax fee, minimum rate, property (rateable) value, and property rate impost. Thus, the annual property tax paid by a dwelling unit is either the minimum rate or the product of its rateable value and property rate impost, whichever is greater. This helps ensure that dwelling units do not end up paying paltry sums as their property taxes.

[13] The AMA's residential rating zone classes are: 1A, 1B, 2A, 2B, 3A, 3B, and 3C, with 1A representing the most prime areas within the AMA and 3C the least prime. However, we jointly consider units the A, B, and C sub-categories to simplify our analyses. This gives us three residential rating zone classes: 1, 2, and 3.

For dwelling units which pay the minimum rate, we can estimate an effective property rate impost as the original property rate impost levied by the AMA no longer applies. The effective property rate impost in this case is greater than the original property rate impost. However, for dwelling units whose property taxes are based on original property rate impost, the effective and original property rate imposts are the same. The equation below helps to illustrate this:

$$R_{it} = \frac{PT_{it}}{PV_i} \tag{4.2}$$

where R_{it} is the effective property rate impost.

4.4.2 Property Tax Arrears Period

A key variable of interest in this study is the dwelling unit arrears or delinquency period as of 2018. However, this is not naturally observed in the data. To therefore determine this, we compare the cumulative property tax arrears as of 2018 end with the property tax fees from 2011-2018. This estimation is made possible by two main factors. First, the cumulative nature of the arrears means we are able to compare it with property tax fees for the 2011-2018 period. Second, any fee payments made first go to settle the outstanding tax liabilities, if any, before the remainder is used to offset the most current bill. This practice, which is not uncommon, helps us to ascertain how long a dwelling unit has been in arrears for.[14]

Thus, on the whole, the arrears periods for dwelling units range from a low of "no arrears" to a high of "more than 8 years" of arrears as of 2018, the latter being the case for dwelling units with arrears prior to 2011. Figure 4.3 displays the arrears period distribution for all the dwelling units. It shows that about 13% of dwelling units are fully

[14]As an example, supposing dwelling unit A had a cumulative arrears figure of GHS 400 as of 2018, and had to make the following yearly property tax fee payments: GHS 70 (in 2011), GHS 90 (in 2012), GHS 90 (in 2013), GHS 120 (in 2014), GHS 120 (in 2015), GHS 150 (in 2016), GHS 180 (in 2017), and GHS 220 (in 2018). Its expected total property tax fee payments at the end of 2018 would be GHS 1,040. Comparing this GHS 1,040 with the arrears of GHS 400, we see that dwelling unit A had settled all of its property tax obligations as of 2018, with the exception of the two most current fees (for 2018 and 2017), which add up to GHS 400. Therefore, dwelling unit A would have been in arrears for exactly 2 years at the end of 2018.

compliant while about 35% have not paid for more than 8 years. A little over half of the remaining units have arrears ranging from just under a year to a period of 8 years.

[Insert Figure 4.3 about here]

4.4.3 Categorization of Arrears Periods

In order to analyze the risk for a dwelling unit of being in arrears, a categorical dependent variable for the dwelling unit arrears periods is constructed:

$$Arrears\ Category_i = \begin{cases} A_0\ if\ there\ are\ no\ arrears, \\ A_1\ if\ arrears\ are\ up\ to\ 1\ year, \\ A_2\ if\ arrears\ are\ between\ 1\ to\ 2\ years, \\ A_3\ if\ arrears\ are\ between\ 2\ to\ 4\ years, \\ A_4\ if\ arrears\ are\ between\ 4\ to\ 6\ years, \\ A_5\ if\ arrears\ are\ between\ 6\ to\ 8\ years, \\ A_6\ if\ arrears\ are\ more\ than\ 8\ years. \end{cases}$$

4.5 Empirical Analysis

In this section, we study how property tax arrears depend on dwelling unit types, as well as their responses to property tax rate increases and proximity to local amenities.

4.5.1 Occupancy Status and Arrears

To understand how compliance varies by occupancy status, we estimate the following multinomial logistic regression:

$$Y_i = \alpha_0 + \alpha_1 Owner{-}Tenant_i + \alpha_2 Tenant_i + \alpha_3 Property\ size_i + \alpha_4 Rating\ zone\ 1_i + \alpha_5 Rating\ zone\ 2_i + \varepsilon_i, \tag{4.3}$$

where

$$Y_i = log\left[\frac{Prob(Arrears\ Category_i = A_m)}{Prob(Arrears\ Category_i = A_0)}\right]$$

gives the log-odds of arrears category A_m $(m = 1, 2, \ldots 6)$, relative to the baseline category of full compliance, A_0. $Owner\text{-}Tenant_i$ and $Tenant_i$ are indicator variables which respectively take the value of one if a dwelling unit is jointly occupied by the homeowner and tenants and solely by tenants, and zero otherwise. $Property\ size_i$ is the logarithm of the rateable value for dwelling unit i. $Rating\ zone\ 1_i$ and $Rating\ zone\ 2_i$ are indicator variables which respectively take the value of one if a dwelling unit is in rating zone class 1 and rating zone class 2, and zero otherwise; ε_i is the standard normal error term.

Table 4.2 presents results on the relationship between dwelling unit types and property tax arrears. In this table, owner-occupied dwelling units is the reference category of occupancy status and rating zone class 3 is the reference rating zone class. The estimates shown are relative risk ratios, which in this case, measure the risk or probability of a dwelling unit having arrears in each of the arrears groupings from columns (1) to (6), relative to the category with no arrears. A regression coefficient exceeding (below) 1 suggests an increased (decreased) risk of a dwelling unit being in arrears.

The relative risk ratio for owner-and-tenant-occupied dwelling units in the up to one year column is 1.107. This suggests that for up to one year of property tax arrears, relative to no arrears, owner-and-tenant-occupied dwelling units are about 11% more likely to have arrears compared with owner-occupied units. With the exception of the 1 to 2 years arrears period, there is a consistent trend of increased risk of arrears across all the other columns for owner-and-tenant-occupied dwelling units, with an almost 26% increased risk in the more than 8 years arrears period. Thus, for both recent and long-overdue arrears, owner-and-tenant-occupied units are significantly more likely to be property tax delinquent than owner-occupied dwellings.

For tenant-occupied dwelling units, the results are statistically significant only in the 6 to 8 years and more than 8 years columns. It reveals that the risk of 6 to 8 years arrears, in relation to no arrears, is almost 22% more for tenant-occupied units than it is

for owner-occupied units. This risk rises even further to 56%, once tenant-occupied units have been in arrears for more than 8 years, as shown in the last column. Also, in this period, the risk of delinquency is much higher for tenant-occupied dwellings than it is for the former, relative to owner-occupied units. One reason for this finding could be that the property tax payer does not reside in the same residential area. When the individual liable for the property tax payment is harder to reach, enforcing compliance is expected to be more difficult, especially under the weak regulatory enforcement setting analyzed here.

The property size control variable shows that larger properties are more likely to be associated with a decreased risk of arrears and the result is significant across all periods. This may be down to those properties being occupied by relatively wealthier persons who are able to pay the tax. As expected, locations in rating zone class 1 are generally associated with reduced tax delinquency, compared with those in rating zone class 3. Interestingly, locations in rating zone class 2 exhibit a higher likelihood of delinquency than those in rating zone class 3. This hints at possible reclassification of locations in rating zone class 2, as they may not be as prime as originally thought.

Overall, the results in Table 4.2 support the hypothesis that owner-and-tenant-occupied units are more likely to be non-compliant.

[Insert Table 4.2 about here]

4.5.2 Arrears and Property Tax Rate Changes

In this section, we study how property rate changes affect the likelihood of dwelling units' being in property tax arrears. This is in line with our hypothesis that the expectedly more financially constrained dwelling units (i.e. owner-and-tenant-occupied dwelling units) should exhibit stronger reactions to changes in property rates. This hypothesis is also consistent with existing literature claiming that taxpayers are resistant to property rate hikes, particularly in developing countries (see for instance Bahl and Wallace, 2008). To enable us carry out this test, we estimate each dwelling unit's effective percentage

property rate change from 2011 to 2018, as given by the below equation:[15]

$$\%\Delta R_i = \frac{(R_{i,2018} - R_{i,2011})}{R_{i,2011}} * 100\%$$

where $\%\Delta R_i$ is the percentage change in the effective rate impost from 2011 to 2018 for dwelling unit i, $R_{i,2011}$ is the 2011 effective rate impost for dwelling unit i, and $R_{i,2018}$ is the 2018 effective rate impost for dwelling unit i.

Next, based on all the $\%\Delta R_i$ estimates, we compute $\%\Delta\overline{R}$, which is the overall median percentage property rate change in the effective rate impost for all dwelling units. We then create a dummy variable to indicate whether a dwelling unit faces a change in its property rate impost, $\%\Delta R_i$, that is above or below the median, $\%\Delta\overline{R}$. From the data, this median value is 380%, representing an overall increase in property rates over the period. Thus, when $\%\Delta R_i > 380\%$, a dwelling unit is deemed to have experienced a "high rate increase". However, in the event that $\%\Delta R_i < 380\%$, we have a "low rate increase" dwelling unit. Finally, we analyse the sub-samples within the context of a multinomial logit framework, as with equation (4.3). However, as the property rate changes are within the 2011-2018 time-frame, it implies that our property rate change analysis is only tenable for a maximum arrears period of 8 years.

Results of this multinomial logit analysis are presented in Table 4.3. In the up to one year period, the risk of delinquency rises by about 20% for owner-and-tenant-occupied dwelling units with high rate increases whilst the result for those with low rate increases is not statistically significant, relative to no arrears. However, in the remaining periods, excluding the 1 to 2 years category, the probability of incurring arrears increases for both low and high rate increase owner-and-tenant-occupied dwelling units. This risk of delinquency is more pronounced in the 6 to 8 years category, where the dwelling units are more than 31% not likely to pay their property taxes. Overall, the results specifically suggest that reducing the extent of tax rate increase for owner-and-tenant-occupied dwelling units does little to improve tax property tax payment outcomes, as

[15]Between 2011 and 2018, there were 5 instances of property tax rate changes, mainly rate increases. These were from 2011-2012, 2013-2014, 2014-2015, 2016-2017, and 2017-2018. For 2012-2013 and 2015-2016, rates remained largely constant.

those dwelling units tend to behave just like those with higher tax rate increases. This is also consistent with the hypothetical expectation of owner-and-tenant-occupied dwelling units being more likely to be income-constrained, with their extra rental income even unable to fully cover their labour income shortfall.

For tenant-occupied units, the results reveal that high rate increases are significantly likely to increase the risk of arrears. This is consistent across all the arrears period categories except in the 1 to 2 years period, where the result is not statistically significant. This increased likelihood of arrears ranges from about 12% to 31%. In the low rate increase categories, the results are only statistically significant in the 1 to 2 years arrears period, where the risk of delinquency falls by about 13%. Thus, tenant-occupied dwelling units, relative to owner-occupied dwellings, tend to respond as expected – the higher the rate increase the higher the probability of delinquency and vice versa. As with the results for owner-and-tenant-occupied dwelling units, it is again noteworthy that the risk of non-payment increases with the period of arrears for dwelling units with high rate increases. Overall, the results suggest that the homeowner under the tenant-occupancy arrangement may not be as income-constrained as that of the owner-occupied and owner-and-tenant-occupied dwelling units, given their rental income receipts. This possibly explains why they are more likely to pay their property taxes when faced with lower rate increases, unlike their owner-and-tenant-occupied counterparts especially, whose risk of reneging increases.

In summary, owner-and-tenant-occupied dwelling units appear to face more financial constraints which increase their risk of delinquency, relative to the other occupancy types, regardless of whether property rates increase by little or much.

[Insert Table 4.3 about here]

4.5.3 Arrears and Distance to Amenities

This section examines the relationship between distance to public amenities and property tax arrears outcomes of dwelling units. We consider proximity to local amenities as a source of compliance pressure. This is in line with previous studies which find that people

tend to be more tax compliant when they receive public services for their tax payments (see for instance Luttmer and Singhal, 2014; Alm et al., 2014). Thus, we reason that dwelling units which are closer to the amenities are expected to face higher compliance pressure to pay their taxes. In other words, they will feel a greater need to reciprocate this closeness to the amenities by exhibiting a lower likelihood of arrears. On the other hand, those living further away should face lower compliance pressure or lower levels of "reciprocity", which would ordinarily increase their probability of being in arrears.[16]

We use road-based Google Maps distance estimates to two classes of public amenities in Accra: police stations and hospitals, to help analyse this reciprocal relationship. The suburbs in which the dwelling units are located serve as the benchmarks.[17] We estimate the shortest travel distance by road (in km) between each of the suburbs and the amenities. In the first case, we ascertain proximity to the nearest police station within the immediate precincts of the suburbs[18]. In total, twenty-two police stations are represented in this analysis. This allows for a direct test as regards the provision of public services in a specific local area. The case with the hospitals however, is not necessarily aimed at amenities within the immediate respective environs of the suburbs. Instead, we select three of the most popular and best resourced public hospitals in Accra and Ghana for that matter: Korle-Bu Teaching Hospital, 37 Military Hospital, and Greater Accra Regional Hospital, and for each suburb, estimate which hospital represents the shortest distance from it. Thus, we are able to further appraise our hypothesis by considering the response of dwelling units to a public amenity that may not necessarily be within their precincts. Summary estimates of these distance measures are shown in Table 4.4 below.

[Insert Table 4.4 about here]

[16]Prior studies have used distance to public services as a measure of accessibility but mostly in relation to property values (see for instance Chin and Foong, 2006; Dronyk-Trosper, 2017; Dubé et al., 2013). We are currently unaware of any such application within the context of property tax arrears.

[17]We exclude 5 suburbs whose exact locations were unknown, owing mainly to vague details provided in the data. There were also a few cases of suburbs which, though known to exist, were not showing up in Google Maps. For these suburbs, we use the nearest neighbouring suburbs or landmarks as the benchmark. We also merge some sub-divisions or extensions of a suburb with the main suburb in cases where they could not be singularly identified via Google Maps. This leaves us with 124 unique suburbs in terms of distance to the amenities.

[18]There were a few cases where a known police station could not be located on Google Maps. Hence, we used the nearest landmark to the police station within the suburb.

We carry out an initial OLS validation check of our public amenity proxies as regards the general response of dwelling units to arrears. Table 4.5 details these results. In column (3), we include both police and hospital distance as regressors, but do not control for the other variables. We find that for every 1 kilometer increase in distance to the nearest police station (hospital), the arrears period increases by approximately 71 days (76 days). When we include the property size and rating zone controls, the coefficient for the distance to hospitals increases, while the coefficient for distance to police stations decreases and loses significance, although still positive in sign. These initial tests are in line with the concept of reciprocity: spatially disadvantaged dwelling units, as regards the siting of public amenities, are generally more likely to be in arrears.

[Insert Table 4.5 about here]

We further analyse the effect of distance to amenities on arrears within a multinomial logit framework, as shown in equation (4.3). Similar to the approach for the property rate change analysis, we split the data into two sub-samples such that based on the distance travelled, dwelling units in each suburb are seen to either have higher access or lower access to the nearest police station and hospital. We consider higher access units to be those within the immediate vicinity of the public amenity with lower access units being those which are more distant from the amenity. The median distance helps with our access delimitations. In the case of the suburban police stations, all dwelling units below or equal to the median distance of 1.8 km are considered as "short distance" (higher access) units whilst those above the median are classed as "long distance" (lower access). For the hospitals, a suburb and by extension a dwelling unit, is deemed "short distance" (higher access) when the travel distance to the hospital is up to the median distance of 4.7 km. Those living beyond this median distance are regarded as "long distance" (lower access) units.

For this analysis, tenant-occupied units are the reference category. The homeowner, who pays the property tax, is not present in tenant-occupied units. Thus, their tax payment decisions are unlikely to be influenced by distance to the amenities as they do not directly enjoy them. The opposite is true of the two other dwelling unit types which

feature the property tax paying homeowner. Thus, we examine how their compliance behaviours compare based on their access to amenities.

[Insert Table 4.6 about here]

Table 4.6 presents results based on distance to the suburban police stations. The results show that distance to amenities is inconsequential to the risk of arrears in the up to one year and 1 to 2 years periods. We also observe that the probability of arrears increases for owner-and-tenant-occupied dwelling units with long distance to police stations in the 2 to 4 years (by 24%), 4 to 6 years (by 50%), and 6 to 8 years (by 34%) arrears periods. These results are strongly statistically significant and stand in contrast to those for the corresponding short distance owner-and-tenant-occupied dwelling units, which are not significant. In the more than 8 years arrears category however, short distance owner-and-tenant-occupied dwelling units are about 30% less likely to be delinquent, as expected. On the whole, these results suggest that access to amenities has little or no effect on the risk of arrears for owner-and-tenant-occupied dwelling units, in the initial stages of delinquency. However, as the arrears begin to lengthen, owner-and-tenant-occupied units become more sensitive to their spatial position vis-à-vis an amenity, particularly true of those who are distant. Being distant implies lower access to the amenity and therefore lower reciprocity levels. This helps to clarify their increased risk of non-payment.

Among owner-occupied units, there is reduced risk of arrears for those with a short distance to police stations in the 4 to 6 years (by 12%), 6 to 8 years (21%), and more than 8 years (38%) arrears periods. Interestingly, long distance owner-occupied dwelling units also show strong evidence of decreased risk of non-compliance in the 6 to 8 years and more than 8 years arrears periods, albeit by a slightly smaller margin than that of short distance owner-occupied units. This latter result hints at homeowners being eventually won over by possible altruistic motives which cause the risk of having prolonged arrears to fall. The result is also consistent with the social capital literature which shows that homeowners, owner-occupied units in our case, are "better citizens" (see for instance DiPasquale and Glaeser, 1999; Hilber, 2010), which helps to explain this reduced risk of arrears, regardless of distance or access to the amenity.

Overall, we see some evidence that, relative to tenant-occupied units, owner-and-tenant-occupied units with reduced access to an amenity are more likely to be delinquent than their owner-occupied counterparts, although the homeowner is present in both cases. This suggests that certain factors, possibly income constraints, could also be at play in the case of the former.

[Insert Table 4.7 about here]

Table 4.7 presents results based on distance to the public hospitals. We again notice that the likelihood of being in arrears rises for owner-and-tenant-occupied units with long distance to hospitals in the 2 to 4 years (by 41%), 4 to 6 years (by 47%), and 6 to 8 years (by 33%) arrears periods. On the contrary, the results for short distance owner-and-tenant-occupied dwelling units in the same periods are not significant. In the more than 8 years arrears period though, the arrears risk of short distance owner-and-tenant-occupied dwelling units reduces, as again anticipated, by 34%. Among owner-occupied units, results again indicate the possibility of altruistic motives reducing the risk of arrears for homeowners, in spite of them being disadvantaged in terms of distance to the hospitals. This effect is particularly strong in the 6 to 8 years and more than 8 years arrears periods, where the possibility of arrears drops by 29% and 27%, respectively. For the same periods also, there is a decreased risk of arrears for owner-occupied units with short distance to hospitals, much like the results based on distance to the suburban police stations.

All in all, the results are similar to those shown in Table 4.6. This similarity in results is noteworthy. This is because the hospital-based analysis involves only three hospitals unlike the former case which covers numerous suburban police stations. Thus, there should be more cases of dwelling unit remoteness from the hospitals. In spite of this, there is still evidence that arrears vary with distance to the hospitals, especially for the owner-and-tenant-occupied dwelling units. One plausible explanation is that the proximity to public amenities creates compliance pressure. However, this is not the only possible explanation. The sorting of more compliant dwelling units near these amenities is an alternative explanation. This effect is, however, likely to be small as we control for home values in our setting.

4.5.4 Robustness Tests

The results presented in the study so far have ignored the use of a clustered standard error approach, particularly because the analysis is not centred on the estimation of cluster-based aggregate effects on individual units. This notwithstanding, we note that dwellings could be stratified based on the suburbs in which they are domiciled. Thus, we consider an alternative specification in which the standard errors are clustered by suburb. Prior results also exclude the original property tax rate imposts as they are based on the rating zone classes, which are included in the analysis. Therefore, we also now include the rate imposts and exclude the rating zone classes, replacing them with the sub-metropolitan district councils (sub-metros) in which the dwelling units fall. The sub-metros exist for greater decentralization within the AMA, as discussed in Chapter 2 of the thesis.[19] Table 4.8 reports the results based on a multinomial logit analysis. The results largely conform to those reported in Table 4.2. Comparatively, with the exception of the up to 1 year arrears period, there is a consistent trend of an increase in the likelihood of incurring arrears for owner-and-tenant-occupied dwelling units. Results for tenant-occupied dwelling units are again statistically significant only in the 6 to 8 years and more than 8 years columns. This confirms the previous results showing an increased risk of longstanding arrears for tenant-occupied dwelling units.

[Insert Table 4.8 about here]

Another check carried out is on the effect of property tax rate increases on arrears. The previous analysis, shown in Table 4.3, computes the percentage changes in the effective property rates from 2011 to 2018, using only two rates - for 2011 and 2018. The overall median value of 380% then forms the basis of the low versus high rate increase sub-sample analysis. A slightly different approach is now adopted. For each dwelling unit, percentage tax rate changes between consecutive years, from 2011 to 2018, as well as the average percentage change, as of 2018, are computed. Thereafter, the overall median value of

[19]For ease of analysis, the 10 sub-metros which were in existence in 2011 are maintained. Currently, the AMA has 3 sub-metros, following the carving out of other MMDAs from the AMA, as allowed by law.

28.23% becomes the benchmark for categorizing dwelling units - low rate increase (below or equal to the median) versus high rate increase (above the median) units. The merit of using this approach is that it allows the use of the full range of the eight effective rate imposts, as opposed to just two. It also accounts for the year-to-year changes in the property rates unlike the former case which only reflects the start (2011) and end (2018). Table 4.9 reports the multinomial logit results, which are very similar to those which were previously reported. Generally, the results show that lower tax rate increases are not likely to improve compliance outcomes of owner-and-tenant-occupied dwelling units, as those dwelling units are susceptible to increased delinquency risks, just as those with high rate increases. On the other hand, the homeowner under the tenant-occupancy arrangement is probably not as income-constrained as that of the other occupancy types, due to rental inflows. This possibly informs their likely reduced non-compliance risks versus higher non-compliance risks for owner-and-tenant-occupied units, when tax increases are low.

[Insert Table 4.9 about here]

4.6 Conclusion

The widespread non-payment of property taxes threatens the provision of local public services. This is particularly true of emerging economies where local authorities face immense administrative and enforcement challenges. That said, the property tax literature on taxpayer motivations which influence their compliance behaviour is scant.

In this paper, we study how property tax compliance behaviour varies with residential occupancy types, and with reference to their responses to property rate increases and proximity to local public amenities.

Using a property tax arrears dataset comprising over 52,000 households from the Accra Metropolitan Assembly (AMA) of Ghana, we find that owner-and-tenant-occupied dwelling units are generally more likely to have arrears, with an increased probability especially for shorter time periods. On the other hand, tenant-occupied dwelling units exhibit a greater likelihood of arrears for longer time periods. Additionally, owner-and-

tenant-occupied dwelling units which experience a greater frequency of property rate increases stand a greater chance of arrears, as are those which face lower compliance pressure across majority of the arrears periods. In the long-run however, lower compliance pressure is associated with a reduced arrears propensity which may be indicative of non-compliance costs eventually becoming too high.

The hope is for this study to inspire the following relevant policy considerations for local authorities, especially those in developing economies. First, local authorities must factor in how increased property tax rates and the attendant heightened risk of delinquency by owner-and-tenant-occupied units could hamper their revenue-projection and generation efforts. Next, more stringent enforcement measures are needed to discourage protracted non-compliance as is the case with tenant-occupied dwelling units, in places where the homeowner is legally liable for property tax payment. Furthermore, policymakers should carefully plan their spatial allocation of public amenities as a more even spread could encourage residents to reciprocate by paying their property taxes. Finally, urgent reforms are needed to generally tackle maladministration-related issues, which create an enabling environment for property tax delinquency to thrive.

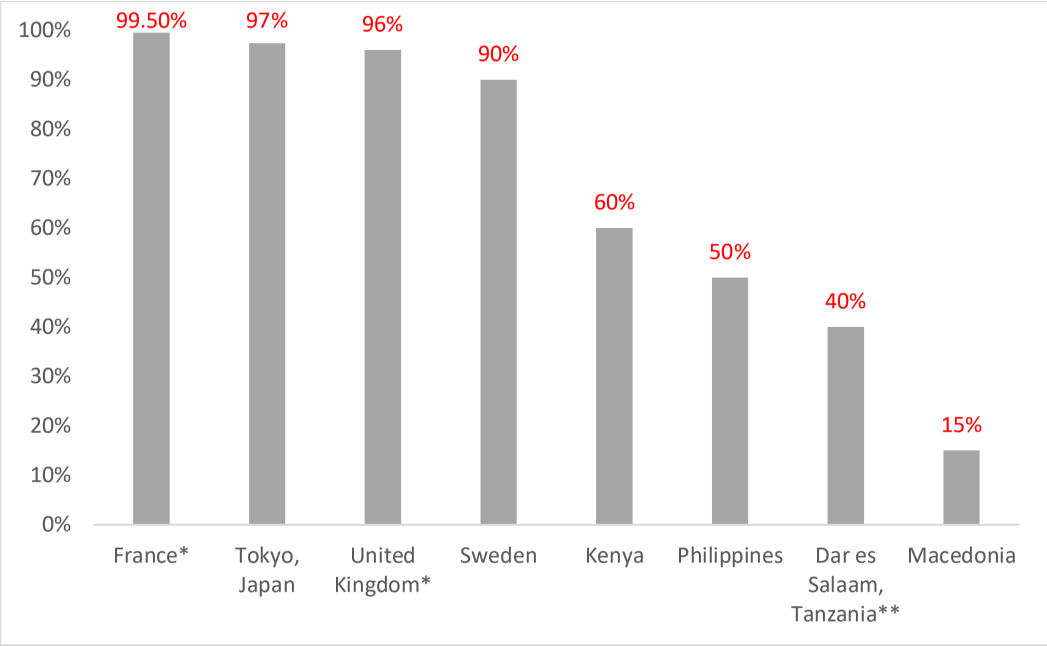


Figure 4.1: Comparative Analysis of Property Tax Collection Rates

This figure compares property tax collection levels (in %) of some OECD countries with those of developing economies. *Average estimates for France and United Kingdom have collection rate ranges of 99% - 100% and 95% - 97%, respectively. ** Average estimate for Dar es Salaam is based on a collection range of 30%-50%.

(Source: Author's construct, based on Vlassenko (2001); Bahl (2009); Guevara (2004); Kelly (1999, 2004); Kitazato (2004)).

(a) East Legon (Class 1) - [average rateable value GHS 83,666.17 and rate impost 0.33%]

(b) Adabraka (Class 2) - [average rateable value GHS 29,857.35 and rate impost 0.22%]

(c) Nima (Class 3) - [average rateable value GHS 19,073.89 and rate impost 0.16%]

Figure 4.2: Residential Rating Zone Classes

The figures shows examples of properties in AMA's three residential rating zone classes, along with their respective average rateable values and average rate impost as of 2018. Class 1 and Class 3 are the most prime and least prime locations, respectively. (All images are from `flickr.com`, under Creative Commons licensing [Accessed 19 November 2020]: (a) is from `https://www.flickr.com/photos/sweggs/534895571`; (b) is from `https://www.flickr.com/photos/sweggs/510700598`; (c) is from `https://www.flickr.com/photos/caetie/9035079273`.

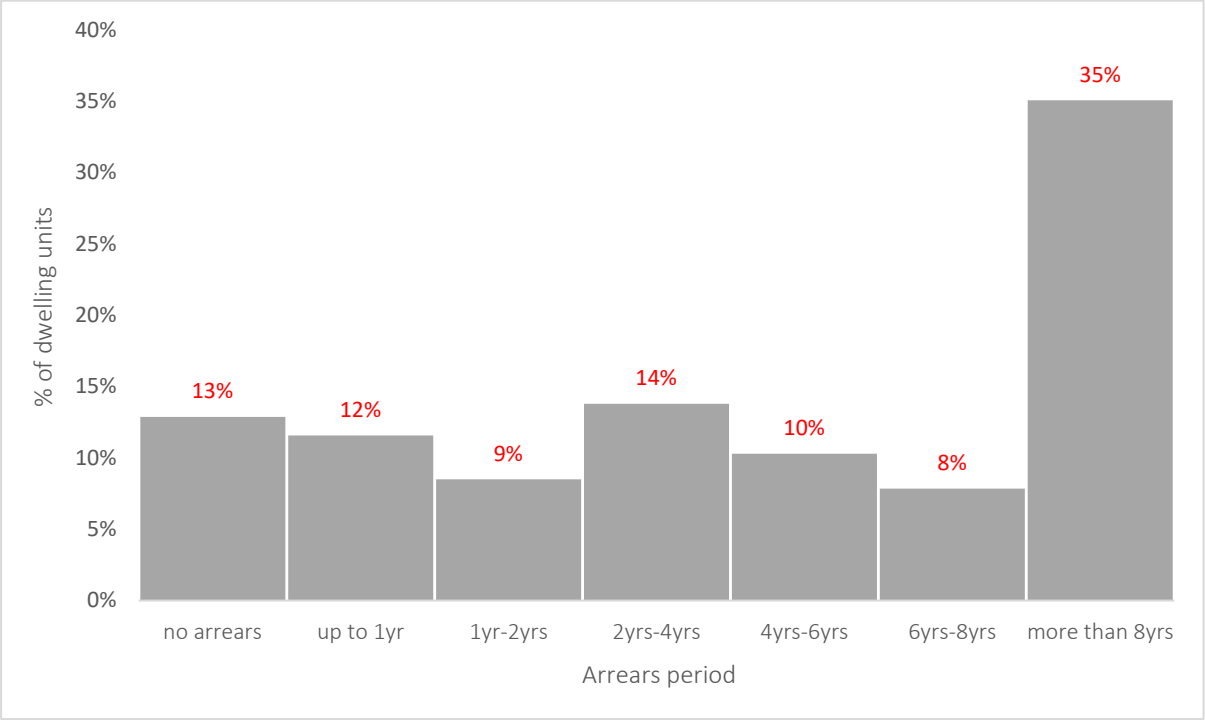


Figure 4.3: Property Tax Arrears Period

This figure displays 7 distinct groupings of the estimated property tax arrears for dwelling units in the AMA. This is based on the cumulative property tax arrears as of 2018 and the property tax fees payable (2011-2018) data.

Table 4.1: Summary Statistics

	Full Sample				Owner-occupiers	Owner-and-tenant-occupiers	Tenant-occupiers
Variable	Mean	Minimum	Maximum	Std. Dev.	Mean	Mean	Mean
Cumulative arrears (GHS)	376.59	-2,250.00	204,282.40	1,052.01	369.98	336.12	425.07
Fees payable (GHS)	73.72	10.00	36,304.76	144.20	74.81	62.30	79.68
Rateable value (GHS)	32,802.54	96.90	13,400,000	101,089.30	32,635.73	31,036.98	34,600.16
Minimum rate (GHS)	66.34	10.00	600.00	25.85	67.49	59.40	68.70
Property rate impost (%)	0.11	0.05	1.65	0.03	0.11	0.10	0.12
Owner-occupiers (%)	59.6						
Owner-and-tenant-occupiers (%)	17.6						
Tenant-occupiers (%)	22.8						
Rating zone class 1 (%)	13.4				13.7	6.7	17.7
Rating zone class 2 (%)	32.2				35.9	26.1	27.1
Rating zone class 3 (%)	54.5				50.4	67.2	55.2

This table presents summary statistics of the main variables. The final sample comprises 52,786 observations based on data from the Accra Metropolitan Assembly (AMA). Non-residential properties are excluded from this final sample as are all residential properties with indeterminate occupancy status, rate imposts of zero percent, and undefined rating zone classes. The cumulative arrears variable is as of 2018, but reflects arrears records beginning in 2007 up until the end of 2018. All other variables are based on averages from 2011-2018. With the exception of fees payable, minimum rate, and property rate impost variables, the remaining variables are constant throughout the 2011-2018 period.

Table 4.2: Occupancy Status and Arrears

	up to 1 year	1 to 2 years	2 to 4 years	4 to 6 years	6 to 8 years	more than 8 years
	(1)	(2)	(3)	(4)	(5)	(6)
Owner-Tenant	1.107**	0.965	1.158***	1.264***	1.318***	1.259***
	(0.0542)	(0.0526)	(0.0541)	(0.0625)	(0.0708)	(0.0508)
Tenant	1.011	0.982	1.057	1.075	1.216***	1.564***
	(0.0457)	(0.0485)	(0.0458)	(0.0505)	(0.0608)	(0.0570)
Property size	0.917***	0.894***	0.817***	0.713***	0.653***	0.499***
	(0.0210)	(0.0225)	(0.0184)	(0.0169)	(0.0168)	(0.0100)
Rating zone 1	1.074	1.000	0.795***	0.669***	0.731***	0.432***
	(0.0535)	(0.0556)	(0.0398)	(0.0382)	(0.0456)	(0.0200)
Rating zone 2	1.216***	1.405***	1.193***	1.234***	1.271***	1.073**
	(0.0500)	(0.0619)	(0.0466)	(0.0513)	(0.0571)	(0.0358)
Observations	12,914	11,288	14,077	12,239	10,942	25,316
Pseudo R-sq.	0.02	0.02	0.02	0.02	0.02	0.02

This table reports the estimated relative risk ratios from the multinomial logit model in equation (4.3). The dependent variable is categorical, capturing the time period (in years) for which a dwelling unit is in arrears. There are seven distinct arrears period categories considered, with the category in which there are no arrears serving as the base category. Owner-Tenant (Tenant) takes the value of one if a dwelling unit is owner-and-tenant-occupied (tenant-occupied), and zero otherwise. Owner-occupied dwelling units are the base occupancy category. Property size is the logarithm of each property's rateable value, which is a monetary value assigned to each property using a valuation-based approach. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. Robust standard errors are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 4.3: Arrears and Increases in Property Tax Rates

	up to 1 year		1 to 2 years		2 to 4 years		4 to 6 years		6 to 8 years	
	low rate increase (1)	high rate increase (2)	low rate increase (3)	high rate increase (4)	low rate increase (5)	high rate increase (6)	low rate increase (7)	high rate increase (8)	low rate increase (9)	high rate increase (10)
Owner-Tenant	1.025	1.204***	0.926	1.005	1.170**	1.143**	1.217***	1.302***	1.318***	1.313***
	(0.0718)	(0.0827)	(0.0720)	(0.0771)	(0.0790)	(0.0738)	(0.0889)	(0.0880)	(0.104)	(0.0961)
Tenant	0.909	1.142**	0.874**	1.124	0.998	1.123*	0.927	1.230***	1.114	1.314***
	(0.0557)	(0.0765)	(0.0591)	(0.0815)	(0.0601)	(0.0704)	(0.0625)	(0.0818)	(0.0801)	(0.0931)
Property size	0.871***	0.952	0.821***	1.046	0.770***	0.916**	0.640***	0.838***	0.592***	0.735***
	(0.0297)	(0.0418)	(0.0313)	(0.0504)	(0.0264)	(0.0381)	(0.0228)	(0.0364)	(0.0233)	(0.0329)
Rating zone 1	1.177**	0.944	1.134	0.880	0.909	0.711***	0.836**	0.549***	0.807**	0.660***
	(0.0826)	(0.0693)	(0.0901)	(0.0715)	(0.0653)	(0.0513)	(0.0691)	(0.0456)	(0.0740)	(0.0577)
Rating zone 2	1.199***	1.184	1.453***	1.428***	1.274***	1.325***	1.326***	1.412***	1.283***	1.543***
	(0.0725)	(0.1356)	(0.0975)	(0.1685)	(0.0746)	(0.1384)	(0.0844)	(0.1535)	(0.0893)	(0.1770)
Observations	7,047	5,867	6,135	5,153	7,339	6,738	6,308	5,931	5,656	5,286
Pseudo R-sq.	0.01	0.004	0.01	0.004	0.01	0.004	0.01	0.004	0.01	0.004

This table reports relative risk ratios from the multinomial logit model assessing property tax arrears and increases in tax rate changes. The dependent variable is categorical, capturing the time period (in years) for which a dwelling unit is in arrears. Various arrears period categories of dwelling units are considered, with dwelling units not in arrears serving as the base category. Based on the property tax rate changes, the data is split into two sub-samples: low rate increases and high rate increases. Low rate (high rate) increase columns report results for dwelling units whose average property rate increases are below (above) the sample median increases observed from 2011 to 2018. Owner-Tenant (Tenant) takes the value of one if a dwelling unit is owner-and-tenant-occupied (tenant-occupied), and zero otherwise. Property size is the logarithm of each property's rateable value, which is a monetary value assigned to each property using a valuation-based approach. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. Robust standard errors are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 4.4: Summary Statistics of Road-Based Distance Estimates to Public Amenities

	Police Stations	Hospitals
Shortest distance (km)	0.26	0.45
Mean distance (km)	2.04	5.83
Median distance (km)	1.8	4.7
Maximum distance (km)	5.7	17.7
Standard deviation (km)	0.97	2.84

This table reports the summary statistics of road-based distance estimates from Google Maps (in kilometers) from the AMA suburbs to suburban police stations and hospitals. Distance estimates for police stations are based on the shortest distance from a given suburb to the nearest police stations. In total, 22 police stations are represented in the data. Estimates for hospitals are based on the shortest distance from a given suburb to the nearest of three hospitals: Korle-Bu Teaching Hospital, 37 Military Hospital, and the Greater Accra Regional Hospital.

Table 4.5: Proximity to Amenities and Arrears - Initial OLS Tests

	Arrears period					
	(1)	(2)	(3)	(4)	(5)	(6)
Police	0.551***		0.194***	0.488***		0.023
	(0.0169)		(0.0213)	(0.0170)		(0.0207)
Hospital		0.246***	0.208***		0.283***	0.278***
		(0.0057)	(0.0072)		(0.0057)	(0.0070)
Property size				-1.023***	-1.156***	-1.155***
				(0.0213)	(0.0214)	(0.0214)
Rating zone 1				-1.012***	-0.918***	-0.913***
				(0.0531)	(0.0527)	(0.0529)
Rating zone 2				-0.255***	-0.392***	-0.393***
				(0.0377)	(0.0372)	(0.0373)
_cons	4.122***	3.811***	3.641***	14.73***	15.44***	15.40***
	(0.0389)	(0.0382)	(0.0419)	(0.2136)	(0.2099)	(0.2130)
Observations	52,769	52,769	52,769	52,769	52,769	52,769
adj. R-sq	0.02	0.03	0.03	0.08	0.10	0.10

This table reports OLS regression estimates of the relationship between proximity to public amenities (suburban police stations and hospitals) and the length of arrears. The dependent variable, arrears period, is the property tax arrears period (in years) for each dwelling unit. Police (Hospital) is a distance measure, calculated as the shortest distance in kilometers from a dwelling unit's suburb to the nearest suburban police station (nearest of the three hospitals). All distances are calculated from Google Maps. Property size is the logarithm of each property's rateable value, which is a monetary value assigned to each property using a valuation-based approach. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. Robust standard errors are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 4.6: Arrears and Distance to Suburban Police Stations

	up to 1 year		1 to 2 years		2 to 4 years		4 to 6 years		6 to 8 years		more than 8 years	
	short distance (1)	long distance (2)	short distance (3)	long distance (4)	short distance (5)	long distance (6)	short distance (7)	long distance (8)	short distance (9)	long distance (10)	short distance (11)	long distance (12)
Owner-Tenant	1.105	1.121	0.964	1.094	1.052	1.239**	1.025	1.497***	0.987	1.338***	0.699***	0.998
	(0.0818)	(0.110)	(0.0809)	(0.115)	(0.0762)	(0.112)	(0.0791)	(0.144)	(0.0827)	(0.135)	(0.0430)	(0.0772)
Owner	0.977	1.003	0.965	1.081	0.975	0.906	0.875**	0.999	0.791***	0.849**	0.618***	0.648***
	(0.0569)	(0.0720)	(0.0622)	(0.0833)	(0.0555)	(0.0609)	(0.0533)	(0.0741)	(0.0520)	(0.0658)	(0.0296)	(0.0371)
Property size	0.941*	0.872***	0.949	0.811***	0.853***	0.751***	0.769***	0.637***	0.721***	0.570***	0.611***	0.410***
	(0.0295)	(0.0303)	(0.0329)	(0.0308)	(0.0266)	(0.0253)	(0.0248)	(0.0232)	(0.0260)	(0.0217)	(0.0167)	(0.0128)
Rating zone 1	1.100	1.080	1.111	0.936	0.867**	0.753***	0.782***	0.520***	0.890	0.579***	0.504***	0.403***
	(0.0672)	(0.0938)	(0.0768)	(0.0888)	(0.0536)	(0.0654)	(0.0534)	(0.0553)	(0.0678)	(0.0653)	(0.0284)	(0.0329)
Rating zone 2	1.275***	1.134**	1.603***	1.173**	1.250***	1.077	1.285***	1.119*	1.552***	0.979	1.009	1.031
	(0.0701)	(0.0715)	(0.0956)	(0.0776)	(0.0667)	(0.0630)	(0.0730)	(0.0696)	(0.0954)	(0.0654)	(0.0468)	(0.0518)
Observations	7,849	5,064	6,710	4,577	8,182	5,892	7,205	5,031	6,449	4,492	12,437	12,866
Pseudo R-sq.	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03

This table reports relative risk ratios from the multinomial logit model assessing property tax arrears and distance to suburban police stations. The dependent variable is categorical, capturing the time period (in years) for which a dwelling unit is in arrears. Various arrears period categories of dwelling units are considered, with dwelling units not in arrears serving as the base category. Using road-based distance estimates from Google Maps, properties are classified into two groups: short distance and long distance. The short (long) distance columns report results for dwelling units whose travel distance to the nearest police stations is below (above) the overall median distance. Owner-Tenant (Owner) takes the value of one if a dwelling unit is owner-and-tenant-occupied (owner-occupied), and zero otherwise. Property size is the logarithm of each property's rateable value, which is a monetary value assigned to each property using a valuation-based approach. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. Robust standard errors are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 4.7: Arrears and Distance to Hospitals

	up to 1 year		1 to 2 years		2 to 4 years		4 to 6 years		6 to 8 years		more than 8 years	
	short distance (1)	long distance (2)	short distance (3)	long distance (4)	short distance (5)	long distance (6)	short distance (7)	long distance (8)	short distance (9)	long distance (10)	short distance (11)	long distance (12)
Owner-Tenant	1.113	1.140	0.932	1.144	0.972	1.411***	1.081	1.466***	0.996	1.333***	0.663***	1.082
	(0.0831)	(0.111)	(0.0784)	(0.120)	(0.0723)	(0.123)	(0.0869)	(0.135)	(0.0870)	(0.129)	(0.0412)	(0.0826)
Owner	0.985	0.984	1.043	0.984	0.982	0.892*	0.960	0.879*	0.922	0.714***	0.622***	0.633***
	(0.0596)	(0.0672)	(0.0690)	(0.0733)	(0.0582)	(0.0570)	(0.0625)	(0.0603)	(0.0642)	(0.0517)	(0.0308)	(0.0346)
Property size	0.913***	0.863***	0.932*	0.798***	0.826***	0.706***	0.700***	0.621***	0.643***	0.576***	0.466***	0.454***
	(0.0290)	(0.0302)	(0.0334)	(0.0304)	(0.0266)	(0.0241)	(0.0234)	(0.0225)	(0.0237)	(0.0223)	(0.0131)	(0.0142)
Rating zone 1	0.917	1.334***	0.795***	1.382***	0.760***	0.897	0.638***	0.758***	0.668***	0.867	0.415***	0.484***
	(0.0611)	(0.100)	(0.0597)	(0.115)	(0.0515)	(0.0667)	(0.0498)	(0.0636)	(0.0565)	(0.0802)	(0.0254)	(0.0340)
Rating zone 2	1.375***	1.073	1.438***	1.360***	1.322***	0.985	1.317***	1.042	1.226***	1.170**	0.799***	1.106*
	(0.0792)	(0.0653)	(0.0888)	(0.0888)	(0.0748)	(0.0548)	(0.0805)	(0.0610)	(0.0814)	(0.0739)	(0.0400)	(0.0527)
Observations	7,251	5,662	6,315	4,972	7,453	6,621	6,502	5,734	5,913	5,028	12,770	12,533
Pseudo R-sq.	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02

This table reports relative risk ratios of the multinomial logit model assessing property tax arrears and distance to hospitals. The dependent variable is categorical, capturing the time period (in years) for which a dwelling unit is in arrears. Various arrears period categories of dwelling units are considered, with dwelling units not in arrears serving as the base category. Using road-based distance estimates from Google Maps, properties are classified into two groups: short distance and long distance. The short (long) distance columns report results for dwelling units whose travel distance to the nearest hospital is below (above) the overall median distance. Owner-Tenant (Owner) takes the value of one if a dwelling unit is owner-and-tenant-occupied (owner-occupied), and zero otherwise. Property size is the logarithm of each property's rateable value, which is a monetary value assigned to each property using a valuation-based approach. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. Robust standard errors are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 4.8: Occupancy Status and Arrears (alternative specification)

	up to 1 year	1 to 2 years	2 to 4 years	4 to 6 years	6 to 8 years	more than 8 years
	(1)	(2)	(3)	(4)	(5)	(6)
Owner-Tenant	1.014	0.917	1.168***	1.250***	1.267***	1.289***
	(0.0643)	(0.0632)	(0.0662)	(0.0763)	(0.0746)	(0.0841)
Tenant	0.948	0.935	1.026	1.039	1.169***	1.550***
	(0.0566)	(0.0597)	(0.0522)	(0.0638)	(0.0703)	(0.1020)
Property size	0.888***	0.886**	0.787***	0.686***	0.625***	0.468***
	(0.0277)	(0.0451)	(0.0314)	(0.0321)	(0.0388)	(0.0317)
Rate impost	1.423	1.254	0.361	0.069**	0.030**	0.001**
	(1.0163)	(1.3791)	(0.4810)	(0.0933)	(0.0526)	(0.0019)
Ablekuma Central	1.039	1.139	1.214	1.164	0.878	1.422
	(0.1334)	(0.2025)	(0.1897)	(0.2283)	(0.1711)	(0.3327)
Ablekuma North	4.261***	6.321***	13.60***	15.24***	13.35***	23.66***
	(0.5843)	(1.1098)	(3.2375)	(4.2194)	(3.2377)	(8.3672)
Ablekuma South	1.515	2.761**	3.069***	3.528***	3.196***	5.681***
	(0.4207)	(1.1662)	(1.1538)	(1.4621)	(1.2656)	(2.3467)
Ashiedu Keteke	0.903	1.01	1.135	0.851	0.553***	0.442***
	(0.1587)	(0.3158)	(0.2546)	(0.1764)	(0.0853)	(0.1076)
Ayawaso Central	1.127	0.808	0.876	0.816	0.77	0.966
	(0.1216)	(0.1748)	(0.2255)	(0.1820)	(0.1510)	(0.2346)
Ayawaso West	1.705***	1.961***	2.380***	2.378***	2.359***	3.628***
	(0.2296)	(0.4084)	(0.4430)	(0.5532)	(0.4297)	(1.0589)
Ayawaso East	1.854***	1.960***	1.739**	1.849**	1.693	1.643*
	(0.2703)	(0.4579)	(0.4075)	(0.4919)	(0.5462)	(0.4836)
Okaikoi North	5.141***	8.826***	10.08***	12.23***	10.99***	20.10***
	(0.7028)	(1.8464)	(1.7437)	(2.7024)	(1.7700)	(5.2158)
Okaikoi South	0.798	0.694*	0.724**	0.749	0.740**	1.126
	(0.1160)	(0.1346)	(0.1183)	(0.1456)	(0.1002)	(0.2372)
Observations	12,914	11,288	14,077	12,239	10,942	25,316
Pseudo R-sq.	0.06	0.06	0.06	0.06	0.06	0.06

This table reports the estimated relative risk ratios from an alternative multinomial logit model baseline specification. The dependent variable is categorical, capturing the time period (in years) for which a dwelling unit is in arrears. There are seven distinct arrears period categories considered, with the category in which there are no arrears serving as the base category. Owner-Tenant (Tenant) takes the value of one if a dwelling unit is owner-and-tenant-occupied (tenant-occupied), and zero otherwise. Owner-occupied dwelling units are the base occupancy category. Property size is the logarithm of each property's rateable value, which is a monetary value assigned to each property using a valuation-based approach. Rate impost is the average property tax rate as of 2018, based on the original property tax rates levied from 2011-2018. Ablekuma Central, Ablekuma North, Ablekuma South, Ashiedu Keteke, Ayawaso Central, Ayawaso West, Ayawaso East, Okaikoi North, and Okaikoi South are sub-metropolitan district councils, with Osu Klottey being the reference category. Standard errors clustered by suburb are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 4.9: Arrears and Increases in Property Tax Rates (alternative analysis)

	up to 1 year		1 to 2 years		2 to 4 years		4 to 6 years		6 to 8 years	
	low rate increase (1)	high rate increase (2)	low rate increase (3)	high rate increase (4)	low rate increase (5)	high rate increase (6)	low rate increase (7)	high rate increase (8)	low rate increase (9)	high rate increase (10)
Owner-Tenant	1.024	1.194***	0.906	1.022	1.104	1.202***	1.191**	1.326***	1.248***	1.368***
	(0.0722)	(0.0813)	(0.0713)	(0.0774)	(0.0756)	(0.0768)	(0.0879)	(0.0888)	(0.1013)	-0.0985
Tenant	0.906	1.139**	0.869**	1.129*	0.977	1.151**	0.91	1.244***	1.091	1.338***
	(0.0560)	(0.0755)	(0.0593)	(0.0811)	(0.0594)	(0.0715)	(0.0620)	(0.0820)	(0.0797)	(0.0937)
Property size	0.889***	0.944	0.818***	1.069	0.790***	0.893***	0.658***	0.812***	0.609***	0.720***
	(0.0303)	(0.0416)	(0.0310)	(0.0510)	(0.0270)	(0.0371)	(0.0232)	(0.0356)	(0.0240)	(0.0326)
Ratezone 1	1.172**	0.947	1.109	0.892	0.858**	0.752***	0.816**	0.558***	0.816**	0.659***
	(0.0809)	(0.0709)	(0.0869)	(0.0737)	(0.0606)	(0.0549)	(0.0662)	(0.0473)	(0.0734)	(0.0590)
Ratezone 2	1.178***	1.417***	1.427***	1.478***	1.220***	1.422***	1.305***	1.396***	1.263***	1.643***
	(0.0709)	(0.1193)	(0.0947)	(0.1322)	-0.0707	(0.1125)	(0.0824)	(0.1167)	-0.088	(0.1431)
Observations	6,842	6,072	5,971	5,317	7,111	6,966	6,134	6,105	5,469	5,473
Pseudo R-sq.	0.01	0.005	0.01	0.004	0.01	0.004	0.01	0.004	0.01	0.004

This table reports relative risk ratios from the multinomial logit model assessing property tax arrears and increases in tax rate changes. The dependent variable is categorical, capturing the time period (in years) for which a dwelling unit is in arrears. Various arrears period categories of dwelling units are considered, with dwelling units not in arrears serving as the base category. Based on the property tax rate changes, the data is split into two sub-samples: low rate increases and high rate increases. Low rate (high rate) increase columns report results for dwelling units whose average property rate increases are below (above) the sample median increases observed from 2011 to 2018. Owner-Tenant (Tenant) takes the value of one if a dwelling unit is owner-and-tenant-occupied (tenant-occupied), and zero otherwise. Property size is the logarithm of each property's rateable value, which is a monetary value assigned to each property using a valuation-based approach. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. Robust standard errors are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Chapter 5

Do Peers Affect Property Tax Compliance?

5.1 Introduction

The factors responsible for property tax arrears especially in developing countries are well-documented in prior research. Prominent among these factors are: weak regulatory enforcement and trivial punitive measures for delinquents (Bahl, 2009); poor record-keeping systems, land and property title challenges, and the absence of a complete cadastre (Bahl and Wallace, 2008; Payne, 1997); lack of flexible payment options and tax payment mentality for citizens, coupled with their misgivings about the proper use of revenues (Kelly, 2013); and the lack of political will (Bahl and Wallace, 2008; Slack, 2013); and default incentives created for renters through short-term rental contracts (Arbel et al., 2017).[1] However, these studies do little to suggest that property tax arrears outcomes could be linked with peer influences too and may therefore be masking a key explanation for the prevalence of property tax arrears in developing economies, particularly at the micro-level.

That said, social or peer interactions have recently emerged as an alternative explanation for tax compliance decisions; borne out of the seminal tax evasion model byAllingham and Sandmo (1972) being deemed insufficient in the real world. The empirical evidence

[1]Their study is based on data from Israel so may not be directly relatable to a developing country experience.

on these social effects is largely experiment-based though, including controlled laboratory and field experiments. Overall therefore, existing research on factors affecting property tax compliance decisions largely ignore a role for peer influences.The few that do are mostly experimental, often without a tax delinquency period consideration and whose effects are not known to remain unchanged over time.

This paper investigates whether peer dwelling unit behaviour matters for property tax arrears. The study is based on an administrative dataset from the Accra Metropolitan Assembly. It contains a representative sample of suburb-level property tax arrears information, which also allows us to estimate the arrears period (in years) as of 2018, for each dwelling unit. Thus, we specifically study the relationship between suburb-level peer effects and dwelling unit property tax arrears period. In line with Manski (1993), there are two main ways in which the peers could affect property tax arrears period here: behaviour(actions) or characteristics.[2] An example of a behaviour-led effect is where reduced peer tax arrears period translates into a lower tax arrears period for a dwelling unit whilst that of a characteristics-driven effect could be a dwelling unit basing their own tax compliance decision on whether peers are homeowners, who have been shown to invest more in local social capital (see for instance DiPasquale and Glaeser, 1999; Hilber, 2010) and therefore less of a non-compliance risk.

However, as Manski (1993) again shows, separating peer behaviours from peer characteristics is not without difficulty which therefore makes the identification of peer effects empirically challenging. Related to this is the "reflection problem" which in this study comes about by using the peer average property tax arrears period or other peer average characteristics within a suburb (peer group) as covariates for the arrears period of all dwelling units within that suburb. Thus, any correlation between dwelling units' property tax arrears outcomes and peer effects (behaviour or characteristics) is as a result of either selection related factors or the peer effects itself, with each having different implications.

With the selection issue, dwelling units could endogenously sort themselves into suburbs which means that correlation in property tax arrears behaviour is because they have

[2]These are the endogenous and exogenous/contextual effects respectively, as denoted by Manski.

homogenous characteristics or face similar environments,[3] thereby making our results spurious. To account for this self-selection bias, we control for a number of individual dwelling unit, average peer dwelling unit, and suburb-related characteristics. Standard errors are also clustered at the suburb level to reduce any downward bias in standard errors stemming from the use of aggregate variables (see Moulton, 1990; Gaviria and Raphael, 2001).

The main identification issue that arises from a dwelling unit's arrears being a direct response to that of their peers is one of endogeneity. To overcome the peer effects identification challenge that this presents, we employ two main approaches in our analysis: a reduced-form approach, which enables us to determine whether some peer effects (via behaviours or characteristics) is present, as distinguished from common suburb-related factors arising from endogenous self-selection (see Manski, 1993; Leary and Roberts, 2014); and an instrumental variable approach, which accounts for the endogenous peer arrears period variable of interest, after controlling for other peer characteristics and common suburb-related factors (similar applications include: Evans et al., 1992; Brock and Durlauf, 2001; Gaviria and Raphael, 2001; Kang, 2007; Fletcher, 2010; Leary and Roberts, 2014).

In the reduced-form approach, the peer average property rate shock is argued to provide an exogenous variation in peer dwelling unit traits, after also controlling for the individual dwelling unit's traits. The exogeneity justification for this variable is that it is primarily based on a filtered out idiosyncratic component which is unobservable to dwelling units. Both the reduced-form OLS and probit results show that dwelling units' arrears outcomes are significantly associated with those of their peers, as seen in the strongly positive relationship between dwelling unit arrears period and the peer average property rate shock. A quantile regression analysis yields similar results though most of its coefficients are not significantly different from those of the OLS.

The instrumental variable approach allows us to estimate the magnitude of peer influences on dwelling unit property tax arrears period.[4] This is done by using the peer

[3]Manski refers to this as correlated effects

[4]This is not possible under the reduced-form approach where the peer effects are compositely estimated

average property rate shock as an instrument for the peer dwelling unit average arrears period. We find that a 1-year increase in the arrears period for peer dwelling units is associated with an 11.8 month rise in dwelling unit *is* arrears period in the baseline result. An analogous probit estimation reveals that a 1-year increase in peer arrears period is linked with a 16 percentage point increase in the probability of dwelling unit i being in arrears. We also conduct a test to check if results are robust to a change in the endogenous peer variable of interest. Thus, an alternative specification is considered in which the peer average arrears period is replaced with the percentage of peers with property tax arrears and instrumented for as in the former case. The results are largely unchanged from those previously estimated, again showing a strong positive relationship between a dwelling unit's arrears period and that of its peers. The results are also robust to the use of two alternative instrumental variables.

The results of this study are relevant for several reasons. First, they add to the scant body of literature which uses administrative data to study peer influences on property tax arrears. Furthermore, the specific focus on the property tax arrears period in this paper aids our understanding of peer effects as a recurring process which could lead to prolonged non-compliance and not as one-off events with no tax delinquency period considerations, which is the context within which related previous experiment-based research is set. Finally, it hints at policy suggestions for reducing property tax arrears, especially as peer dwelling unit arrears have been shown to be positively associated with individual dwelling unit arrears outcomes. Therefore, policy measures by local governments in similar markets, aimed at improving property tax compliance for the worst culprits will not only raise their compliance levels, but also for all other residents in the neighbourhood, whose further improved compliance could occasion even more improved compliance by the original recipients of that policy intervention.

The rest of this chapter proceeds as follows. Section 5.2 gives an overview of the literature. Section 5.3 describes the data and variable construction. Section 5.4 presents the empirical analysis, including a discussion of the results. Section 5.5 is the conclusion.

(see Manski, 1993).

5.2 Literature Review

5.2.1 Related Literature

The Allingham and Sandmo (1972) seminal model on tax evasion shows that the proportion of income declared by a taxpayer is based on a trade-off between being successfully able to evade the tax (benefit) and the penalty rate payable if unsuccessful in the evasion attempt (cost). Tax compliance is thus expected to fall when the benefit exceeds the cost. However, their model has been deemed inadequate in explaining tax compliance in the real world, especially as actual compliance rates are much higher than what their model predicts even with low penalty and detection rates (Graetz and Wilde, 1985; Alm, 1996; Andreoni et al., 1998; Frey and Torgler, 2007).

Thus, alternative explanations for tax compliance behaviour, often steeped in behavioural economics, have emerged. In a recent study, Alm (2019) undertakes a comprehensive review of the tax compliance literature, including on aspects related to behavioural economics. He notes that taxpayer behaviour is not only driven by financial considerations but also by group-related factors. Luttmer and Singhal (2014), in another review of the tax compliance literature, use the term “tax morale" to denote all non-pecuniary motivations for tax compliance as well as other factors which fall outside the standard tax compliance model. They highlight a number of tax morale channels including peer effects and social influences, in which an individual’s own tax compliance decisions are influenced by peer tax compliance behaviour.

The empirical evidence on how peer influences drive individual tax compliance behaviour is predominantly experimental. This includes controlled laboratory studies such as: Alm et al. (2017), who find a greater likelihood of individual tax filing and reporting when they believe that their peers are also filing and reporting same; and Lefebvre et al. (2015), who report that individuals’ own tax compliance behaviour is unchanged (gets worse) when they are exposed to the highest (lowest) rates of compliance of other previously observed individuals.

Some other studies use field experiments to ascertain the extent to which individual

tax compliance responses are influenced by peer tax payment behaviour or other social factors. For instance, Blumenthal et al. (2001) include a message indicating that 93% of people are income tax compliant. They however, do not find any statistically significant effect on the tax compliance behaviour of the treated group. Fellner et al. (2013) also conduct a similar experiment on potential TV license fee evaders in Austria, providing information on a 94% compliance rate by peer households. They also do not find significant aggregate treatment effects. Battiston and Gamba (2016) study the effect of peer pressure on the compliance decisions of bakeries in Milan, Italy. Their field experiment reveals that direct social pressure significantly increases the probability of sellers releasing tax receipts, which they are legally obliged to do, by about 17%. In a study on intrinsic and extrinsic motivations for paying local church taxes in the Bavaria region of Germany, Dwenger et al. (2016) include a treatment in which those paying the tax timeously stand the chance of being recognised through the publication of their names in a local newspaper. They report positive effects of this on compliance, especially among taxpayers who are already intrinsically motivated to pay. Finally, Hallsworth et al. (2017), also test the effect of social norm messages on payment rates for overdue taxes in a field experiment in the United Kingdom. They find that informing taxpayers that they are part of a very small minority of people with tax debts significantly results in increased payment rates for outstanding taxes.

As seen from the above, most of the experimental literature on peer influences and tax compliance is not based on property taxes. That said, Castro and Scartascini (2015) conduct a field experiment in Argentina on 23,000 taxpayers, aimed at affecting property tax compliance levels by influencing beliefs about peer compliance levels, among others. However, they find no average peer treatment effects. They note though that, after taxpayers have received the peer effects message, results around the probability of tax compliance tend to be mixed, depending on a respondent's underlying beliefs about the compliance behaviour of other taxpayers. Similarly, Del Carpio (2014) investigates the effect of norms on property tax compliance in a field experiment in Peru, in which she also gathers information on the subjects' beliefs about compliance and enforcement through

surveys. She reports that disclosing information on past peer compliance rates has a large significantly positive effect on compliance relative to the control group, which receives no such information. However, she also notes that when the effect of payment reminders is stripped out of this peer compliance information, the net effect on individual tax compliance is not statistically significant. Overall, her results suggest that individual tax behaviour is not significantly influenced by peer tax payment information due to the inability of this information to significantly change the subjective beliefs of the individual taxpayers.

Notwithstanding the high levels of internal validity associated with experimental methods (Alm, 2019), their limitations have also been well documented. For instance, Alm (2010) cites the specific case of laboratory experiments whose results may be sensitive to a particular experimental design. Thus, it may be difficult to replicate happenings in the "naturally occurring world". Another challenge he highlights is that laboratory experiments cannot capture key factors in taxpayer reporting such as jail and social stigma. Finally, subjects in a laboratory setting may put up more "obedience to authority" and "pro-social" behaviours, which they are unlikely to exhibit in the real world (Alm, 2010; Levitt and List, 2007). Controlled field experiments have been faulted on grounds of rarely generating direct measures of tax evasion as well as typically being one-time events, whose effects are not known to persist over time (Alm, 2019).

The alternative is the use of naturally occurring field data. However, as Alm (2019) notes in his review of some direct and indirect forms of naturally occurring field data on tax compliance, this is also fraught with challenges. He notes that direct forms such as survey data generate unreliable tax evasion statistics because respondents may: not recall reporting decisions, be untruthful, not be representative of all taxpayers. Additionally, in instances where indirect approaches[5] are used to measure evasion behaviour, the unpaid tax is always attributed to the shadow economy (ibid.).

Notwithstanding the above, administrative data, which is somewhere in-between the direct and indirect forms, is often representative of the relevant population and is linkable

[5]For example, Chernick and Merriman (2013) use tax stamp information on cigarette pack litter to help determine the extent to which smokers evade taxes on cigarettes in New York City.

to direct tax information, even though it typically does not generate direct measures of tax evasion (Alm, 2019). That said, there are few studies, if any, which fully employ administrative data in the study of peer effects and property tax compliance behaviour, moreso which allow for delinquency period considerations. This is what we do in this study.

5.2.2 The Identification Problem

A key issue that has to be addressed in the analysis of peer effects on individual behaviours is the identification problem. In line with this, Manski (1993) makes reference to three social effects hypotheses within the context of a linear model: endogenous effects, exogenous or contextual effects, and correlated effects.

Endogenous effects is where an individual's behaviour varies with the behaviour of the peer group. For example, where the likelihood of an individual paying their property tax varies with the average payment behaviour of their neighbours. Exogenous or contextual effects is where the tendency of an individual to behave in a certain way varies with the exogenous characteristics of the peer group. For example, where the likelihood of an individual paying their property tax varies with the average educational level of their neighbours' parents. Manski (1993) points out a "reflection problem" which arises from the empirical difficulty in identifying endogenous effects. More specifically, in a linear model, one cannot easily tell whether the average behaviour of a group influences the behaviour of individuals who make up that group, as the group and the individual simultaneously influence each other. Closely related to this is the fact that the separate identification of these endogenous effects from contextual effects is problematic as one cannot easily differentiate individual behaviour which is affected by peers' exogenous features from individual behaviour which is directly influenced by the average peer behaviour.

Finally, there are correlated effects which mean that the individual and peer group may behave similarly as they share common unobserved individual attributes or face similar institutional environments. For instance, all residents of a particular neighbourhood may have similar property tax payment probabilities because they all fall within the

same property tax band or jurisdiction. As similarities in the outcomes of persons in a neighbourhood or other social group could arise from intentional self-selection into or sorting across those groups, it again makes the identification of peer effects challenging (i.e. it is difficult to separate the selection decision from the actual peer effect).

These effects have significantly different policy implications, especially endogenous and contextual effects which represent actual social interactions. Let us assume that a local government, in a bid to encourage more property tax payments, introduces a measure specifically targeted at residents who often renege on their property tax obligations. In the presence of endogenous effects, arrears will not only reduce for those who directly receive the intervention but also for all other residents in the neighbourhood. Then, the reduced arrears of residents who did not receive the original "treatment" also trigger even further arrears reductions by those who were initially targeted by the local government, with this sequence of effects expected to occur repeatedly. What this creates is a "social multiplier", which contextual and correlated effects do not generate (Manski, 1993). Therefore, if only contextual effects are present, the local government in the above example will have to spend more to find ways of positively affecting neighbourhood composition (e.g. through mobility programmes) to reduce the incidence of property tax arrears (see Lin, 2010). So, a high arrears neighbourhood which receives more tax compliant new neighbours would gain whilst the neighbourhood from which the more compliant neighbours came becomes worse off which helps to explain the absence of any multiplier effects (see Fletcher, 2010).

To illustrate the identification problem, Manski (1993) estimates a linear-in-means model of a population, as follows:

$$y = \alpha + \beta E(y|x) + E(z|x)'\gamma + z'\eta + u,\ E(u|x,z) = x'\delta \tag{5.1}$$

where y is a scalar outcome variable; x are defining characteristics of an individual's reference group, and (z, u) are characteristics that directly affect y, with u being unobserved.

Thus, what follows is the mean regression of y on (x, z) where:

$$E(y|x,z) = \alpha + \beta E(y|x) + E(z|x)'\gamma + x'\delta + z'\eta \tag{5.2}$$

where the parameter β captures the endogenous effect, γ the contextual/exogenous effect, and δ the correlated effect. However, the presence of $\beta E(y|x)$ as a covariate creates the reflection problem and makes the parameters separately unidentifiable. Towards remedying this, Manski suggests the integration of (2) with respect to z in order to achieve the "social equilibrium" equation:

$$E(y|x) = \alpha + \beta E(y|x) + E(z|x)'\gamma + x'\delta + E(z|x)'\eta \tag{5.3}$$

Given that $\beta \neq 1$, the equilibrium equation can be uniquely solved:

$$E(y|x) = \frac{\alpha}{1-\beta} + E(z|x)'\left(\frac{\gamma+\eta}{1-\beta}\right) + x'\left(\frac{\delta}{1-\beta}\right) \tag{5.4}$$

However, we see that the equilibrium solution does not help in identifying the parameters (α, β, γ, δ): endogenous effects, represented by β, cannot be separated out from the exogenous or correlated effects, captured by γ and δ, respectively. Thus, Manski estimates a reduced-form model by substituting equation (5.4) into equation (5.2) as follows:

$$E(y|x,z) = \frac{\alpha}{1-\beta} + E(z|x)'\left(\frac{\gamma+\beta\eta}{1-\beta}\right) + x'\left(\frac{\delta}{1-\beta}\right) + z'\eta \tag{5.5}$$

As shown in equation (5.5), estimating the reduced-form model makes it possible to separate social effects (albeit in a composite form $\left(\frac{\gamma+\beta\eta}{1-\beta}\right)$ as endogenous and exogenous effects cannot be distinguished from each other) from correlated effects. As he points out though, within the context of a linear model, identification of the social/peer effects is only possible if $E(z|x)$ varies non-linearly with x and $var(x) > 0$. Thus, a number of considerations still need to be made in order to be able to identify peer effects.

5.2.3 Overview of Non-Experimental Identification Approaches

5.2.3.1 Instrumental Variables

Many studies, especially those based on observational data, use an instrumental variable (IV) approach to help identify endogenous peer effects, where the endogenous regressor (peer behavior) is instrumented for to help determine the impact on the outcome variable (individual behaviour). This estimation is made possible by the assumption that contextual effects are not present[6]. For instance, Case and Katz (1991) recognize the simultaneity between neighbouring youths' behaviour and youth behaviour as regards involvement in crime, illegal drugs among other activities in inner-city Boston and use neighbours' background characteristics and those of the neighbours' neighbours to help identify peer influences. Gaviria and Raphael (2001) also employ a set of average background characteristics of peers' parents as instruments for peer behaviour towards determining the influence of school-based peer effects on individual juvenile behaviour, whilst doing a household mobility analysis to account for unobserved parental heterogeneity which may influence peer group selection choices and bias peer effects estimates[7]. In a simultaneous equation framework, Evans et al. (1992) use metropolitan area attributes to instrument for peer group influence on teenage pregnancy and school dropout behaviour. Interestingly, they argue that peer effects become less pronounced than they appear in single equation models, once the endogenous sorting of individuals into peer groups is accounted for[7][8]. Other approaches to dealing with this selection bias have also been suggested (see for instance Aaronson, 1998; Rosenbaum, 1991).

The recent peer effects-linked Finance literature has also employed exogenous average peer attributes as IVs to primarily help to get around the endogeneity concerns. For instance, Leary and Roberts (2014) use peer firm average equity shocks as an instrument for peer firm financial policies, in showing how peer firm behaviour significantly influences corporate capital structure decisions. Adhikari and Agrawal (2018) also find that a firm's

[6] A few studies do however control for contextual effects by directly including exogenous background information of peers (e.g. educational level of peers' parents) in the regression equation (see for instance Kang, 2007).

[7] This is in line with Manski's correlated effects proposition.

[8] See also Jencks and Mayer (1990) for further evidence on the overestimation of peer effects

dividend payment and share repurchase decisions are significantly impacted by those of peers in the same industry. To help identify the peer effects, they use peers' idiosyncratic stock return shocks and idiosyncratic risk as instruments for peers' dividend policy which is endogenous.

Overall, as complete exogeneity of IVs is not guaranteed, we could have a situation where the IVs are correlated with some unobserved and therefore omitted variables such as those informing neighbourhood choice, which means that the selection bias or the correlated effects problem will persist. To mitigate this problem, some studies control for several characteristics of the neighbourhood or location in which the social interactions occur (see for instance Gaviria and Raphael, 2001; Kang, 2007).

5.2.3.2 Directly Relating Outcome Variable to Exogenous Peer Characteristics

To circumvent the reflection problem arising from the use of the endogenous peer regressor, some studies employ a peer variable which is not directly related to the outcome variable. For instance, in analysing the effect of peers on worker productivity, Cornelissen et al. (2017) regress the individual worker's wage on predetermined average peer worker fixed effect and not on average peer group wages thereby avoiding the reflection problem. Recognizing a potentially spurious relationship between peer quality and wages, through the endogenous sorting of high-quality workers into high-quality firms, they also include four main categories of fixed effects: worker fixed effects, time-varying firm fixed effects, time-varying occupation fixed effects, and firm-specific occupation effects as part of their identification strategy. They report large peer effects for low-skilled occupations where coworkers can easily observe each other's output. Fairhurst and Nam (2020), towards ascertaining whether the quality of the corporate governance environment influences the extent to which firms base their own financial policies on those of their peers, study the effect of peer firms' leverage choices on an individual firm's leverage. As the variable of interest, average peer firm leverage ratio, is endogenous, they replace it with the average of idiosyncratic shocks to peer firms' equity, which is exogenous, in an OLS framework.

Additionally, they also use the idiosyncratic shocks as an instrument for the peer firms' average leverage in a two-stage least squares model. They find that the influence of peer firms in leverage choices is peculiar to firms operating in a weak corporate governance environment.

5.2.3.3 Random Assignments as Natural Experiments

Some studies also rely on the random assignment of peers in the data as a natural experiment for getting around the selection problem arising from both observable and unobservable factors. Using the case of Dartmouth College, where freshmen are randomly assigned to dormmates and roommates, Sacerdote (2001) finds that peers significantly influence the freshman year grade point average (GPA) and decisions to join social groups such as fraternities, though no peer effects are recorded in the choice of a college major. However, with aspects of the analyses involving OLS regressions of individual $i's$ GPA on individual $j's$ GPA (to determine peer effects), it means there is still a reflection problem which places causal inference restrictions on those results. Kremer and Levy (2008) similarly estimate peer effects within the context of a large mid-western US state university which employs a lottery system to allocate roommates. They report that male students who were assigned pre-college alcohol drinkers as roommates obtained on average a lower GPA than those with non-drinking roommates. In another of such experiments, Yakusheva et al. (2011) find a negative relationship between a freshman female student's weight gain and that of a randomly assigned roommate's initial weight, arguing that students adopt some of their roommates' weight-loss behaviors which lead to them gaining less weight than they otherwise would have (see also Graham, 2008; Ammermueller and Pischke, 2009; Zimmerman, 2003 for other random assignment applications).

5.2.3.4 Value-Added Models

Another way peer effects are identified is by means of value-added specifications, with particular reference to the education literature. Value-added approaches typically relate an achievement outcome variable (eg. test scores) to contemporaneous school and family

input variables, and a lagged achievement variable which proxies for the input histories and endowed mental ability of a child, both of which are typically unobserved in the data (Todd and Wolpin, 2003). The evidence on the contribution of value-added models however, appears mixed. Hanushek et al. (2003), in showing the positive relationship between peer average achievement and individual student achievement, posit that the omitted and mismeasured variables problem are critical and attempt to overcome same within a fixed effects framework, where the endogenous current peer achievement explanatory variable is replaced with lagged peer achievement measures. Neidell and Waldfogel (2010) also argue that by using kindergarten scores which are measured just after kindergarten begins and with the help of school fixed effects, they are able to control for peer endogeneity in their value-added specification. However, Todd and Wolpin (2003) aver that the inclusion of the lagged achievement variable makes value-added models highly susceptible to endogeneity bias especially when key variables are omitted.

5.3 Data and Variable Construction

Our institutional data comes from the Accra Metropolitan Assembly (AMA). The AMA is one of 260 local authorities, collectively referred to as Metropolitan Municipal and District Assemblies (MMDAs), in Ghana.[9] Its jurisdiction includes Accra, the capital city, which therefore makes the AMA an important and highly visible MMDA in Ghana. The data records information on actual property tax collections, including on cumulatively recorded property tax arrears covering the 2007-2018 period.

[Insert Table 5.1 about here]

Table 5.1 presents summary statistics for the final sample of 34,253 dwelling units.[10] The table groups the variables into two main categories: peer dwelling unit averages and dwelling unit-specific attributes. With the former, variables are computed as the average

[9]The number of MMDAs is as of August 2019, as found on the Ministry of Local Government and Rural Development, Ghana

[10]Entire dataset includes non-residential properties which are excluded. We also remove all residential properties with ambiguous occupancy status, rate imposts of zero, and rating zone classes that are undefined. As we look at the arrears period as of 2018, it means our study is cross-sectional.

of all dwelling units within the suburbs, after excluding dwelling unit i. The latter simply reflects dwelling unit $i's$ computed value for each variable. We define peer groups as the suburbs in which the dwelling units reside. There are 133 suburbs in the final sample with a mean (median) of 258 (139) dwelling units per suburb. The distribution of dwelling units across each suburb is shown in Figure 5.1.

The cumulative arrears variable reflects the build-up of arrears from 2007 until 2018. So, it tells us whether a dwelling unit is in arrears or not and by how much, as of 2018. The average cumulative arrears for an individual dwelling unit is GHS 250 (USD 51)[11], which shows that the vast majority of dwelling units are property tax delinquent. The yearly average property tax fee a dwelling unit is expected to pay is about GHS 78. The annual mean minimum rate is about GHS 69. The mean rateable value is GHS 35,923. Rateable values are the monetary values of the properties determined through property valuation.[12] The property rate impost is 0.12% on average for each year. About 62% of all dwelling units are occupied by the homeowner, without any tenant(s). The minimum rate is essentially a fixed monetary property tax fee which becomes the fee payable when the product of dwelling unit's rateable value and property rate impost, yields an amount lower than the fixed threshold. This helps ensure that dwelling units do not end up paying meagre property taxes. This means that dwelling units which pay the minimum rate have higher effective property rate imposts. About 17% of the dwelling units are in rating zone class 1, a third in rating zone class 2, and the remaining 51% in rating zone class 3. The rating zone classes show differences which exist within the AMA in terms of suburb quality. Class 1 consist of the most prime suburbs while Class 3 suburbs are are relatively low-tier. Understandably, the peer dwelling unit mean estimates for all the variables are equivalent to those of the individual dwelling units, though the standard deviations of the peer dwelling unit averages are always lower than those of the latter.

[Insert Figure 5.1 about here]

[11] All GHS to USD conversions are based on a USD/GHS exchange rate of 4.9139 at the end of 2018 (`bloomberg.com`).

[12] In Ghana, the valuations are done by the Lands Commission using the depreciated replacement cost method of valuation, based on legal provisions (Act 936). However, valuations are infrequently carried out owing to the huge outlay, which explains why rateable values remain unchanged in the data.

5.3.1 Property Tax Arrears Period

The dependent variable of interest in this study is the arrears period as of 2018, which is unobserved in the data. We ascertain this by comparing the cumulative property tax arrears as of 2018 with the property tax fees from 2011 to 2018. This computation is helped by the fact that arrears are cumulatively recorded from 2007 and so also reflect the arrears for each of the eight years (2011-2018). This justifies our comparison with property tax fees for the same time frame. Additionally, outstanding tax liabilities have priority over current bills when tax payments are made. This makes it possible to estimate the number of years each dwelling unit has had arrears for, as of 2018.[13]

We use the procedure of comparing the 2018 cumulative arrears figure with property tax amounts paid from 2011 to 2018, to determine the arrears period for all dwelling units in the sample.[14] Figure 5.2 shows this distribution of the average arrears period across the AMA suburbs. The longest suburb average arrears period is 7.44 years whilst the lowest is 0.13 years (about 1.5 months). The median (mean) for the distribution is 2.42 years (2.68 years).

[Insert Figure 5.2 about here]

5.4 Empirical Analysis

This section details the specific set-up of the empirical model used for the analysis, the identification techniques, and also reports the main peer effects estimation results as well as robustness tests.

5.4.1 Empirical Model

To estimate the average effect of peer property tax arrears on dwelling unit property tax arrears outcomes, we employ the following empirical model, whose specification is akin

[13]This approach is similar to the one used to determine the arrears period in Chapter 4 (Section 4.4.2) of this thesis.

[14]The arrears period for the study is restricted to a maximum of 8 years (2011-2018), especially as property tax rates prior to 2011 are not recorded in the data. This makes for a more precise estimation and identification of the effects.

to a standard linear-in-means model of social interactions:

$$Y_{is} = \alpha + \beta \bar{Y}_{-is} + \Phi' \bar{X}_{-is} + \gamma' X_{is} + \delta' W_s + \varepsilon_{is} \tag{5.6}$$

where the indices i, and s refer to dwelling unit and suburb, respectively. The outcome variable, Y_{is}, is the property tax arrears period (in years) of individual dwelling unit i in suburb s. The covariate, $\bar{Y}_{-is}$, represents the average property tax arrears period for peer dwelling units in suburb s, after excluding dwelling unit i. The vectors $\bar{X}_{-is}$ and X_{is} capture peer dwelling unit average and dwelling unit-specific characteristics, correspondingly. Suburb attributes are represented by W_s and ε_{is} denotes the random error term.[15]

Thus, the coefficients β and Φ' capture the two main peer effects, respectively measuring the influence of peer property tax arrears period (endogenous effects) and characteristics (contextual effects) on the dwelling unit arrears period. Common dwelling unit behaviour arising from shared individual traits and similar suburb-related environments (correlated effects) are captured by γ' and δ'.

5.4.2 Identification

The main challenge stems from the presence of $\bar{Y}_{-is}$ as an explanatory variable in equation (5.6). Naturally, if dwelling units' property tax arrears outcomes are influenced by one another, then dwelling unit $i's$ arrears period is a function of dwelling unit $j's$ and vice versa. This simultaneity makes $\bar{Y}_{-is}$ an endogenous regressor for which reason the parameters (α, β, Φ', γ', δ') are unidentified. However, as Manski (1993) notes, estimating a reduced-form model will help to establish the presence of some peer effects and to distinguish same from effects which stem from common factors. Following this, we take steps to estimate the reduced-form model by[16]:

[15] Another specification is tried out where the outcome variable is $Prob(Y_{is} = 1)$, a dummy variable which takes the value of one if a dwelling unit is in arrears, and zero otherwise. The empirical analysis in this study is as of 2018.

[16] Full derivation of this is in line with the Manski "Identification Problem" discussed in the Literature Review. It follows from first estimating the mean regression of Y on X and W, based on the population

Taking the population version of equation (5.6):

$$Y = \alpha + \beta E(Y|W_s) + \Phi' E(X|W_s) + \gamma' X + \delta' W_s + \varepsilon \tag{5.7}$$

Estimating the mean regression of Y on X and W_s:

$$E(Y|X, W_s) = \alpha + \beta E(Y|W_s) + \Phi' E(X|W_s) + \gamma' X + \delta' W_s \tag{5.8}$$

Integrating (5.8) with respect to X to yield the equilibrium equation:

$$E(Y|W_s) = \alpha + \beta E(Y|W_s) + \Phi' E(X|W_s) + \gamma' E(X|W_s) + \delta' W_s \tag{5.9}$$

Estimating a unique solution for (5.9), given that $\beta \neq 1$:

$$E(Y|W_s) = \frac{\alpha}{1-\beta} + \left(\frac{\Phi + \gamma}{1-\beta}\right)' E(X|W_s) + \left(\frac{\delta}{1-\beta}\right)' W_s \tag{5.10}$$

Plugging (5.10) into (5.8) to derive the reduced-form model:

$$E(Y|X, W_s) = \frac{\alpha}{1-\beta} + \left(\frac{\beta\gamma + \Phi}{1-\beta}\right)' E(X|W_s) + \left(\frac{\delta}{1-\beta}\right)' W_s + \gamma' X \tag{5.11}$$

In line with Manski (1993), we see that the equation (5.11) yields a composite peer effects parameter, $\left(\frac{\beta\gamma+\Phi}{1-\beta}\right)'$, which allows us to ascertain the presence of some peer or social effect, as also differentiated from correlated effects, and as long as neither $\beta\gamma$ or Φ is zero. However, the composite peer effects parameter does not enable one to distinguish between endogenous and exogenous effects.

5.4.2.1 Identification Plan

The concept of peer effects on property tax compliance is not implausible, particularly in residential set-ups which foster interactions among neighbours. This is generally the case in urban areas of Ghana where residents form neighbourhood watch-dog committees and engage in clean-up activities within their immediate vicinities or suburbs, the peer group. Thus, it is not untenable that discussions, such as those related to property taxation,

form of equation (5.6), integrating both sides of the equation with respect to W, and then plugging back the resultant solution into the previously estimated mean regression equation, to obtain the reduced-form model.

could take place during such social convocations, with the attendant result of influencing individuals' property tax payment outcomes. That said, the empirical determination of the peer effect is fraught with the "reflection problem" - the tax payment behaviour of the dwelling unit, we seek to predict, may actually be a reflection of the behaviour of the suburb in which the dwelling unit resides. More specifically, a positive relationship between a dwelling unit's compliance behaviour and the compliance behaviour of its peers (other dwelling units within the same suburb), does not indicate that peer effects exist because dwelling units may simultaneously exhibit similar compliance behaviour in response to common suburb-related factors, an example being a significant decline in economic fortunes.

Ordinarily, the identification challenge presented above could be surmounted by random assignment of the peer dwelling units. However, for an administrative dataset such as what is used in this study, this is infeasible as the peer dwelling units are fixed. Therefore, there is the need for an alternative approach to identifying the peer effects. In order to identify the composite peer effects parameter in equation (5.11), there is the need for a peer dwelling unit attribute which is exogenous. The basis for deriving this exogenous variation is the property tax rates, which have been shown to influence property tax compliance outcomes (see for instance Alm et al., 1992a; Bahl and Wallace, 2008).

In the AMA, as in other jurisdictions, the annual property tax payable by a dwelling unit is calculated as the annual property tax rate multiplied by the rateable value of the home. However, in instances where the property tax rate is below the minimum fee (rate), a fixed annual amount which depends on the rating zone class in which the property is situated, a dwelling unit is charged the minimum fee. Thus, for dwelling units which pay the minimum fee, we can estimate an effective tax rate by simply dividing the minimum fee by the rateable value. This yields a tax rate which is higher than the original tax rate. For dwellings units whose property tax liability is based on the original tax rate, their effective rate is equal to the original tax rate. So, in both cases, the tax rate is determined by the rating zone class in which the property is located although it is possible for dwelling units within the same rating zone class to have different tax

rates owing to varying individual circumstances. Therefore, it is important to isolate this common variation from the dwelling unit-specific component, with the latter serving as the basis for identifying the peer effects. To ascertain how dwelling unit i is impacted by the compliance behaviour its peers, it would have been helpful to utilize information that is relevant only for dwelling unit $i's$ peers' compliance behaviour but random as regards dwelling unit $i's$ own compliance outcome. However, given how difficult it is to observe such information and to tell that it does not directly affect dwelling unit i, an identification strategy that isolates the dwelling unit-specific variation in effective property tax rates is used.

To this end, we employ a model that estimates the mean effective property tax rate for dwelling units for the 8-year period (2011 - 2018), whilst filtering out the common rating zone effects among peers. The residual from the model is the idiosyncratic mean effective tax rate or the mean effective rate shock. The equation below helps to illustrate this:

$$r_{is} = \alpha + \eta' Occupancy\ status_{is} + \chi' Rating\ zones_s + \epsilon_{is} \tag{5.12}$$

where r_{is} is the 8-year (2011 – 2018) mean effective property tax rate for dwelling unit i in suburb s, the vectors $Occupancy\ status_{is}$ and $Rating\ zones_s$ contain information on the dwelling unit type and rating zone classes, respectively. ϵ_{is} is the random error term.

Thus, from equation (5.12), the mean expected and idiosyncratic rate imposts can be computed as follows:

Expected mean effective rate$_{is} \equiv \widehat{r}_{is} = \widehat{\alpha} + \widehat{\eta}' Occupancy\ status_{is} + \widehat{\chi}' Rating\ zones_s$

Idiosyncratic mean effective rate$_{is} \equiv \widehat{\epsilon}_{is} = r_{is} - \widehat{r}_{is}$

The idiosyncratic component is then averaged over peer dwelling units to generate, $\bar{\widehat{\epsilon}}_{-is}$, which is the idiosyncratic mean effective tax rate or the mean effective rate shock for peer dwelling units, after excluding dwelling unit i. This variable provides the exogenous variation needed to help identify the composite peer effects in equation (5.11). In order to be considered exogenous, the peer mean effective rate shock must not directly affect the

dependent variable - dwelling unit-specific arrears period. One reason why this might be the case here is that the peer shock is based on the filtered out idiosyncratic component, which is unobservable to dwelling units. Thus, individual dwelling unit arrears period cannot directly depend on it. Also, there are empirical precedents as similar identification strategies have been employed, notably by Leary and Roberts (2014) and Adhikari and Agrawal (2018), albeit in contexts different from property tax compliance.[17]

In line with the above, we use the peer rate shock variable in two ways: as a standalone for the composite peer effects parameter (i.e. the reduced-form approach) and as an instrument for the endogenous peer arrears period (i.e. structural approach).

5.4.2.2 Confounding Factors

An added challenge in the identification of peer effects could be due to factors such as shared suburb characteristics. If relevant suburb variables are omitted, it may lead us to attribute common property tax arrears behaviour among dwelling units to peer influences while in actuality, the similar behaviour is down to them being in a common (unobserved) environment. This could for instance, be related to the endogenous sorting of wealthier dwelling units into high-quality suburbs which will lead to spurious results. This means that overall, our peer effects variable will be correlated with the random error term, ε_{is}, for all dwelling units.

The identification strategy takes this into account by including key suburb-related characteristics, as captured by W_s. Thus, we control for the rating zone classes, which reflect the quality of a suburb and differentiate among suburbs in terms of the property tax rate levels set by the AMA. The analysis also accounts for other factors related to the suburb namely: connectedness to mainstream society and business opportunities using its nearness to the Central Business District (CBD) of Accra, safety, and access to healthcare.[18] These estimates primarily control for the effect of reciprocity at the

[17]Leary and Roberts (2014) use the peer idiosyncratic equity return shock as an instrument to show that peer effects matter for firms' capital structure decisions. Adhikari and Agrawal (2018) similarly use the peer idiosyncratic equity return shock as well as the standard deviation (risk) as instruments to show how firms' dividend payout and share repurchase policies are influenced by policies of their peers.

[18]These proxies are based on the shortest Google Maps road-based distance estimates from each suburb to the the Makola Shopping Mall in central Accra, nearest suburban police station, and public hospital,

suburb-level on arrears outcomes (see Luttmer and Singhal, 2014). These suburb-level variables are in addition to controls for peer and individual dwelling units, $\bar{X}_{-is}$ and X_{is}, respectively.

However, because most of our covariates, especially the peer variable, are clustered within suburbs, standard errors may be biased. As Moulton (1990) argues, not accounting for correlation of errors within groups can cause OLS standard errors to be severely biased downward, leading to spurious results when estimating the effects of aggregate variables on micro units. To this end, all standard errors in the regression analysis are clustered by suburb.

5.4.3 Reduced-Form Results

This approach is basically the estimation of the reduced-form model in equation (5.11). We present two sets of results based on OLS and probit regressions in one case, and quantile regressions in the other.

5.4.3.1 OLS and Probit Regressions

Table 5.2 presents the initial reduced-form results. Specifically, column (1) presents OLS coefficient estimates based on the dwelling unit-specific arrears period as the dependent variable. Column (2), which is the probit equivalent, shows the average marginal effects based on whether the dwelling unit is in arrears or not. So, while the focus of the former is the estimation of peer influences on the property tax arrears period, the latter looks at peer influences on the probability of being in arrears. Standard errors clustered by suburb are in parentheses for the two columns.

[Insert Table 5.2 about here]

The results in both columns show that the peer average rate shock has a strong positive relationship with dwelling unit-specific arrears outcomes. However, as this result derives from a reduced-form model, especially one in which the peer effects term in the

choosing among Korle-Bu, 37 Military, and Greater Accra Regional hospitals.

reduced-form model is composite in nature, any exact interpretation of the magnitude of the coefficients/marginal effects will be misleading.[19]

The results for the other peer dwelling unit attributes are largely not statistically significant. That said, there is some weak evidence that as the percentage of owner-and-tenant-occupied dwellings increase there is a rise in the probability of non-compliance.

For the dwelling unit-specific attributes, we again see that the property tax rate shock is directly related with the dwelling unit-specific arrears period. Similarly, both owner-and-tenant- and tenant-occupied units, relative to owner-occupied units, show a positive relationship with the arrears period. This could be due to income constraints for the former and the absence of the homeowner, who pays the property tax, for the latter (see Chapter 4). The larger a property is however, the more likely it is to be associated with a reduced arrears period or probability of being in arrears.

Among the suburb attributes, rating zone 1 exhibits a statistically significant and negative relationship with dwelling unit-specific arrears outcomes, although the risk or probability of arrears result is not significant. The further a suburb is from the central business district and the lower its accessibility to healthcare, the more likely it is to be positively associated with the arrears period.

Overall, these initial results suggest that peers effects do indeed play a significant role in dwelling unit arrears outcomes.

5.4.3.2 Quantile Regressions

As the standard OLS regression computes the conditional mean of the dependent variable, based on the explanatory variables, it potentially masks relevant information which will help us better understand the relationship between both sets of variables at varying conditional distribution locations (quantiles) of the dependent variable. With particular reference to this study, it is possible that the effect of the peer average rate shock regressor varies with quantiles of the property tax arrears period. We therefore conduct a quantile regression analysis across different points in the conditional distribution of the dwelling

[19]See discussion of "Identification Problem" and "Identification" in the Literature Review and Identification sections correspondingly.

unit arrears period.

Table 5.3 presents results of the quantile regression. These results are specifically based on Parente-Silva estimation procedure which accounts for intra-cluster correlation, while providing a formal test for its presence, and therefore more robust.[20] Focusing on the main peer effects term, we see that its coefficient is positive across all the quantiles and statistically significant. This result is meaningful because it corroborates the existence of a direct relationship between peer effects and the arrears period as found in the initial OLS and Probit results.

The Parente-Santos Silva test statistics also show that we cannot reject the null hypothesis for intra-cluster correlation for each of the three quantiles. This justifies our use of this estimation approach, which is robust to intra-cluster correlation, and therefore ensures that our estimates are consistent. We also undertake a test for heteroskedasticity as a way of supporting the quantile regression approach. A Breusch-Pagan/Cook-Weisberg test statistic of 115.15 strongly rejects the null hypothesis of homoskedasticty and thus justifies our use of quantile regressions.[21] This notwithstanding, there is no strong case for its use as overall most of the quantile coefficients, particularly that of the peer average property rate shock, are not significantly different from the OLS estimates.

[Insert Table 5.3 about here]

5.4.4 Instrumental Variable Results

This approach enables us to determine the magnitude of peer influences on the property tax arrears period, by using the peer average property rate shock variable as an instrument for the endogenous peer arrears period regressor, $\bar{Y}_{-is}$, in equation (5.6). We thus use a two-stage least squares approach to estimate equation (5.6).

Though we have so far argued for the exogeneity of the peer average rate shock variable, the relevance condition must also be satisfied in order for it to be a valid instrument.

[20] The user-written *qreg2* Stata command by Machado et al. (2011) is used for this purpose. We are therefore able to cluster standard errors by suburb as is done for the other regressions.

[21] The clustering of standard errors by suburb in both the OLS and Table 5.3 specifications however, should help reduce the extent of heteroskedasticity.

This means that the instrument must be significantly correlated with the peer dwelling unit average property tax arrears period, which can be formally tested. The empirical research suggests a positive relationship between the peer average arrears period and the peer average property rate shock variables. First, Youngman and Malme (2005) highlight the fact that "Taxpayers do not like unpredictability", in a study aimed at improving property tax payment and collection effectiveness in California. Also, Alm et al. (1992a), in a more related study, show that when taxpayers receive a public good in exchange for tax payments, uncertainty in the tax rate increases their non-compliance. This arises from a taxpayer having to determine their own response to the uncertainty, whilst guessing the responses of other taxpayers within their group, whose total payments make the delivery of the public services possible. So, it suggests that when uncertainty levels within a peer group increase, the non-compliance levels of the taxpayers within the same group peer group also goes up. This study is directly applicable to the case of property tax, whose payment is typically tied to the provision of local public services. Therefore, for any given suburb s, the average peer arrears period is expected to be directly related to the magnitude of its peer average property rate shock.

5.4.4.1 Peer Arrears Period

Table 5.4 reports the two-stage least squares estimation of equation (5.6). The first column displays results based on the dwelling unit arrears period outcome variable. Those of the second column are equivalent to prior results except that the outcome variable is an indicator - whether a dwelling unit is in arrears or not. Thus, we use a probit model and report average marginal effects for column (2). Column (1) simply reports the regression coefficients.

[Insert Table 5.4 about here]

The instrument coefficient from the first-stage regression is shown towards the bottom of column (1). The first-stage result shows that the peer average property rate shock is strongly positively correlated with the average peer dwelling unit arrears period, in line with our expectation. This means that an increase in the peer average rate shock in

a suburb is associated with a correspondingly longer average peer property tax arrears period. The instrument also passes two main tests. First, it passes the underidentification test which suggests that the instrument is not irrelevant, as seen from the Kleibergen-Paap LM statistic. Second, it passes the weak instrument test. This is with reference to the Staiger and Stock (1997) rule of thumb that the first-stage F statistic should be at least 10, for an instrument not to be deemed weak.

The row designated "Peer arrears period" near the top of the table reports the estimated coefficients and average marginal effects for the instrumented peer dwelling unit average arrears period variable. Results across both specifications reveal that dwelling units' property tax arrears outcomes are significantly positively influenced by the arrears periods of their peers. Specifically, column (1) shows that a 1-year increase in the peer dwelling unit average arrears period is associated with a 0.99 year (about 11.9 months) rise in dwelling unit $i's$ arrears period. That of column (2), which is the analogous instrumental variable probit version of column (1), buttresses the previous result by showing that a 1-year increase in peer average arrears period is associated with a 16 percentage point increase in the probability of dwelling unit i being in arrears.

The results for the other variables exhibit some statistical significance though this is not always robust across the two specifications, especially in the case of the peer dwelling unit averages. That said, an increase in the percentage concentration of peer owner-and-tenant- and tenant-occupied units, relative to owner-occupied units, is associated with an increase in the dwelling unit arrears period. This result is largely unsurprising given that those two occupancy types tend to be more susceptible to arrears and so may bring that negative influence to bear on neighbouring dwelling units, especially as their concentration in a suburb increases. For the dwelling unit-specific attributes, results are more consistent and robust. They show a strong positive relationship between a dwelling unit's own rate shock and the arrears period, as expected. Specifically, a 1 percentage point increase in the rate shock is associated with a 0.04 year (about 15 days) rise in the arrears period of a dwelling unit. Also, owner-and-tenant- and tenant-occupied units are more likely to be property tax delinquent than owner-occupied units. This is consistent

with prior studies which find that pure homeowners are more likely to invest in local social capital than do renters (see for instance DiPasquale and Glaeser, 1999; Hilber, 2010), which suggests a reduced incidence of longstanding property tax arrears for the former. Finally, larger (high-valued) properties are inversely related to the property tax arrears period and probability of being in arrears. This is not surprising as those properties are likely to be occupied by those with the wherewithal to pay. Results for the suburb attribute controls are again not robust across the coefficient and marginal effect specifications.

Overall, the above results indicate that peer influences are significantly relevant in explaining the property tax arrears outcomes of dwelling units.

5.4.4.2 Percentage of Peers in Arrears

The main independent variable of interest in the results so far is the endogenous peer average arrears period, which is instrumented for. To check whether the results are robust to changes to this variable, we replace it with the average percentage of peers in a suburb with property tax arrears and instrument for it also, as previously done. Thus, a slightly different form of equation (5.6) is estimated as follows:

$$Y_{is} = \alpha + \beta \bar{\%Y}_{-is} + \Phi' \bar{X}_{-is} + \gamma' X_{is} + \delta' W_s + \varepsilon_{is} \tag{5.13}$$

where the indices i, and s refer to dwelling unit and suburb, respectively. The outcome variable, Y_{is}, is the property tax arrears period (in years) of individual dwelling unit i in suburb s.[22] The predictor variable, $\bar{\%Y}_{-is}$, represents the average percentage of peer dwelling units in suburb s with property tax arrears, after excluding dwelling unit i. All the other parameters are as previously defined in equation (5.6).

Table 5.5 presents the results of this estimation. In the first column, results are based on the dwelling unit arrears period outcome variable whilst the second column displays average marginal effects, based on whether a dwelling unit is in arrears or not.

[22] It also includes a specification where the outcome variable is $Prob(Y_{is} = 1)$, a dummy variable which takes the value of one if a dwelling unit is in arrears, and zero otherwise.

The results are generally similar to those reported in the initial instrumental variable regression. Beginning with the first-stage results, we see that the instrument is strongly positively significant. It shows that as the peer average property rate shock in a suburb increases, there is a corresponding rise in the percentage of peers with property tax arrears. The instrument also passes both the underidentification and weak identification tests.

Results for the instrumented main variable of interest are shown in the row labelled "Perc. of peers in arrears", near the table's summit. Across both specifications, it can be seen that dwelling units' property tax arrears outcomes are significantly positively associated with the percentage of peers who also have property tax arrears. From column (1), we see that a one percentage point increase in the percentage of peers with arrears is associated with a 0.07 year (26 days) rise in dwelling unit arrears period. That of column (2) reinforces this relationship. It reveals that a one percentage point increase in the percentage of peers with arrears is significantly linked with a 0.9 percentage point increase in the probability of a dwelling unit being in arrears.

[Insert Table 5.5 about here]

5.4.5 Robustness Tests

Two alternative instruments: peer rate standard deviation shock and peer rate difference, are also employed to help identify peer effects in the analysis. The former follows a similar approach used to determine the main instrument, peer rate shock, except that it is based on the standard deviation of the effective tax rates and is thus used as a measure of risk (see Adhikari and Agrawal, 2018). The peer rate difference is simply the difference between the 8-year average effective tax rate for dwelling unit i and the average original tax rate of the suburb s, in which dwelling unit i resides. This is based on the assumption that dwelling units are unaware of all the rules which determine property tax rates, although they can tell whether they are being taxed more or less, with reference to others in the same suburb. It is also a simplistic way of eliminating the common suburb-related factors which could influence the property tax rate setting process.

The results obtained from using these two other instruments are quantitatively similar to what derive from the peer rate shock, again showing a positive association between peer dwelling unit and individual dwelling unit property tax arrears outcomes. The results are reported in Appendix B (from B.2 to B.9).

5.5 Conclusion

Prior research on factors affecting property tax compliance decisions largely ignore a role for peer influences while the few that do are mostly based on laboratory or field experiments and with no tax delinquency period considerations. This study uses administrative data to investigate whether peer effects help explain dwelling unit property tax arrears behaviour, as measured by the number of years of arrears.

Using institutional data on over 34,000 dwelling units in the Accra Metropolitan Assembly of Ghana, we find that individual dwelling units' arrears periods are significantly positively associated with those of their peers, in both reduced-form and instrumental variable identification strategies. With the instrumental variable approach, the results are also robust to alternative specifications, specifically where the endogenous peer average arrears period is replaced with the percentage of peers in property tax arrears and where two other instruments are employed.

There are interesting policy implications arising from the positive relationship between peers and the individual dwelling unit, in respect of the arrears period. Particularly, policy measures by local governments, in markets similar to Ghana, aimed at improving property tax compliance for the worst culprits will not only raise their compliance levels but also do same for all other residents in the peer group, whose further improved compliance could trigger even more improved compliance by the original recipients of that policy intervention.

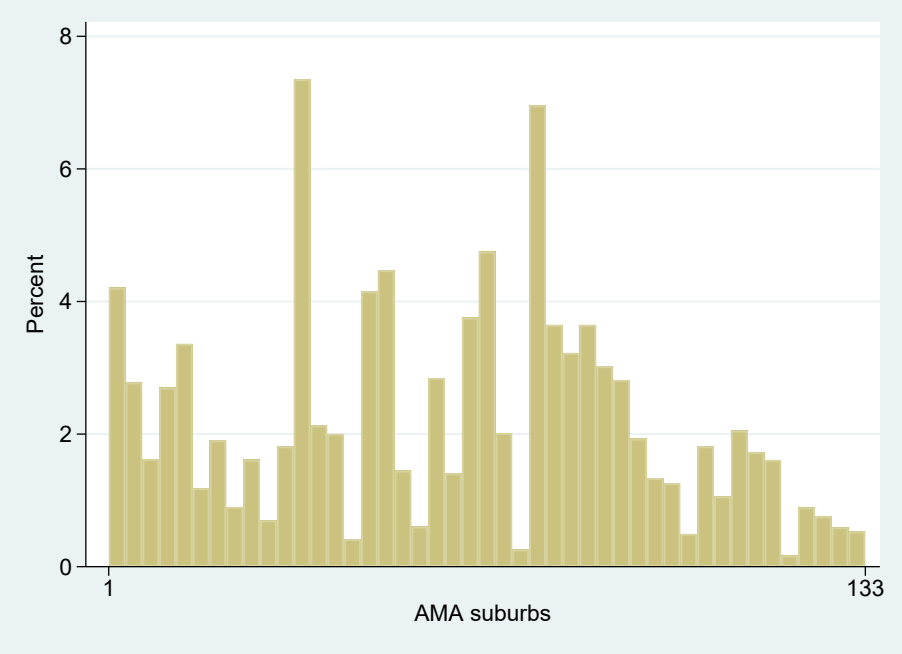


Figure 5.1: Distribution of Dwelling Units by Suburb

This figure shows the distribution of dwelling units across 133 AMA suburbs, based on the final data sample.

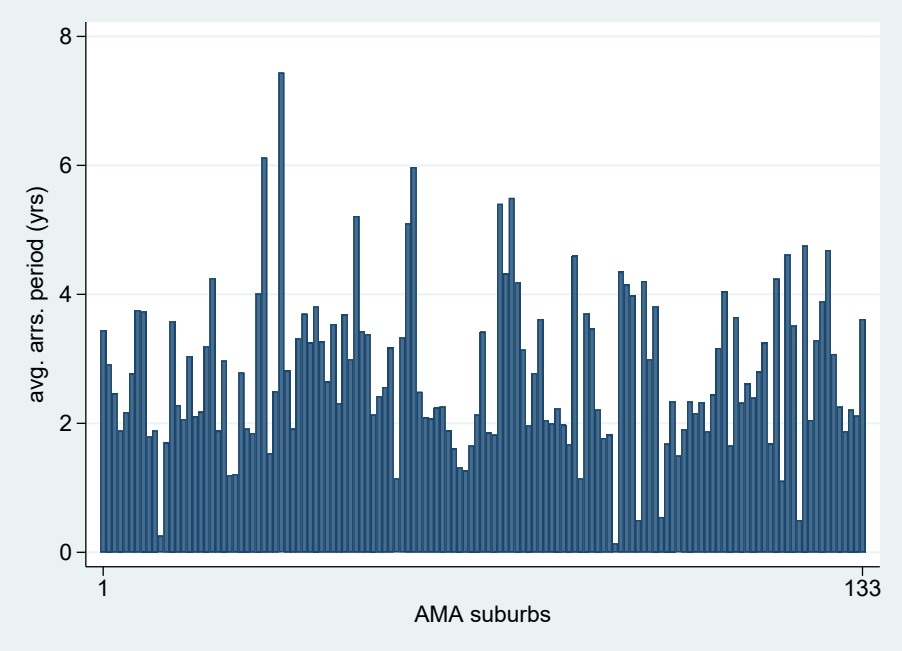


Figure 5.2: Average Arrears Period by Suburb

This figure shows the average property tax arrears period for each of 133 AMA suburbs, based on the final data sample.

Table 5.1: Summary Statistics

Variable	Mean	Median	Std. Dev.
Peer dwelling unit averages:			
Cumulative arrears (GHS)	250.03	227.43	121.00
Fees payable (GHS)	77.82	66.63	53.78
Minimum rate (GHS)	68.87	62.23	24.97
Rateable value (GHS)	35,923.09	30,212.90	22,326.49
Property rate impost (%)	0.12	0.11	0.03
Dwelling unit-specific attributes:			
Cumulative arrears (GHS)	250.03	224.00	376.22
Fees payable (GHS)	77.82	59.49	134.55
Minimum rate (GHS)	68.87	60.25	26.86
Rateable value (GHS)	35,923.09	25,872.20	84,731.68
Property rate impost (%)	0.12	0.10	0.04
Other dwelling unit and suburb attributes:			
Owner-occupiers (%)	61.8		
Owner-and-tenant-occupiers (%)	17.7		
Tenant-occupiers (%)	20.5		
Rating zone class 1 (%)	16.7		
Rating zone class 2 (%)	32.7		
Rating zone class 3 (%)	50.6		
Total no. of suburbs	133		
No. of dwelling units per suburb	258	139	333

The table reports summary statistics of the variables based on data from the Accra Metropolitan Assembly (AMA). The cumulative arrears estimates are based on records as of 2018. Rating zone classes and occupancy status do not change over time. All other estimates are based on records from 2011 to 2018.

Table 5.2: Reduced-Form (Composite) Results: OLS and Probit Estimates

	Arrears period (1)	Arrears or not (2)
Peer Dwelling Unit Averages		
Rate shock	2.255***	0.366***
	(0.4939)	(0.1222)
Owner-Tenant	0.006	0.001
	(0.0060)	(0.0010)
Tenant	-0.004	0.0003
	(0.0095)	(0.0015)
Property size	0.014*	0.002
	(0.0080)	(0.0020)
Dwelling Unit-Specific Attributes		
Rate shock	0.048***	0.011
	(0.0160)	(0.0074)
Owner-Tenant	0.194***	0.018***
	(0.0441)	(0.0068)
Tenant	0.156***	0.005
	(0.0395)	(0.0064)
Property size	-0.385***	-0.032***
	(0.0373)	(0.0047)
Suburb Attributes		
Ratezone 1	-0.453**	-0.029
	(0.1762)	(0.0319)
Ratezone 2	0.029	0.032
	(0.1583)	(0.0293)
CBD	0.105**	0.023***
	(0.0460)	(0.0075)
Safety	-0.070	0.002
	(0.0982)	(0.0169)
Healthcare	0.095*	0.007
	(0.0550)	(0.0086)
_cons	0.967**	
	(0.4372)	
Observations	34,253	34,253
adj. R-sq.	0.06	

The table reports reduced-form regression estimates on the effect of peer dwelling units on individual dwelling unit arrears period outcomes. The dependent variable is shown at the top of each column. That of column (1) is the dwelling unit-specific property tax arrears period and reports the estimated OLS coefficients. Column (2) has the dependent variable as the analogous dummy variable version which takes on the value of one if a dwelling unit has arrears, and zero otherwise. It reports the average marginal effects. Rate shock is the residual error term, after estimating the average effective property tax rates from 2011 to 2018. Owner-Tenant (Tenant) takes the value of one if a dwelling unit is owner-and-tenant-occupied (tenant-occupied), and zero otherwise. Property size takes on the value of one if a property is above the median rateable value, and zero otherwise. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. CBD measures the shortest travel distance from a suburb to the central business district. Safety measures the shortest travel distance from a suburb to the nearest suburban police station. Healthcare measures the shortest travel distance from a suburb to the nearest of three public hospitals: Korle-bu, 37 Military, and Greater Accra Regional hospitals. Standard errors clustered by suburb are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 5.3: Reduced-Form (Composite) Quantile Regression Estimates

	Arrears period		
	q0.25	q0.50	q0.75
	(1)	(2)	(3)
Peer Dwelling Unit Averages			
Rate shock	1.946*	3.502***	3.094***
	(1.1749)	(1.0443)	(0.5483)
Owner-Tenant	0.003	0.002	0.010
	(0.0074)	(0.0109)	(0.0084)
Tenant	0.001	-0.011	-0.015
	(0.0085)	(0.0140)	(0.0134)
Property size	0.0004	0.001	0.016*
	(0.0102)	(0.0099)	(0.0096)
Dwelling Unit-Specific Attributes			
Rate shock	0.054***	0.065***	0.047***
	(0.0098)	(0.0200)	(0.0121)
Owner-Tenant	0.098**‡	0.288***	0.276***
	(0.0421)	(0.0909)	(0.0885)
Tenant	0.044‡	0.188**	0.299***
	(0.0271)	(0.0773)	(0.0884)
Property size	-0.169***‡	-0.512***	-0.601***
	(0.0521)	(0.0993)	(0.0791)
Suburb Attributes			
Ratezone 1	-0.157	-0.500*	-0.645***
	(0.1516)	(0.2757)	(0.2029)
Ratezone 2	0.112	-0.067	-0.084
	(0.2060)	(0.2752)	(0.2187)
CBD	0.084**	0.125*	0.165***
	(0.0404)	(0.0743)	(0.0538)
Safety	-0.056	-0.128	-0.112
	(0.1076)	(0.1677)	(0.1213)
Healthcare	0.067	0.192**	0.095
	(0.0485)	(0.0903)	(0.0669)
_cons	-0.297‡	0.691	2.432***‡
	(0.4615)	(0.4291)	(0.6026)
Observations	34,253	34,253	34,253
Parente-Santos Silva Test Statistic	210.81	166.99	63.46
R-sq.	0.05	0.06	0.06

The table reports reduced-form quantile regression estimates on the effect of peer dwelling units on individual dwelling unit arrears period outcomes. The dependent variable is shown above the four columns which represent three conditional quantile distributions: Columns (1), (2), and (3), representing quantiles 0.25, 0.50, 0.75 respectively. Coefficients are estimated using Parente-Silva *qreg*2 user-written command in Stata, which accounts for intra-cluster correlation and allows for clustering of standard errors. Rate shock is the residual error term, after estimating the average effective property tax rates from 2011 to 2018. Owner-Tenant (Tenant) takes the value of one if a dwelling unit is owner-and-tenant-occupied (tenant-occupied), and zero otherwise. Property size takes on the value of one if a property is above the median rateable value, and zero otherwise. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. CBD measures the shortest travel distance from a suburb to the central business district. Safety measures the shortest travel distance from a suburb to the nearest suburban police station. Healthcare measures the shortest travel distance from a suburb to the nearest of three public hospitals: Korle-bu, 37 Military, and Greater Accra Regional hospitals. Standard errors clustered by suburb are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively. ‡ denotes quantile regression coefficients that are significantly different from OLS coefficients at the 5% level.

Table 5.4: Instrumental Variable Results (with peer arrears period)

	Arrears period	Arrears or not
	(1)	(2)
Peer Dwelling Unit Averages		
Peer arrears period	0.990***	0.162***
	(0.0088)	(0.0224)
Owner-Tenant	-0.001**	0.0002
	(0.0006)	(0.0004)
Tenant	-0.002***	0.001
	(0.0008)	(0.0005)
Property size	0.020*	0.002
	(0.0108)	(0.0028)
Dwelling Unit-Specific Attributes		
Rate shock	0.042***	0.017**
	(0.0156)	(0.0083)
Owner-Tenant	0.194***	0.018***
	(0.0435)	(0.0067)
Tenant	0.158***	0.005
	(0.0385)	(0.0064)
Property size	-0.386***	-0.030***
	(0.0379)	(0.0048)
Suburb Attributes		
Ratezone 1	0.030	0.021
	(0.0257)	(0.0179)
Ratezone 2	0.015	0.026**
	(0.0283)	(0.0105)
CBD	0.001	0.007**
	(0.0011)	(0.0033)
Safety	0.001	0.014**
	(0.0026)	(0.0063)
Healthcare	0.0004	-0.008**
	(0.0017)	(0.0040)
_cons	-0.809	
	(0.5436)	
First-Stage Results		
Peer avg. rate shock	2.278***	
	(0.4933)	
Observations	34,253	34,253
First-stage F-statistic	21.33	
Kleibergen-Paap rk LM statistic	11.39	
R-sq.	0.12	

The table largely reports second-stage instrumental variable regression estimates. The dependent variable is shown at the top of each column. That of column (1) is the dwelling unit-specific property tax arrears period and reports estimated coefficients. Column (2) has the dependent variable as the analogous dummy variable version which takes on the value of one if a dwelling unit has arrears, and zero otherwise. It reports the average marginal effects. Peer arrears period is the average arrears period for peer dwelling units. Rate shock is the residual error term, after estimating the average effective property tax rates from 2011 to 2018, which serves as the instrument. Owner-Tenant (Tenant) takes the value of one if a dwelling unit is owner-and-tenant-occupied (tenant-occupied), and zero otherwise. Property size takes on the value of one if a property is above the median rateable value, and zero otherwise. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. CBD measures the shortest travel distance from a suburb to the central business district. Safety measures the shortest travel distance from a suburb to the nearest suburban police station. Healthcare measures the shortest travel distance from a suburb to the nearest of three public hospitals: Korle-bu, 37 Military, and Greater Accra Regional hospitals. Standard errors clustered by suburb are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 5.5: Instrumental Variable Results (with percentage of peers in arrears)

	Arrears period	Arrears or not
	(1)	(2)
Peer Dwelling Unit Averages		
Perc. of peers in arrears	0.070***	0.009***
	(0.0079)	(0.0008)
Owner-Tenant	-0.005	-0.0003
	(0.0035)	(0.0003)
Tenant	-0.008*	-0.0004
	(0.0046)	(0.0003)
Property size	0.009	0.001
	(0.0145)	(0.0037)
Dwelling Unit-Specific Attributes		
Rate shock	0.043***	0.018**
	(0.0156)	(0.0081)
Owner-Tenant	0.188***	0.017***
	(0.0437)	(0.0066)
Tenant	0.154***	0.005
	(0.0389)	(0.0063)
Property size	-0.389***	-0.029***
	(0.0380)	(0.0049)
Suburb Attributes		
Ratezone 1	-0.150	-0.010
	(0.1288)	(0.0090)
Ratezone 2	-0.100	0.017***
	(0.0771)	(0.0063)
CBD	-0.084***	-0.002
	(0.0270)	(0.0024)
Safety	-0.069*	0.001
	(0.0409)	(0.0042)
Healthcare	0.078***	0.005**
	(0.0244)	(0.0024)
_cons	-2.574***	
	(0.8986)	
First-Stage Results		
Peer avg. rate shock	32.395***	
	(9.4934)	
Observations	34,253	34,253
First-stage F-statistic	11.64	
Kleibergen-Paap rk LM statistic	11.24	
R-sq.	0.10	

The table largely reports second-stage instrumental variable regression estimates. The dependent variable is shown at the top of each column. That of column (1) is the dwelling unit-specific property tax arrears period and reports estimated coefficients. Column (2) has the dependent variable as the analogous dummy variable version which takes on the value of one if a dwelling unit has arrears, and zero otherwise. It reports the average marginal effects. Perc. of peers in arrears is the average proportion of peer dwelling units with an arrears period greater than zero. Rate shock is the residual error term, after estimating the average effective property tax rates from 2011 to 2018, which serves as the instrument. Owner-Tenant (Tenant) takes the value of one if a dwelling unit is owner-and-tenant-occupied (tenant-occupied), and zero otherwise. Property size takes on the value of one if a property is above the median rateable value, and zero otherwise. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. CBD measures the shortest travel distance from a suburb to the central business district. Safety measures the shortest travel distance from a suburb to the nearest suburban police station. Healthcare measures the shortest travel distance from a suburb to the nearest of three public hospitals: Korle-bu, 37 Military, and Greater Accra Regional hospitals. Standard errors clustered by suburb are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Chapter 6

Local Capital Expenditure and Property Tax Compliance

6.1 Introduction

Local authorities the world over are tasked with providing public services which will improve the quality of life of their citizens. Spending on these public services is often classified as capital expenditure. For instance, according to the MHCLG (2018), "Capital spending is mainly for buying, constructing or improving physical assets, such as buildings, land, vehicles and other miscellaneous property, including street lights and road signs"[p. 2]. In developing countries though, the local authorities struggle to provide these amenities owing to widespread non-payment of property taxes, which would ordinarily have gone to finance their provision (see for instance Bahl and Wallace, 2008; Bahl and Martinez-Vazquez, 2008; Kelly, 2004). An alternative explanation for the property tax delinquency however, lies in whether taxpayers, in the first place, believe their previous tax payments have been well utilized by the local authorities, in providing needed local infrastructure or public services.

This alternative scenario emerges from "tax morale", an aspect of the broad literature on non-pecuniary motives for tax payment. Specifically, it is based on the concept of "reciprocity" where "Individuals may view taxes as part of a social contract: tax payments

are made in exchange for services provided by the state." (Luttmer and Singhal, 2014, p. 157).[1] That said, the empirical evidence relating property tax compliance to some form of capital expenditure investment (public services mostly), is scant and largely experimental, being often centred around moral appeal-based treatment messages. Additionally, consideration is not specifically given to local capital expenditure in those studies.

The primary aim of this work is to therefore shed light on the external validity of these prior studies by analysing the effect of capital expenditure on property tax arrears outcomes. It also considers how different classifications of local capital expenditure are associated with property tax compliance. This comes at a time where, specifically for Ghana, a recent survey by Afrobarometer (2021) documents the following: 70% of Ghanaians find it "difficult" or "very difficult" to know how the government uses the taxes and fees it collects; Ghanaians are about 6 to 8 percentage points more likely to endorse the government's right to collect taxes if they believe that the government is doing a good job of providing and/or improving amenities such as healthcare, water and sanitation services, and electricity supply; 47% of Ghanaians support higher taxes if the government provides more services; and 72% of Ghanaians are willing to pay more taxes in order to finance the country's development from domestic resources, rather than using external loans.

This empirical work derives from administrative and financial data on about 53,000 dwelling units in the Accra Metropolitan Assembly (AMA), covering the 2011-2018 time period. The capital expenditure variable is derived by expressing capital expenditure as a percentage of total expenditure, and is thus a ratio. The ratio is lagged by up to 2 years to account for the potential endogenous relationship between capital expenditure and property tax arrears. This is also to account for the possibility of tax payments showing a lagged response to capital expenditure investments, which response time is expected to be a year. The main result points to a negative relationship between property tax arrears and capital expenditure. Specifically, a 1 percentage point increase in the capital expenditure ratio, lagged 1 year, is associated with a 1.2 percentage point decrease in the

[1] Early experiments by Alm et al. (1992c) find that, when tax revenues are used to fund a public good, tax compliance is substantially higher than theoretically predicted by fully rational behavior.

probability of incurring property tax arrears and a 1.9 percentage point decline in dwelling unit arrears levels. However, dwelling units are unlikely to remember capital expenditure projects made 2 years ago when making their property tax payment decisions, as results for the 2-year lag of the capital expenditure ratio are either not statistically significant or positively associated with arrears. The findings also reveal the possible existence of differences between owner- and owner-and-tenant-occupied dwellings in respect of overall capital spending, with the latter particularly more susceptible to property tax delinquency in spite of increased capital expenditure.

An increase in economic capital expenditure is interestingly associated with an increase in property tax arrears levels, which points to key economic infrastructure possibly being inadequate from the viewpoint of the taxpayers. All the remaining ratios are inversely related to arrears, with security-related capital expenditure appearing to be the most valued by the dwelling units. The level of tax delinquency more likely increases for owner-and-tenant-occupiers despite a corresponding in social capital expenditure. However, as regards increased environmental and security-related capital expenditure, both owner-and owner-and-tenant-occupied dwelling units appear to be more susceptible to incurring property tax arrears.

This works adds to the growing literature studying non-pecuniary motives for tax compliance, by considering actual or real-world effects of capital expenditure on arrears outcomes, rather than perceiving the effects through experimental approaches. To our knowledge, we are the first to directly consider how various groupings or segments of local capital expenditure may be related to property tax arrears.

The findings of this study have several policy implications for local governments, especially those in developing economies with similar issues to that of Ghana. First, policymakers should create more interactive platforms with residents which will go a long way towards helping the authorities know the actual needs of the people. This could incentivize greater property tax compliance. Next, is the need for local authorities to ensure that projects are provided in an adequate and balanced way, across all classes of capital expenditure. This is because little increases in required public services or major

increases in "white elephants" could adversely affect property tax compliance. Finally, the provision of capital infrastructure projects should be a continuous process with projects also completed as originally scheduled. This is because taxpayers are unlikely to be motivated to pay their property taxes based on projects delivered in the past, as they would probably have moved on from them and be expecting new ones. Thus, local authorities must take proactive steps towards ensuring socio-economic development of their local areas, particularly in jurisdictions with weak regulatory enforcement.

The remainder of the paper is structured as follows. Section 6.2 briefly highlights the related literature. Section 6.3 describes the data. Section 6.4 presents the empirical analysis and Section 6.5 concludes the study.

6.2 Related Literature

The tax compliance literature typically starts with Allingham and Sandmo (1972) – the first to apply Becker's (1968) economics-of-crime model to tax compliance. In their theoretical model, Allingham and Sandmo (1972) posit that a taxpayer makes a trade off between the monetary benefit of tax evasion and the penal costs payable upon detection. Their work therefore suggests that the decision to pay or not pay taxes is based only on how effective tax enforcement and punitive measures are. However, this conclusion has been called into question in the real world. For example, some empirical studies have shown that compliance levels are much higher than what is predicted by their model, even when the probability of detection is low and penalties are not severe (see for instance Alm et al., 1992c; Andreoni et al., 1998; Frey and Torgler, 2007; Alm and Torgler, 2011).

Thus, alternative explanations for tax compliance behaviour, often steeped in behavioural economics, have emerged. In a recent study, Alm (2019) undertakes a comprehensive review of the tax compliance literature, including on aspects related to behavioural economics. He notes that taxpayers are not only motivated by financial factors but also by "notions that arise from group considerations such as fairness, altruism, reciprocity, empathy, sympathy, trust, guilt, shame, morality, alienation, patriotism, social

norms, social customs, social capital, 'tax morale', intrinsic motivations and many other objectives"(ibid., p. 358). Luttmer and Singhal (2014), in another review of extant studies, use the term "tax morale" to denote all non-pecuniary motivations for tax compliance as well as other factors which fall outside the standard tax compliance model. They consider a number of tax morale mechanisms including "reciprocity", in which taxes are viewed "as part of a social contract: tax payments are made in exchange for services provided by the state"(ibid., p. 157). Another aspect of reciprocity, which they highlight, is that tax compliance could also be affected by the types of public services provided with tax revenues and whether those services are viewed favourably by taxpayers. The latter is more closely connected with what is considered in this study.

The empirical evidence relating tax compliance to the provision of public services is largely experimental. This includes laboratory experiments such as Alm et al. (1992a, 1992b) who show that compliance increases when taxpayers are able to sense some benefits arising from public goods that are funded by their tax payments. Alm et al. (1992c) also find that individuals are likely to pay their taxes in exchange for government services even with zero probability of detection and punishment. They further advocate that governments provide more of the goods which are preferred by their citizens, in an efficient manner, as this helps to increase tax compliance. This is corroborated by Alm and Jackson (1993) who report that individuals tend to be more compliant when public expenditure is on programmes they themselves select and that they know enjoy majority approval. All these experiments are however, based on income tax considerations.

Field experiments have also been employed in the analysis of tax compliance and public services delivery. Blumenthal et al. (2001) include a treatment message to ascertain whether people pay their taxes in order to support the provision of socially valuable services. This is based on how income tax revenue is distributed among services in Minnesota, including on education, healthcare, law enforcement, parks, highways, and the environment. However, their results are not statistically significant. However, Bott et al. (2019) find that including a moral appeal-based treatment message: "Your tax payment contributes to the funding of publicly financed services in education, health, and other

important sectors of society" (p. 6), significantly increases foreign income tax reporting in Norway. Hallsworth et al. (2017) investigate the effect of including social norm messages on overdue tax payments in the United Kingdom. They find that messages on the public goods and services (National Health Service (NHS), roads, and schools) that are financed by tax revenues reduce the late payment of taxes. Finally, Castro and Scartascini (2015) specifically investigate property tax compliance in a municipality in Argentina. They do this by adding a message on reciprocity, among others, where they give taxpayers information about specific public goods which had recently been provided by the local government from tax revenues. Although they find no average treatment effects, they find mixed results regarding the probability of tax compliance based on subjective underlying beliefs about the government's use of public revenues, after taxpayers have received the reciprocity message.

Notwithstanding the high levels of internal validity associated with experimental methods (Alm, 2019), their limitations have also been well documented. For instance, Alm (2010) cites the specific case of laboratory experiments whose results may be sensitive to a particular experimental design. Thus, it may be difficult to replicate happenings in the "naturally occurring world". Another challenge he highlights is that laboratory experiments cannot capture key factors in taxpayer reporting such as jail and social stigma. Finally, subjects in a laboratory setting may put up more "obedience to authority" and "pro-social" behaviours, which they are unlikely to exhibit in the real world (Levitt and List, 2007; Alm, 2010). Controlled field experiments have been faulted on grounds of rarely generating direct measures of tax evasion as well as typically being one-time events whose effects are not known to persist over time (Alm, 2019).

The alternative is the use of naturally occurring field data. However, as Alm (2019) notes in his review of some direct and indirect forms of naturally occurring field data on tax compliance, this is also fraught with challenges. He notes that direct forms such as survey data generate unreliable tax evasion statistics because respondents may not recall reporting decisions, be untruthful, and with the statistics not being representative of all

taxpayers. Additionally, in instances where indirect approaches[2] are used to measure evasion behaviour, the unpaid tax is always attributed to the shadow economy (ibid.).

Notwithstanding the above, administrative data, which is somewhere in-between the direct and indirect forms, is often representative of the relevant population and is linkable to direct tax information, even though it typically does not generate direct measures of tax evasion (Alm, 2019). That said, there is a dearth of literature on property tax compliance and local public services expenditure, using administrative data. That said, Alm et al. (2014) study property tax compliance in the city of Detroit, using parcel-level data and at a time of severe economic decline for the city. They find that households which receive lower quality public services, as measured by police response time (in minutes), are more likely to be non-compliant. It is worth noting however, that the institutional context of property taxation in Detroit is different from what pertains to Accra. For example, low-income households in Detroit receive some relief through state income tax credits whilst delinquent properties attract higher interest charges (ibid., p. 4), none of which applies to Accra. Additionally, their analysis does not involve a breakdown of local capital expenditure spend as is done in this paper.

6.3 Data

The data primarily comes from the Accra Metropolitan Assembly (AMA) for the period 2011 to 2018 and is based on merging two strands of information. In the first case, the data is administrative, covering dwelling unit-related observations such as their cumulative property tax arrears, property rate imposts, and occupancy status. The second data strand is derived the AMA's annual income and expenditure statements (2011-2018) which provides data on total and capital expenditure patterns and other related financial information.[3]

[Insert Table 6.1 about here]

[2]For example, Chernick and Merriman (2013) use tax stamp information on cigarette pack litter to help determine the extent to which smokers evade taxes on cigarettes in New York City.

[3]The additional financial information is graphically shown in the Appendix.

Table 6.1 presents summary statistics on the administrative data for the final sample of 422,288 dwelling unit-year observations, representing 52,786 unique dwelling units.[4] It also includes statistics on the expenditure variables. The yearly arrears variable is the difference in cumulative arrears between consecutive years.[5] The average dwelling unit has yearly arrears to the tune of about GHS 180 (USD 37),[6] which also indicates property tax delinquency by most of the dwelling units. The average annual property tax fee payable is about GHS 74 while the mean property valuation-based rateable value is around GHS 32,793.[7] The property rate impost is 0.11% on average, which is consistent with typical property tax rate levels. Nearly 60% of all dwelling units are purely owner-occupied. A little over 13% of the dwelling units are in rating zone class 1, nearly a third in rating zone class 2, and the remaining 55% in rating zone class 3. The rating zone classes differentiate suburbs within the AMA in terms of quality and reflects in the property tax rates which apply to each rating zone. Class 1 comprises the most prime suburbs while Class 3 suburbs are the most deprived. The AMA's mean total expenditure, based on an 8-year financial statement (2011-2018), is about GHS 63.8million. Out of this, only about GHS 18.4million is spent on capital expenditure (Capex), which is what is easily recognizable by the residents and can significantly improve their lives. This suggests that about 71% of the AMA's spending goes into recurrent expenditure, which at first glance suggests inadequate investment by the AMA into infrastructure or some inefficiency in properly managing financial resources. We also decompose capital expenditure into four main types - Economic, Social, Environmental, and Security - per the financial statements, and express this as a percentage of the total expenditure. This shows that on average, the greatest percentage of Capex goes to fund social projects (21%), with security-related projects attracting the least (1%). Other descriptive information, based on the income

[4]Entire dataset includes non-residential properties which are excluded. We also remove all residential properties with ambiguous occupancy status, rate imposts of zero, and rating zone classes that are undefined.

[5]The arrears records are typically accumulated by the AMA, as opposed to the recording of yearly-specific arrears. Thus, to find the arrears for 2014 alone, for example, we subtract the cumulative arrears as of 2014 from the cumulative arrears as of 2013.

[6]All GHS to USD conversions are based on a USD/GHS exchange rate of 4.9139 at the end of 2018 (`bloomberg.com`).

[7]The huge expenditure involved in carrying out property valuations means that they are infrequently carried out. Thus, all rateable values remain unchanged from 2011-2018.

and expenditure statements, is shown in the appendix to this chapter as is a more detailed breakdown of Capex into its constituent parts.

6.4 Empirical Analysis

This section presents the empirical models and results of the relationship between capital expenditure, taken as a whole and in its sub-components, and property tax arrears outcomes. It also reports some robustness test results.

6.4.1 Capital Expenditure and Arrears Probability

This section investigates the relationship between capital expenditure and the probability of being in arrears for dwelling units. It also seeks to ascertain how and the extent to which lagging capital expenditure can influence the decision to be property tax compliant or not. To this end, the model below is estimated:

$$\begin{aligned} Prob\ (Arrears_{it} = 1) = \beta_0 &+ \beta_1 Capex/Totex_{t-1} + \beta_2 Capex/Totex_{t-2} + \beta_3 Owner_i \\ &+ \beta_4 Owner - Tenant_i + \beta_5 Inflation_{t-1} + \beta_6 Unemployment_{t-1} \\ &+ \beta_7 Rating\ zone\ 1_i + \beta_8 Rating\ zone\ 2_i + \varepsilon_{it} \end{aligned} \tag{6.1}$$

where the indices i and t refer to dwelling unit and year respectively. The dependent variable, $Arrears_{it}$, takes the value of one if a dwelling unit is in arrears for a given year, and zero otherwise. The arrears for a given year are obtained by computing the difference in cumulative arrears between consecutive years. $Capex/Totex_{t-1}(Capex/Totex_{t-2})$, the main regressor of interest, is the ratio of capital expenditure to total expenditure (in percentage terms) for year t, lagged 1 year (2 years). $Owner_i(Owner - Tenant_i)$ takes on the value of one if a dwelling unit is owner-occupied (owner-and-tenant-occupied), and zero otherwise. $Inflation_{t-1}$ is the average annual inflation rate for Ghana, lagged 1 year. $Unemployment_{t-1}$ is the annual unemployment rate for Ghana, lagged 1 year. $Rating\ zone\ 1_i(Rating\ zone\ 2_i)$ takes the value of one if a dwelling unit is in rating zone

class 1 (rating zone class 2), and zero otherwise. ε_{it} denotes the random error term.[8]

Table 6.2 reports the average marginal effects (Column 1) as well as linear probability model estimates (Column 2). The dependent variable, "Arrears or not", is a dummy variable which takes the value of one if a dwelling unit incurs property tax arrears in a given year, and zero otherwise. The main covariate of interest, capital expenditure ratio, is lagged for up to 2 years.

[Insert Table 6.2 about here]

The results show a negative relationship between a 1-year lag of the capital expenditure ratio and the probability of a dwelling unit incurring arrears. Specifically, it shows that a 1 percentage point increase in the capital expenditure ratio is associated with a 1.2 percentage point drop in the probability of incurring property tax arrears. This significant inverse relationship is relevant as it shows that overall, dwelling units are more likely to recognize increased capital expenditure spending by the AMA and reciprocate by paying their property taxes. However, we find that when the lagged period increases to 2 years, it is associated with a near 3 percentage point increase in the likelihood of a dwelling unit being in arrears. This is suggestive of the arrears reducing effect of increased capital expenditure diminishing after 1 year. In other words, dwelling units are unlikely to remember and factor in capital expenditure projects made 2 years ago when making the decision to pay their property taxes and could actually end up defaulting.

Results for the other control variables are mostly significantly robust across the two columns and largely unsurprising. Dwelling units which are owner-occupied (owner-and-tenant-occupied) are about 4 (3) percentage points less likely to be property tax delinquent, compared with tenant-occupied units. As the homeowner, who pays the property tax, under both occupancy arrangements is a direct beneficiary of the capital expenditure investments, they can be expected to reciprocate in the form of reduced property tax delinquency levels. On the contrary, the homeowner is unlikely to be present in the tenant-occupancy arrangement and so may be less motivated to honour their tax payment

[8]Year fixed effects are omitted to avoid collinearity especially with the main capital expenditure covariate, which is also solely time-varying. For this same reason, a random effects model is estimated.

obligations, especially under weak regulatory enforcement regimes. The result is also in line with the literature showing that homeowners, particularly pure owner-occupiers, are more likely to invest in local social capital than tenants (see for instance DiPasquale and Glaeser, 1999; Hilber, 2010), which suggests a reduced risk of property tax arrears for the former. An increase in inflationary pressures is expected to reduce disposable income for dwelling units, which possibly explains the increased risk of delinquency result. This could also help explain the positive association between unemployment and the probability of being in arrears.[9] Rating zone classes 1 and 2 are less susceptible to arrears, relative to the least endowed rating zone class 3, although for rating zone class 1, the result is only statistically significant when the average marginal effects are considered.

6.4.2 Capital Expenditure and Arrears Levels

This section examines the relationship between capital expenditure and the property tax arrears levels of dwelling units. It also seeks to ascertain how and the extent to which lagging capital expenditure can influence property tax compliance outcomes. Specifically, the model below is estimated:

$$\begin{aligned} ArrearsLevel_{it} = \beta_0 &+ \beta_1 Capex/Totex_{t-1} + \beta_2 Capex/Totex_{t-2} + \beta_3 Owner_i \\ &+ \beta_4 Owner - Tenant_i + \beta_5 Inflation_{t-1} + \beta_6 Unemployment_{t-1} \\ &+ \beta_7 Rating\ zone\ 1_i + \beta_8 Rating\ zone\ 2_i + \varepsilon_{it} \end{aligned} \tag{6.2}$$

where the indices i and t refer to dwelling unit and year respectively. $ArrearsLevel_{it}$ denotes the arrears amount divided by the rateable value (in percentage terms). The arrears for a given year are obtained by computing the difference in cumulative arrears between consecutive years. $Capex/Totex_{t-1}(Capex/Totex_{t-2})$, the main regressor of interest, is the ratio of capital expenditure to total expenditure (in percentage terms) for year t, lagged 1 year (2 years). $Owner_i(Owner-Tenant_i)$ takes on the value of one if a dwelling unit is owner-occupied (owner-and-tenant-occupied), and zero otherwise. $Inflation_{t-1}$ is the average annual inflation rate for Ghana, lagged 1 year. $Unemployment_{t-1}$ is the

[9]The inflation and unemployment rates are obtained from the World Bank (`data.worldbank.org`).

annual unemployment rate for Ghana, lagged 1 year. *Rating zone* 1_i(*Rating zone* 2_i) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. ε_{it} denotes the random error term.[10]

Table 6.3 presents the estimated results. The dependent variable, shown above the column numbers, is derived by dividing each dwelling unit's monetary arrears figure by the corresponding rateable value and expressing the quotient in percentage terms. This normalisation helps to account for differences in property sizes (using rateable values as a proxy), which in turn affects the arrears levels. Columns (1) and (2) showcase results in which capital expenditure ratio is lagged 1 year. Additionally, the latter includes fixed effects for the suburbs in which the dwelling units are located whilst the former does not. This notwithstanding, the results in both columns show a negative relationship between the capital expenditure ratio and the outcome variable. Specifically, a 1 percentage point increase in the capital expenditure ratio is associated with a 1.4 percentage point decline in dwelling unit arrears. In the case of the control variables, owner- and owner-and-tenant-occupied dwelling units are again less likely to have increased property tax arrears levels. Inflation is also significantly positively related with arrears. The result for unemployment is not robust across the two specifications, although it has a significantly positive sign in column (2). Ordinarily, a positive coefficient is expected as an increase in the unemployment rate is likely to translate into reduced disposable incomes and therefore increased property tax arrears levels. However, the national unemployment rate is what is used in the analysis, as opposed to the rate specific to Accra,[11]. Thus, the mixed results, depending on whether suburb fixed effects are included or not, could be because the unemployment rate is not an exact reflection of the situation within the AMA, although it serves as a good proxy for the wider macroeconomic environment. The results for rating zone class 1 are also not robust across both columns whilst that of rating zone class 2 interestingly reveal a positive relationship with arrears, with reference to rating

[10]Year fixed effects are omitted to avoid collinearity especially with the main capital expenditure covariate, which is also solely time-varying. Individual fixed effects are also omitted due to possible degrees of freedom issues in the computation. However, suburb fixed effects are included to mitigate the effects from their non-inclusion.

[11]The unemployment rate specific to Accra is not available.

zone class 3. The results suggests that property tax arrears levels, for "third-rate" zones are actually lower than those for "second-rate" zones and in some cases even, "first-rate" zones. This calls into question the accuracy of the methodology used by the AMA to classify dwelling units into these property tax rate bands, on the basis of location quality, as it is possible that some dwelling units may have been "wrongly" classified.

Results in columns (3) and (4) have both the 1- and 2-year lags of the capital expenditure ratio included in one regression, with and without suburb fixed effects, respectively. We find that the initial negative relationship between a 1-year lag of the capital expenditure ratio and arrears still holds. Specifically, it shows that a 1 percentage point increase in the capital expenditure ratio is associated with a 1.9 percentage point decrease in the property tax arrears level, expressed as a percentage of the rateable value.

When the capital expenditure variable is lagged for 2 years however, there is no statistical significance in its association with arrears. That is to say, the arrears reducing impact of capital expenditure appears to die out when the 2-year lag is reached. Thus, there is a strong possibility of dwelling units not factoring into their current property tax payment decision, capital expenditure investments that were made 2 years prior. The results for the other variables are similar in magnitude and coefficient sign to those of columns (1) and (2). However, we find that the relationship between unemployment and property tax arrears is now not statistically significant.

[Insert Table 6.3 about here]

Overall, the results show evidence of a strong negative relationship between capital expenditure and property tax arrears, especially when there is a minimal lag between when the capital expenditure investment is made and when the property taxes are expected to be paid. Thus, the rest of the analysis employs a 1-year lag of the capital expenditure ratio.

6.4.2.1 Capital Expenditure-Owner-occupier Interaction and Arrears Levels

Table 6.4 displays results of estimating the capital expenditure ratio on arrears levels, when the interaction terms between the capital expenditure ratio and each of the oc-

cupancy status variables are included. We see that there is still a negative relationship between the capital expenditure ratio and arrears levels, as seen in Table 6.3. A 1 percentage point increase in the capital expenditure ratio is associated with a near 2 percentage point decline in dwelling unit arrears, expressed as a percentage of rateable value. Owner- and owner-and-tenant-occupancy remain strongly negatively correlated with property tax arrears.

However, the interaction term between the capital expenditure and owner-and-tenant-occupancy variables reveals a significantly direct relationship with the dependent variable. It shows that a 1 percentage point increase in the capital expenditure ratio for owner-and-tenant-occupiers, relative to tenant-occupiers, is significantly associated with a 0.8 percentage point increase in the level of arrears. This result suggests that the homeowner in the mixed occupancy arrangement is more susceptible to property tax delinquency, regardless of the increased capital spending, compared with the homeowner who is unlikely to directly benefit from the spending (i.e. tenant-occupancy arrangement). On the other hand, the interaction term involving owner-occupied dwelling units is not statistically significant. Thus, the results suggest that differences may exist between owner- and owner-and-tenant-occupied dwelling units as regards their responses to increased capital expenditure. It is plausible that these differences could be informed by an income shortfall for the latter, as pointed out in Chapter 4.

Overall, the interaction term results are surprising, especially given the initial strongly statistically significant negative coefficient signs for the individual occupancy cases. It is therefore possible that dwelling units are also sensitive to the types of capital expenditure investments made with their tax payments. For instance, if there is an inadequate increase in the provision of a particular capital expenditure category, which taxpayers deem important, then the taxpayers could express their disaffection by reneging on their property tax payment obligations. Alternatively, increased spending on "white elephant" projects could disincentivize residents from paying their property taxes. What these potentially lead to is a situation in which property tax arrears levels are increasing even though capital expenditure levels are also rising.

In summary, homeowners view the payment of the property taxes as a contract, and expect to receive public services in return.[12] That said, it is equally important to also consider what types of public services are provided as well as whether their provision is adequate. This forms the subject of the next section where we consider the breakdown of the capital expenditure ratio into its four constituent sub-categories.

[Insert Table 6.4 about here]

6.4.3 Capital Expenditure Breakdown

In order to analyse the individual effects of the four sub-components of capital expenditure on arrears outcomes, a slightly modified version of model (6.2) is employed, as shown below:

$$\begin{aligned} ArrearsLevel_{it} = \beta_0 + \beta_1 Owner_i + \beta_2 \text{Owner} - \text{Tenant}_i + \beta_3 Inflation_{t-1} \\ + \beta_4 Unemployment_{t-1} + \beta_5 Rating\ zone\ 1_i \\ + \beta_6 Rating\ zone\ 2_i + \gamma' Capex - brkdwn_{t-1} + \varepsilon_{it} \end{aligned} \tag{6.3}$$

where the indices i and t refer to dwelling unit and year respectively. $ArrearsLevel_{it}$ denotes the arrears amount normalized by the rateable value (in percentage terms). The arrears for a given year are obtained by computing the difference in cumulative arrears between consecutive years. The vector $Capex - brkdwn_{t-1}$ contains the component categories of capital expenditure: Economic, Social, Environmental, and Security, each expressed as a percentage of total expenditure for year t, lagged 1 year. All other parameters are as previously defined in (6.2).

Table 6.5 reports the results. It shows the breakdown of the capital expenditure ratio into its four main sub-categories: Economic, Social, Environmental, and Security. The variables representing these sub-categories are also lagged 1 year and respectively denoted as Econcapex/Totex_L1, Soccapex/Totex_L1, Envcapex/Totex_L1, and Secucapex/Totex_L1. The results also include a composite capital expenditure variable,

[12] See for example Alm et al., 1992b,c

Comp.capex/Totex_L1, which aggregates the other three sub-capital expenditure ratio categories, when reporting results of a particular sub-capital expenditure ratio. This ensures that none of the other variables is omitted when analysing the sub-category ratio of interest. The dependent variable is again the arrears normalized by rateable value, as shown above the column numbers.

Columns (1) and (2) present results on the effects of the economic capital expenditure ratio, which is significantly positively associated with property tax arrears. Specifically, a 1 percentage point increase in the economic capital expenditure ratio is associated with a 2.4 percentage point increase in property tax arrears. Columns (3) and (4) display results on the effects of the social capital expenditure ratio. It can be seen that a 1 percentage point increase in the social capital expenditure ratio is associated with a 1.4 percentage point fall in property tax arrears levels. Columns (5) and (6) showcase results on the effects of the environmental capital expenditure ratio. Although the coefficient has a negative sign, it is not statistically significant. Columns (7) and (8) present results on the effects of the security capital expenditure ratio. Results shows that a 1 percentage point increase in the environmental capital expenditure ratio is associated with a 4.8 percentage point decrease in property tax arrears levels. The composite capital expenditure term is also significantly negative across all the columns. However, the fact that the level of significance drops to the 10% level in columns (3) and (4), where social capital expenditure is removed, may be indicative of the relative importance of the social capital expenditure sub-category.

The model specification of interest is where all the capital expenditure ratio sub-categories are independently included in one regression. Columns (9) and (10) present these results. We find that although the economic capital expenditure ratio is now significant, it is positively related to property tax arrears. To be precise, a 1 percentage point increase in the economic capital expenditure ratio is associated with a 3.1 percentage point increase in arrears. Though surprising, this result, as alluded to earlier, probably suggests that the economic infrastructure, such as roads and markets, are either inadequate or do not meet the economic needs of the residents.

The social capital expenditure variable maintains its significantly negative relationship with arrears, showing a 1.2 percentage point drop in arrears for a 1 percentage point increase in the social capital expenditure ratio. This shows that social interventions such as the construction of schools and sports facilities, rehabilitation of homes for the aged, and youth development activities, among others, are relatively more valued by the residents.

A 1 percentage point increase in the environmental capital expenditure ratio is associated with 1.7 percentage point decrease in the level of arrears, and the result is also statistically significant. This hints at the appreciation residents have for environment-related infrastructure such as drains and maintenance of sanitary sites within the AMA. The relevance of this sub-category becomes apparent when one puts into perspective the perennial flooding in Accra, due in part to poor drainage systems.

Finally, security-related capital expenditure is also significantly inversely related with arrears levels, with the coefficients indicating a 4.5 percentage point drop in the level of arrears for a 1 percentage increase in security-related spending. This shows that dwelling units take their security very seriously and appreciate the provision of public goods such as street lights and fences. Accra, as is typical of many large cities and urban locations, is prone to increased risk of crime. This includes burglaries in residential areas and attacks at night, especially in poorly lit places.[13]

Thus, it is largely unsurprising that security-related expenditure is arguably the most valued capital expenditure sub-category, relative to the other categories, as seen from the magnitude of its coefficient. Its coefficient is also significantly different from those of the other capital expenditure sub-categories. Full results of the coefficient equality tests are reported in Appendix C.6.

[Insert Table 6.5 about here]

[13]Further details of this are contained in OSAC reports, an example of which can be accessed from `https://www.osac.gov/Country/Ghana/Content/Detail/Report/17cce973-2f6d-45de-bf74-15f4aec9e90a` [Accessed 23 April 2021].

6.4.3.1 Capital Expenditure Breakdown with Interaction Terms

Table 6.6 displays results of including interaction terms between the sub-capital expenditure ratios and occupancy status in the initial capital expenditure breakdown analysis. These interaction variables are denoted as follows in the table: Econcapex–Owner_L1, Econcapex–OwnerTenant_L1, Soccapex–Owner_L1, Soccapex–OwnerTenant_L1, Envcapex–Owner_L1, Envcapex–OwnerTenant_L1, Secucapex–Owner_L1, and Secucapex–OwnerTenant_L1. The outcome variable is still the arrears amount normalized by rateable value.

Columns (1) and (2) display results of the interaction term created between the economic capital expenditure ratio and occupancy variables, whilst columns (3) and (4) show the interaction involving the social capital expenditure ratio. Columns (5) and (6) display results of the interaction term comprising the environmental capital expenditure variable whilst columns (7) and (8) involve the security capital expenditure ratio.

Columns (9) and (10) present results of all the sub-category interaction terms independently included in one regression. In this latter two columns, we find that the individual capital expenditure sub-classification and the owner- and owner-and-tenant-occupied variables maintain their coefficient signs from the prior results. However, a look at the interaction terms reveals interesting results. The interaction term involving economic capital expenditure returns results which are not significant for both occupancy types. This indicates that an increase in economic capital expenditure is unlikely to be associated with reduced arrears levels for owner- and owner-and-tenant-occupiers, relative to tenant-occupied dwelling units. As regards the social capital expenditure-based interactions, only the interaction term involving owner-and-tenant-occupied units is statistically significant, showing a positive relationship with arrears. In the case of environmental and security-related capital expenditure, both sets of interaction terms exhibit a significantly positive relationship with arrears. It is noteworthy also that only in the environmental and security-related interactions do we find robustness in respect of statistical significance of the two occupancy interaction coefficients, that is those of columns (5), (6), (7), and (8) versus those of columns (9) and (10).

As none of the interaction terms is significantly negatively related with arrears, it raises questions as to whether homeowners within those localities feel the increased spending across the four sub-categories is adequate. In particular, both owner- and owner-and-tenant-occupiers appear to be sensitive to the provision of environmental and security-related infrastructure. Additionally, the arrears levels of owner-occupiers seem to be unaffected by increased social capital expenditure, compared with owner-and-tenant-occupiers, who are associated with an accumulation of more arrears for the same increased social capital spending. This latter outcome is useful in showing that owner-and-tenant-occupiers are relatively more sensitive to the adequacy or inadequacy of social investments made.

[Insert Table 6.6 about here]

6.4.4 Robustness Tests

The previous results have mostly employed the arrears figure, scaled by rateable value, as the dependent variable. As this is expressed in percentage terms, it means we do not actually consider arrears levels in monetary terms. The robustness tests therefore aim to ascertain whether the initial effects of the capital expenditure ratio, in terms of coefficient sign and persistence of effects, hold when we consider arrears in pure monetary terms. To do this, the arrears outcome variables are no longer normalized by rateable value, with the rateable value serving as a regressor - a proxy for property size.

Table 6.7 presents the results. The capital expenditure variable is lagged up to 2 years. There are four dependent variables, as shown above the column numbers. The first is denoted by Arrears (GHS) in columns (1) and (2) and is simply the arrears amount in the local currency, GHS. The second, Log_Arrears (GHS), is the logarithm of the arrears amount in GHS and is used for results reported under columns (3) and (4). For columns (5) and (6), the dependent variable is Arrears with const.(GHS), the arrears amount plus a constant term. This is done in order not to lose negative arrears balance (prepayments) observations, which is what happens in the case of Log_Arrears (GHS). For columns (7) and (8), the arrears variable, Log_Arrears with const.(GHS), is the logarithm of the

outcome variable for the preceding two columns.

The results show a strong negative relationship between the 1-year lag of the capital expenditure ratio and property tax arrears across all specifications of the latter. This shows that the arrears reducing effect of increased capital expenditure investments still holds in the case of "pure" property tax arrears levels. When the capital expenditure ratio is lagged 2 years however, its relationship with arrears is not statistically significant, except in columns (7) and (8). But even then, the relationship is positive which still hints at the possibility of the arrears-reducing effect of capital expenditure diminishing, once we go beyond after the 1-year lag.

[Insert Table 6.7 about here]

In another test of the previous results, the capital expenditure variable is varied. First, we use the yearly percentage changes in the monetary value of capital expenditure, lagged up to 2 years (Δ Capex_L1 and Δ Capex_L2). Second, the analysis also employs the yearly percentage changes in the ratio of annual capital expenditure to total expenditure, lagged up to 2 years (Δ Capex/Totex_L1 and Δ Capex/Totex_L2). Table 6.8 presents the results. Columns (1) and (2) of the table report results based on Δ Capex_L1 and Δ Capex_L2 whilst columns (3) and (4) report results based on Δ Capex/Totex_L1 and Δ Capex/Totex_L2. The dependent variable in all cases is the yearly property tax arrears amount divided by the rateable value and expressed in percentages.The results are again consistent with those obtained from previous estimations. The 1-year lags of capital expenditure, Δ Capex_L1 and Δ Capex/Totex_L1, are significantly inversely associated with arrears. On the contrary, the 2-year lagged capital expenditure variables, Δ Capex_L2 and Δ Capex/Totex_L2, do not have a significant relationship with the arrears levels.

Thus, it is fair to again conclude that the arrears reducing effect of increased capital expenditure is strongest at the 1-year lag point. Once capital expenditure is lagged 2 years though, those effects appear to die out or diminish. This means that dwelling units are unlikely to recall and consider capital expenditure projects made 2 years ago in their property tax payment decisions.

[Insert Table 6.8 about here]

6.5 Conclusion

The empirical evidence relating property tax compliance to some form of capital expenditure investment, public services mostly, is largely experimental, being often centred around moral appeal-based treatment messages. Additionally, consideration is not specifically given to local capital expenditure in the analysis. This study primarily sheds light on the external validity of these prior studies by analysing the effect of capital expenditure on property tax arrears outcomes, using data on nearly 53,000 dwelling units in Accra. Unlike previous studies, this study also considers how different classifications of local capital expenditure are associated with property tax compliance.

The results indicate that a 1 percentage point increase in the capital expenditure ratio, lagged 1 year, is associated with a 1.2 percentage point drop in probability of incurring property tax arrears and a 1.9 percentage point decline in dwelling unit arrears levels. However, dwelling units are unlikely to remember capital expenditure projects made 2 years ago when making their property tax payment decisions, as results for the 2-year lag of the capital expenditure ratio are either not statistically significant or positively correlated with arrears. The findings also reveal the possible existence of disparities between owner- and owner-and-tenant-occupied dwellings in respect of overall capital spending, with the latter particularly more susceptible to property tax delinquency in spite of increased capital expenditure.

An increase in economic capital expenditure is surprisingly associated with a rise in property tax arrears levels, which possibly points to the inadequacy of relevant economic infrastructure from the perspective of the taxpayers. All the remaining ratios are negatively related to arrears, with security-related capital expenditure appearing to be the most valued by the dwelling units. The level of tax delinquency more likely increases for owner-and-tenant-occupiers despite an increase in social capital expenditure. In the case of increased environmental and security-related capital expenditure though, both owner-

and owner-and-tenant-occupied dwelling units appear to be inclined towards accumulating property tax arrears.

Overall, these findings have several policy implications for local authorities in emerging economies, which have a similar structure to what is presented in this work. First, policymakers should engage more with their residents through means such as public fora and focus group discussions. This will help the authorities to know and provide the real needs of the people, which will motivate them to pay their taxes. Closely connected to the above, is the need for local authorities to ensure an adequate and balanced provision of public services which cut across all classes of capital expenditure. This is because little increases in required public services or major increases in "white elephants" could likely discourage the payment of property taxes. Finally, the provision of capital infrastructure projects should be an ongoing process with projects also timeously completed. This is because taxpayers appear to quickly move on from projects that were delivered in the past. Thus, they are unlikely to derive the motivation for greater property tax compliance from those past projects. Local authorities must therefore be proactive in driving the socio-economic development of their local areas, particularly in jurisdictions with weak regulatory enforcement.

Table 6.1: Summary Statistics

Variable	Mean	Median	Std. Dev.
Administrative data:			
Yearly arrears (GHS)	179.55	122.95	749.45
Fees payable (GHS)	73.72	58.00	183.55
Rateable value (GHS)	32,792.75	23,728.60	100,021.50
Property rate impost (%)	0.11	0.09	0.05
Owner-occupiers (%)	59.6		
Owner-and-tenant-occupiers (%)	17.6		
Tenant-occupiers (%)	22.8		
Rating zone class 1 (%)	13.4		
Rating zone class 2 (%)	32.2		
Rating zone class 3 (%)	54.5		
Income and Expenditure accounts data:			
Total Expenditure (Totex - GHS)	63,797,596.91		
Capital Expenditure (Capex - GHS):	18,351,273.15		
Economic Capex-Totex ratio (%)	2.9		
Social Capex-Totex ratio (%)	21.3		
Environmental Capex-Totex ratio (%)	4.1		
Security Capex-Totex ratio (%)	1.0		

The sample comprises observations between 2011 and 2018, and excludes non-residential properties as well as observations with indeterminate occupancy status, rate imposts of zero percent, and undefined rating zone classes. This table presents means, medians, and standard deviations (Std. Dev.) for variables in levels. Administrative data denotes variables which are based on administrative data from the Accra Metropolitan Assembly (AMA). Income and expenditure accounts data refers to variables derived from the AMA's annual income and expenditure statements. These estimates are for the AMA as a whole and also for the 2011 to 2018 period.

Table 6.2: Capital Expenditure and Arrears Probability

	Arrears or not	
	(1)	(2)
Capex/Totex_L1	-0.012***	-0.012***
	(0.0015)	(0.0014)
Capex/Totex_L2	0.025***	0.028***
	(0.0039)	(0.0037)
Owner	-0.044***	-0.042***
	(0.0049)	(0.0081)
Owner-Tenant	-0.032***	-0.026***
	(0.0070)	(0.0086)
Inflation	0.020***	0.022***
	(0.0022)	(0.0021)
Unemployment	0.047**	0.065***
	(0.0190)	(0.0176)
Rating zone 1	-0.114***	0.003
	(0.0116)	(0.0068)
Rating zone 2	-0.020***	-0.036***
	(0.0071)	(0.0089)
Suburb fixed effects	No	Yes
Observations	316,716	316,716
R-sq. (overall)		0.08

This table reports average marginal effects (Column 1) and linear probability model estimates (Column 2) on the relationship between capital expenditure and property tax arrears. The dependent variable, which is shown at the top of the columns, is a dummy variable which takes on the value of one if property tax arrears are incurred by a dwelling unit in any particular year, and zero otherwise. Capex/Totex_L1 (Capex/Totex_L2) is the ratio of annual capital expenditure to total expenditure (in percentage terms), lagged 1 year (2 years). Owner (Owner-Tenant) is a dummy variable which takes on the value of one if a dwelling unit is owner-occupied (owner-and-tenant-occupied), and zero otherwise. Inflation is the average annual inflation rate for Ghana, lagged 1 year. Unemployment is the average annual unemployment rate for Ghana, lagged 1 year. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. Robust standard errors are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 6.3: Capital Expenditure and Arrears Levels

	Arrears normalized by rateable value (%)			
	(1)	(2)	(3)	(4)
Capex/Totex_L1	-0.014***	-0.014***	-0.019***	-0.019***
	(0.0027)	(0.0027)	(0.0066)	(0.0066)
Capex/Totex_L2			0.013	0.013
			(0.0169)	(0.0169)
Owner	-0.032***	-0.037***	-0.033***	-0.038***
	(0.0059)	(0.0052)	(0.0068)	(0.0060)
Owner-Tenant	-0.133***	-0.116***	-0.142***	-0.123***
	(0.0293)	(0.0241)	(0.0332)	(0.0274)
Inflation	0.016***	0.016***	0.023**	0.023**
	(0.0045)	(0.0045)	(0.0097)	(0.0097)
Unemployment	-0.174***	0.061***	-0.115	-0.115
	(0.0303)	(0.0271)	(0.0804)	(0.0804)
Rating zone 1	-0.086***	0.061**	-0.092***	0.058*
	(0.0194)	(0.0271)	(0.0216)	(0.0319)
Rating zone 2	0.037***	0.103***	0.034***	0.104***
	(0.0102)	(0.0271)	(0.0115)	(0.0320)
_cons	1.529***	1.257***	0.827	0.539
	(0.1680)	(0.1438)	(0.9282)	(0.9135)
Suburb fixed effects	No	Yes	No	Yes
Observations	369,502	369,502	316,716	316,716
R-sq. (overall)	0.02	0.03	0.02	0.03

This table reports estimated coefficients on the relationship between capital expenditure and property tax arrears.The dependent variable, which is shown at the top of the columns, is given by the arrears incurred by a dwelling unit in any particular year divided by its rateable value, expressed i percentage. Capex/Totex_L1 (Capex/Totex_L2) is the ratio of annual capital expenditure to total expenditure (in percentage terms), lagged 1 year (2 years). Owner (Owner-Tenant) is a dummy variable which takes on the value of one if a dwelling unit is owner-occupied (owner-and-tenant-occupied), and zero otherwise. Inflation is the average annual inflation rate for Ghana, lagged 1 year. Unemployment is the average annual unemployment rate for Ghana, lagged 1 year. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. Robust standard errors are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 6.4: Capital Expenditure-Occupancy Interaction and Arrears Levels

	Arrears normalized by rateable value (%)	
	(1)	(2)
Capex/Totex_L1	-0.016***	-0.016***
	(0.0030)	(0.0030)
Owner	-0.065***	-0.070***
	(0.0223)	(0.0219)
Owner-Tenant	-0.371***	-0.354***
	(0.0985)	(0.0948)
Capex–Owner_L1	0.001	0.001
	(0.0007)	(0.0007)
Capex–OwnerTenant_L1	0.008**	0.008**
	(0.0033)	(0.0033)
Inflation	0.016***	0.016***
	(0.0045)	(0.0045)
Unemployment	-0.174***	-0.174***
	(0.0303)	(0.0303)
Rating zone 1	-0.086***	0.061**
	(0.0194)	(0.0271)
Rating zone 2	0.037***	0.103***
	(0.0102)	(0.0271)
_cons	1.591***	1.319***
	(0.1761)	(0.1470)
Suburb fixed effects	No	Yes
Observations	369,502	369,502
R-sq. (overall)	0.02	0.03

The table reports estimated coefficients on the relationship between capital expenditure and property tax arrears, with an interaction term between capital expenditure and occupancy status included. The dependent variable, which is shown at the top of the columns, is given by the arrears incurred by a dwelling unit in any particular year divided by its rateable value, expressed as a percentage. Capex/Totex_L1 is the ratio of annual capital expenditure to total expenditure (in percentage terms), lagged 1 year. Owner (Owner-Tenant) is a dummy variable which takes on the value of one if a dwelling unit is owner-occupied (owner-and-tenant-occupied), and zero otherwise. Capex–Owner_L1 is the interaction term between Capex/Totex_L1 and Owner. Capex–OwnerTenant_L1 is the interaction term between Capex/Totex_L1 and Owner-Tenant. Inflation is the average annual inflation rate for Ghana, lagged 1 year. Unemployment is the average annual unemployment rate for Ghana, lagged 1 year. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. Robust standard errors are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 6.5: Capital Expenditure Breakdown

	Arrears normalized by rateable value (%)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Econcapex/Totex_L1	0.024**	0.024**							0.031***	0.031***
	(0.0102)	(0.0102)							(0.0000)	(0.0000)
Soccapex/Totex_L1			-0.014***	-0.014***					-0.012***	-0.012***
			(0.0024)	(0.0024)					(0.0000)	(0.0000)
Envcapex/Totex_L1					-0.008	-0.008			-0.017***	-0.017***
					(0.0054)	(0.0054)			(0.0000)	(0.0000)
Secucapex/Totex_L1							-0.048**	-0.048**	-0.045***	-0.045***
							(0.0230)	(0.0230)	(0.0000)	(0.0000)
Comp.capex/Totex_L1	-0.012***	-0.012***	-0.008*	-0.008*	-0.015***	-0.015***	-0.016***	-0.016***		
	(0.0022)	(0.0022)	(0.0049)	(0.0049)	(0.0025)	(0.0025)	(0.0034)	(0.0034)		
Owner	-0.032***	-0.037***	-0.032***	-0.037***	-0.032***	-0.037***	-0.032***	-0.037***	-0.032***	-0.037***
	(0.0059)	(0.0052)	(0.0059)	(0.0052)	(0.0059)	(0.0052)	(0.0059)	(0.0052)	(0.0059)	(0.0052)
Owner-Tenant	-0.133***	-0.116***	-0.133***	-0.116***	-0.133***	-0.116***	-0.133***	-0.116***	-0.133***	-0.116***
	(0.0293)	(0.0241)	(0.0293)	(0.0241)	(0.0293)	(0.0241)	(0.0293)	(0.0241)	(0.0293)	(0.0241)
Inflation	0.016***	0.016***	0.019***	0.019***	0.019***	0.019***	0.015***	0.015***	0.012***	0.012***
	(0.0025)	(0.0025)	(0.0051)	(0.0051)	(0.0055)	(0.0055)	(0.0043)	(0.0043)	(0.0000)	(0.0000)
Unemployment	-0.212***	-0.212***	-0.197***	-0.197***	-0.187***	-0.187***	-0.141***	-0.141***	-0.177***	-0.177***
	(0.0216)	(0.0216)	(0.0268)	(0.0268)	(0.0272)	(0.0272)	(0.0417)	(0.0417)	(0.0000)	(0.0000)
Rating zone 1	-0.086***	0.061**	-0.086***	0.061**	-0.086***	0.061**	-0.086***	0.061**	-0.086***	0.061**
	(0.0194)	(0.0271)	(0.0194)	(0.0271)	(0.0194)	(0.0271)	(0.0194)	(0.0271)	(0.0194)	(0.0271)
Rating zone 2	0.037***	0.103***	0.037***	0.103***	0.037***	0.103***	0.037***	0.103***	0.037***	0.103***
	(0.0102)	(0.0271)	(0.0102)	(0.0271)	(0.0102)	(0.0271)	(0.0102)	(0.0271)	(0.0102)	(0.0271)
_cons	1.623***	1.351***	1.592***	1.320***	1.566***	1.294***	1.441***	1.168***	1.525***	1.253***
	(0.0711)	(0.0817)	(0.1313)	(0.1052)	(0.1460)	(0.1192)	(0.1716)	(0.1445)	(0.0079)	(0.0550)
Suburb Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	369,502	369,502	369,502	369,502	369,502	369,502	369,502	369,502	369,502	369,502
R-sq. (overall)	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03

The table reports estimated coefficients on the relationship between capital expenditure categories and property tax arrears. The dependent variable, which is shown at the top of the columns, is given by the arrears incurred by a dwelling unit in any particular year divided by its rateable value, expressed as a percentage. Econcapex/Totex_L1 is the annual economic capital expenditure expressed as a percentage of total expenditure and lagged 1 year. Soccapex/Totex_L1 is the annual social capital expenditure expressed as a percentage of total expenditure and lagged 1 year. Envcapex/Totex_L1 is the annual environmental capital expenditure expressed as a percentage of total expenditure and lagged 1 year. Secucapex/Totex_L1 is the annual security capital expenditure expressed as a percentage of total expenditure and lagged 1 year. Comp.capex/Totex_L1 is the composite capital expenditure term of all the other three sub-capital expenditure categories, when reporting results of a sub-capital expenditure category in question. Owner (Owner-Tenant) is a dummy variable which takes on the value of one if a dwelling unit is owner-occupied (owner-and-tenant-occupied), and zero otherwise. Inflation is the average annual inflation rate for Ghana, lagged 1 year. Unemployment is the average annual unemployment rate for Ghana, lagged 1 year. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. Robust standard errors are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 6.6: Capital Expenditure Breakdown with Interaction Terms

	Arrears normalized by rateable value (%)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Econcapex/Totex_L1	0.019*	0.019*							0.032***	0.032***
	(0.0105)	(0.0105)							(0.0028)	(0.0028)
Soccapex/Totex_L1			-0.014***	-0.014***					-0.014***	-0.014***
			(0.0031)	(0.0031)					(0.0006)	(0.0006)
Envcapex/Totex_L1					-0.012**	-0.012**			-0.021***	-0.021***
					(0.0053)	(0.0053)			(0.0014)	(0.0014)
Secucapex/Totex_L1							-0.060***	-0.060***	-0.057***	-0.057***
							(0.0230)	(0.0230)	(0.0020)	(0.0020)
Comp.capex/TotexL1	-0.012***	-0.012***	-0.008*	-0.008*	-0.015***	-0.015***	-0.016***	-0.016***		
	(0.0022)	(0.0022)	(0.0049)	(0.0049)	(0.0025)	(0.0025)	(0.0034)	(0.0034)		
Owner	-0.040***	-0.045***	-0.030	-0.035	-0.044***	-0.049***	-0.042***	-0.047***	-0.063***	-0.068***
	(0.0064)	(0.0058)	(0.0248)	(0.0242)	(0.0075)	(0.0068)	(0.0073)	(0.0067)	(0.0153)	(0.0153)
Owner- Tenant	-0.161***	-0.144***	-0.189	-0.171	-0.192***	-0.174***	-0.181***	-0.164***	-0.363***	-0.346***
	(0.0351)	(0.0302)	(0.1308)	(0.1274)	(0.0477)	(0.0433)	(0.0423)	(0.0376)	(0.0615)	(0.0587)
Econcapex–Owner_L1	0.004***	0.004***							-0.001	-0.001
	(0.0010)	(0.0010)							(0.0021)	(0.0021)
Econcapex–OwnerTenant_L1	0.013***	0.013***							-0.003	-0.003
	(0.0048)	(0.0048)							(0.0086)	(0.0086)
Soccapex–Owner_L1			-0.000	-0.000					0.001	0.001
			(0.0010)	(0.0010)					(0.0005)	(0.0005)
Soccapex–OwnerTenant_L1			0.003	0.003					0.006***	0.006***
			(0.0056)	(0.0056)					(0.0020)	(0.0020)
Envcapex–Owner_L1					0.003**	0.003**			0.002**	0.002**
					(0.0011)	(0.0011)			(0.0010)	(0.0010)
Envcapex–OwnerTenant_L1					0.013*	0.013*			0.013***	0.013***
					(0.0065)	(0.0065)			(0.0045)	(0.0045)
Secucapex–Owner_L1							0.009***	0.009***	0.008***	0.008***
							(0.0034)	(0.0034)	(0.0014)	(0.0014)
Secucapex–OwnerTenant_L1							0.042*	0.042*	0.043***	0.043***
							(0.0220)	(0.0220)	(0.0072)	(0.0072)
_cons	1.633***	1.360***	1.601***	1.328***	1.583***	1.311***	1.455***	1.183***	1.584***	1.312***
	(0.0716)	(0.0813)	(0.1439)	(0.1093)	(0.1466)	(0.1182)	(0.1726)	(0.1446)	(0.0187)	(0.0544)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Suburb Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	369,502	369,502	369,502	369,502	369,502	369,502	369,502	369,502	369,502	369,502
R-sq. (overall)	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03

The table reports estimated coefficients on the relationship between capital expenditure categories and property tax arrears, with interaction terms between the categories and occupancy status included. The dependent variable, which is shown at the top of the columns, is given by the arrears incurred by a dwelling unit in any particular year divided by its rateable value, expressed as a percentage. Econcapex/Totex_L1 is the annual economic capital expenditure expressed as a percentage of total expenditure and lagged 1 year. Soccapex/Totex_L1 is the annual social capital expenditure expressed as a percentage of total expenditure and lagged 1 year. Envcapex/Totex_L1 is the annual environmental capital expenditure expressed as a percentage of total expenditure and lagged 1 year. Secucapex/Totex_L1 is the annual security capital expenditure expressed as a percentage of total expenditure and lagged 1 year. Comp.capex/Totex_L1 is the composite capital expenditure term of all the other three sub-capital expenditure categories, when reporting results of a sub-capital expenditure category in question. Owner (Owner-Tenant) is a dummy variable which takes on the value of one if a dwelling unit is owner-occupied (owner-and-tenant-occupied), and zero otherwise. Econcapex–Owner_L1 (Econcapex–OwnerTenant_L1), Soccapex–Owner_L1 (Soccapex–OwnerTenant_L1), Envcapex–Owner_L1 (Envcapex–OwnerTenant_L1), and Secucapex–Owner_L1 (Secucapex–OwnerTenant_L1) are the interaction terms between each of the respective capital expenditure categories and Owner(Owner-Tenant). Controls include the average annual inflation and unemployment rates for for Ghana, each lagged 1 year and the rating zones. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. Robust standard errors are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 6.7: Capital Expenditure and Arrears Unscaled by Rateable Value

	Arrears (GHS)		Log_Arrears (GHS)		Arrears with const.(GHS)		Log_Arrears with const.(GHS)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capex/Totex_L1	-4.049***	-4.049***	-0.020**	-0.021**	-4.049***	-4.049***	-0.00004***	-0.00004***
	(1.2320)	(1.2323)	(0.0095)	(0.0096)	(1.2320)	(1.2323)	(0.0000)	(0.0000)
Capex/Totex_L2	2.677	2.677	-0.004	-0.002	2.677	2.677	0.00002***	0.00002***
	(3.1780)	(3.1787)	(0.0255)	(0.0257)	(3.1780)	(3.1787)	(0.0000)	(0.0000)
Owner	-6.216***	-5.087***	-0.030***	-0.018***	-6.216***	-5.087***	-0.0001***	-0.0001**
	(1.8389)	(1.2518)	(0.0044)	(0.0040)	(1.8389)	(1.2518)	(0.0001)	(0.0001)
Owner-Tenant	-7.562***	-6.016**	-0.062***	-0.036***	-7.562***	-6.016**	-0.0001	-0.00004
	(3.7409)	(2.3402)	(0.0039)	(0.0047)	(3.7409)	(2.3402)	(0.0001)	(0.0000)
Property size	7.353	9.648	0.094***	0.056***	7.352	9.648	-0.00004	-0.0001
	(9.4952)	(9.9578)	(0.0098)	(0.0101)	(9.4952)	(9.9578)	(0.0002)	(0.0002)
Inflation	3.893**	3.893**	0.060***	0.061***	3.893**	3.893**	0.00003***	0.00003***
	(1.8255)	(1.8260)	(0.0143)	(0.0144)	(1.8255)	(1.8260)	(0.0000)	(0.0000)
Unemployment	-17.473	-17.473	-0.333***	-0.327***	-17.473	-17.473	-0.0003***	-0.0003***
	(15.0921)	(15.0956)	(0.1160)	(0.1169)	(15.0921)	(15.0955)	(0.0000)	(0.0000)
Rating zone 1	22.862	8.503	0.672***	0.313***	22.862	8.504	0.0003	-0.0001
	(24.8380)	(36.8126)	(0.0359)	(0.0308)	(24.8380)	(36.8126)	(0.0003)	(0.0006)
Rating zone 2	14.019***	17.701***	0.384***	0.412***	14.019***	17.701***	0.00004	-0.00003
	(2.9605)	(5.9724)	(0.0303)	(0.0303)	(2.9605)	(5.9724)	(0.0001)	(0.0003)
_cons	48.824	6.589	4.860***	5.065***	89425.04***	89382.8***	11.403***	11.404***
	(176.1421)	(183.4283)	(1.3447)	(1.3583)	(176.142)	(183.4282)	(0.0015)	(0.0017)
Suburb Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	316,716	316,716	245,816	245,816	316,716	316,716	316,716	316,716
R-sq. (overall)	0.02	0.02	0.43	0.48	0.02	0.02	0.0003	0.0004

The table reports estimated coefficients on alternative specifications regarding the relationship between capital expenditure and property tax arrears. The dependent variables are shown at the top of the columns. For columns (1) and (2), the dependent variable is the arrears incurred by a dwelling unit in any particular year. For columns (3) and (4), the dependent variable is log of that for the preceding two columns. For columns (5) and (6), the dependent variable is the arrears incurred by a dwelling unit in any particular year plus a constant term in order not to lose negative arrears balances (prepayments) observations. For columns (7) and (8), the dependent variable is log of that for the preceding two columns. Capex/Totex_L1 (Capex/Totex_L2) is the ratio of annual capital expenditure to total expenditure (in percentage terms), lagged 1 year (2 years). Owner (Owner-Tenant) is a dummy variable which takes on the value of one if a dwelling unit is owner-occupied (owner-and-tenant-occupied), and zero otherwise. Property size is the log of the rateable value. Inflation is the average annual inflation rate for Ghana, lagged 1 year. Unemployment is the average annual unemployment rate for Ghana, lagged 1 year. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. Robust standard errors are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 6.8: Capital Expenditure (alternative variables) and Arrears Levels

	Arrears normalized by rateable value (%)			
	(1)	(2)	(3)	(4)
Δ Capex_L1	-0.001**	-0.001**		
	(0.0004)	(0.0004)		
Δ Capex_L2	-0.000	-0.000		
	(0.0006)	(0.0006)		
Δ Capex/Totex_L1			-0.008*	-0.008*
			(0.0044)	(0.0044)
Δ Capex/Totex_L2			0.001	0.001
			(0.0021)	(0.0021)
Owner	-0.033***	-0.038***	-0.033***	-0.038***
	(0.0068)	(0.0060)	(0.0068)	(0.0060)
Owner-Tenant	-0.142***	-0.123***	-0.142***	-0.123***
	(0.0332)	(0.0274)	(0.0332)	(0.0274)
Inflation	0.019	0.019	0.035**	0.035**
	(0.0117)	(0.0117)	(0.0155)	(0.0155)
Unemployment	-0.204***	-0.204***	-0.044	-0.044
	(0.0496)	(0.0496)	(0.1241)	(0.1241)
Rating zone 1	-0.092***	0.058*	-0.092***	0.058*
	(0.0216)	(0.0319)	(0.0216)	(0.0319)
Rating zone 2	0.034***	0.104***	0.034***	0.104***
	(0.0115)	(0.0320)	(0.0115)	(0.0320)
_cons	1.321***	1.034***	0.054	-0.234
	(0.3346)	(0.2805)	(0.9405)	(0.9306)
Suburb fixed effects	No	Yes	No	Yes
Observations	316,716	316,716	316,716	316,716
R-sq. (overall)	0.02	0.03	0.02	0.03

This table reports estimated coefficients on the relationship between capital expenditure and property tax arrears.The dependent variable, which is shown at the top of the columns, is given by the arrears incurred by a dwelling unit in any particular year divided by its rateable value, expressed i percentage. Δ Capex_L1(Δ Capex_L2) is the yearly percentage changes in the monetary value of capital expenditure, lagged 1 year (2 years). Δ Capex/Totex_L1(Δ Capex/Totex_L2) is the yearly percentage changes in the ratio of annual capital expenditure to total expenditure, lagged 1 year (2 years). Owner (Owner-Tenant) is a dummy variable which takes on the value of one if a dwelling unit is owner-occupied (owner-and-tenant-occupied), and zero otherwise. Inflation is the average annual inflation rate for Ghana, lagged 1 year. Unemployment is the average annual unemployment rate for Ghana, lagged 1 year. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. Robust standard errors are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Chapter 7

Conclusion

Property taxes contribute greatly to the local economy of many a developing country. Nevertheless, these developing countries are also typically faced with a myriad of administrative and regulatory challenges which result in widespread non-compliance and sub-optimal exploitation of the revenue potential, thereby threatening the sustainable delivery of public services. In order to improve compliance levels however, the local authorities need to also understand the motives which drive property tax-payment behaviour. Evidence around this is still emerging though. This thesis investigates the above in three separate empirical essays, all of which are based on data from the Accra Metropolitan Assembly (AMA), the foremost local authority in Ghana with oversight responsibility for the capital city, Accra.

The first empirical chapter investigates how the risk of incurring property tax arrears is influenced by the dwelling unit type. It further analyses the risk of non-compliance based on how the different dwelling unit types respond to property rate increases and proximity to public amenities. The results indicate that owner-and-tenant-occupied dwelling units are more likely to be in arrears than owner-occupied units, with the result holding true in the event of property rate increases also. This could be as as a result of income constraints which informs their initial decision to give up the full enjoyment of their homes in exchange for that much-needed rental income. Tenant-occupied units are more likely to be in long-term arrears, relative to owner-occupiers. The findings also support reciprocity

as a non-pecuniary motive for tax payment, as being distant (low access) from amenities serves to increase property tax arrears, with the risk of non-compliance being more pronounced among owner-and-tenant-occupied dwelling units. There are a number of policy implications arising from these results, especially for local authorities with similar developing country issues as Ghana's. First, revenue-enhancing policy interventions must recognize that owner-and-tenant-occupied dwelling units are more sensitive to property tax increases, and must thus be guided accordingly when effecting property rate changes. Second, dwelling units in suburbs with lower access to public amenities are at more risk of property tax arrears. Third, tenant-occupied dwelling units are more likely to be in long-term arrears, and for this dwelling unit type, property tax efficiency and compliance could only be improved with stricter tax enforcement policies. Fourth, local authorities must ensure the equitable distribution of public amenities to incentivize greater property tax compliance decisions.

The second study analyses the role of peers in influencing the property tax arrears period and probability of being in arrears of individual dwelling units. The main results point to a direct relationship between an individual dwelling unit and peers, with the structural estimates showing that a 1-year increase in the arrears period for peer dwelling units is associated with an 11.8 month rise in an individual dwelling unit's arrears period and a 16 percentage point increase in its probability of being in arrears. The fact that there are "endogenous effects", based on the structural estimates, is useful for policymakers. Particularly, policy interventions aimed at improving property tax compliance for the least compliant taxpayers will not only improve their compliance levels but also for all other residents in the suburb, whose further improved compliance could engender even more improved compliance by the original recipients of that policy intervention.

The final essay examines the effect of actual local government spending decisions on property tax compliance. It specifically analyses whether an increase in capital expenditure translates into reduced property tax arrears, how property tax arrears are affected by the interaction between capital expenditure and occupancy status, and how the different sub-categories of local capital expenditure are related with property tax arrears. The re-

sults reveal that an increase in the capital expenditure ratio, lagged 1 year, is associated with a fall, both in the probability of incurring arrears and in the arrears levels. However, dwelling units are unlikely to factor in capital expenditure projects made 2 years ago when making their current property tax payment decisions, as results for the 2-year lag of the capital expenditure ratio are either not statistically significant or positively associated with arrears. Also, the results show that owner-and-tenant-occupied dwelling units could be susceptible to property tax delinquency, even with an increase in overall capital spending. An increase in economic capital expenditure is surprisingly linked with an increase in property tax arrears levels, which could be indicative of inadequate relevant economic interventions for the taxpayers. The remaining capital expenditure ratios are negatively related to arrears, with security-related capital expenditure appearing to be the most valued by the dwelling units. The level of tax delinquency is likely to be more pronounced for owner-and-tenant-occupiers despite an increase in social capital expenditure. As regards the effect of increased environmental and security-related capital expenditure however, both owner-and owner-and-tenant-occupied dwelling units appear to move towards more property tax delinquency. This probably prompts a rethink of the "better citizens" tag for owner-occupiers (see DiPasquale and Glaeser, 1999), especially in jurisdictions where weak regulatory enforcement and poor property tax administration systems incentivize property tax delinquency. From a policy perspective, these findings suggest that policymakers should engage more with the households under their watch through public fora, focus group discussions, among others. This will facilitate the provision of the most essential public services and possibly help reduce the levels of property tax non-compliance. Additionally, capital infrastructure projects should be ongoing, relevant, adequate and timeous in delivery. This would encourage taxpayers to fulfil their property tax payment obligations.

Overall, this research adds to the growing tax morale literature, mainly on the non-pecuniary motives for property tax compliance, and from a developing country perspective where property tax administration challenges are widespread. That said, the study is not without the usual limitations and suggestions for future research, as is typical

of many research projects. First, and of particular note, is the fact that results of the first two empirical chapters (Chapters 4 and 5) are based on cross-sectional analysis. Although they exploit various phenomena in the data, with reference to dwelling units and other property-level characteristics, there is the need for a better understanding of the causal mechanisms and implications. Thus, an important caveat for policymakers is that future research may require panel estimations and other causality-based identification approaches such as randomized control trials and field experiments as well, to better quantify the causal implications of the findings on their revenue-based outcomes. Second, results of the third empirical chapter (Chapter 6) could be made more granular by considering the individual components of each of the sub-categories of capital expenditure, which this study data did not have the full complement of. Doing this will help improve the estimation strategies and uncover specific capital expenditure items that are most valued by the dwelling units and help make a more detailed policy contribution. Third, the absence of detailed household-level and demographic variables such as household income, size, and composition placed constraints on the breadth of analysis that could be carried out in this study.

In light of the above, there is scope to extend this research in other relevant directions in future. For instance, it will make for interesting research to combine administrative data with data from geospatial technologies and related systems such as the GIS, which can provide minute details on individual properties and locations in ways that are not possible with administrative data alone. This will help to enrich the analysis and provide further robustness checks for the results. Also, future studies may want to explore how differences in demand for residential areas and the attendant impact on rental incomes help explain variations in property tax arrears across housing tenure types. Another potential issue to explore, particularly in jurisdictions with weak regulatory enforcement and accountability systems, is whether politicians allocate resources for reasons of political expediency and how that interferes with the equitable distribution of local public amenities. Thus, it could aid our understanding of how property tax arrears are influenced by the interaction between the political economy and access levels of dwelling units to

local public amenities. Towards mitigating endogeneity concerns around the relationship between capital expenditure and property tax arrears, an instrumental variable approach could also be employed where capital expenditure is instrumented for using external donor funding, for example. Further research may also want to look into the possibility of property tax compliance varying by home set-up (social, multi-generational, extended family, among others), especially as compliance levels could vary directly with their activity levels in the property market. Finally, one may also want to extend this study into the wider behavioural science discipline by considering for instance, the role that heuristics play in property tax payment decisions, especially in locations where non-compliance is rife.

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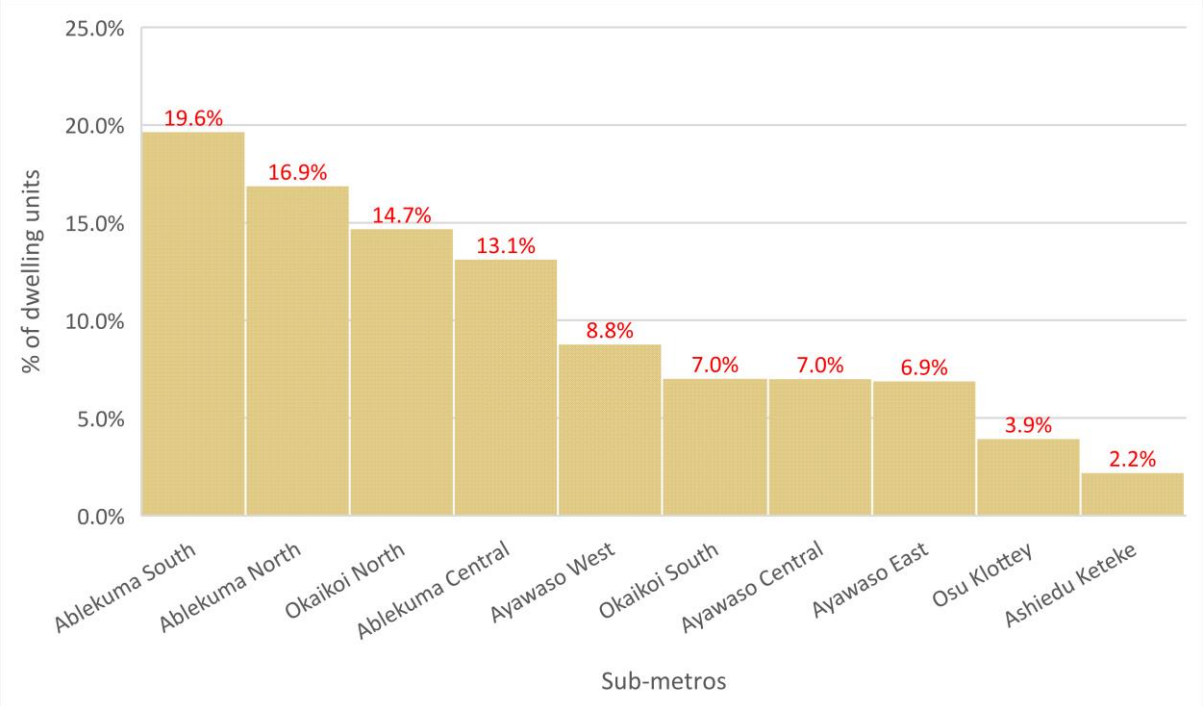
Appendix A

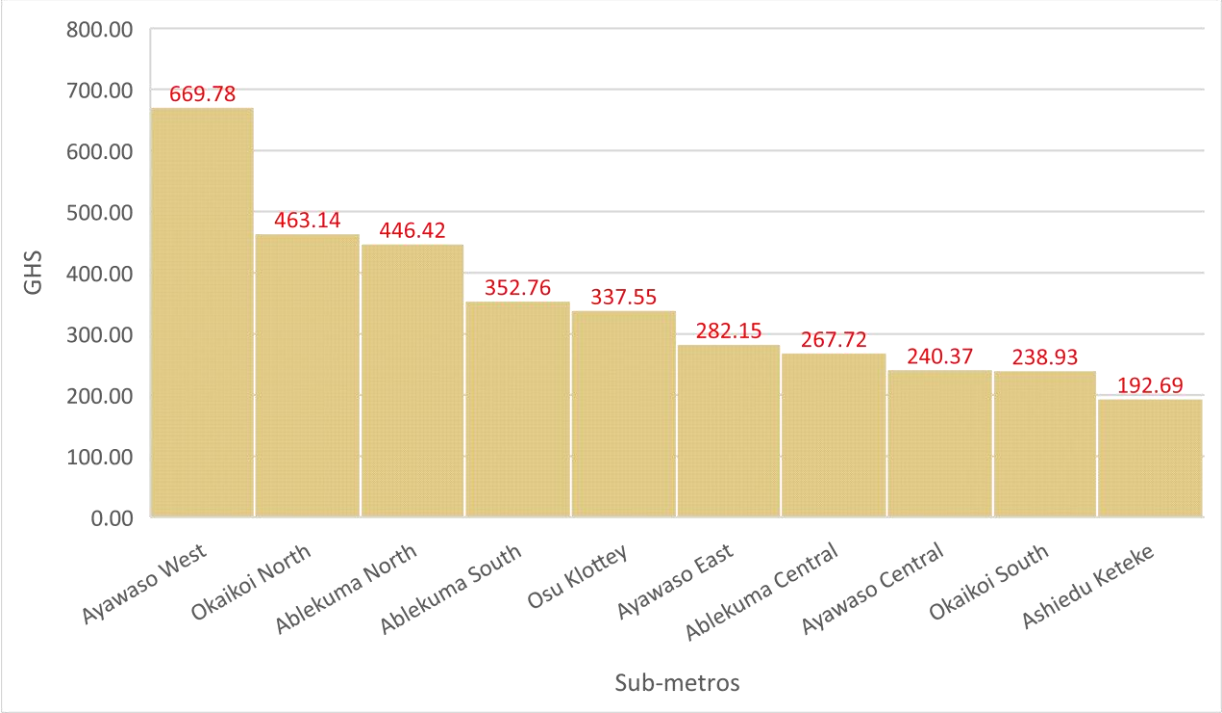
Appendix to Chapter 4

A.1 Distribution of Dwelling Units by Sub-Metropolitan District Councils



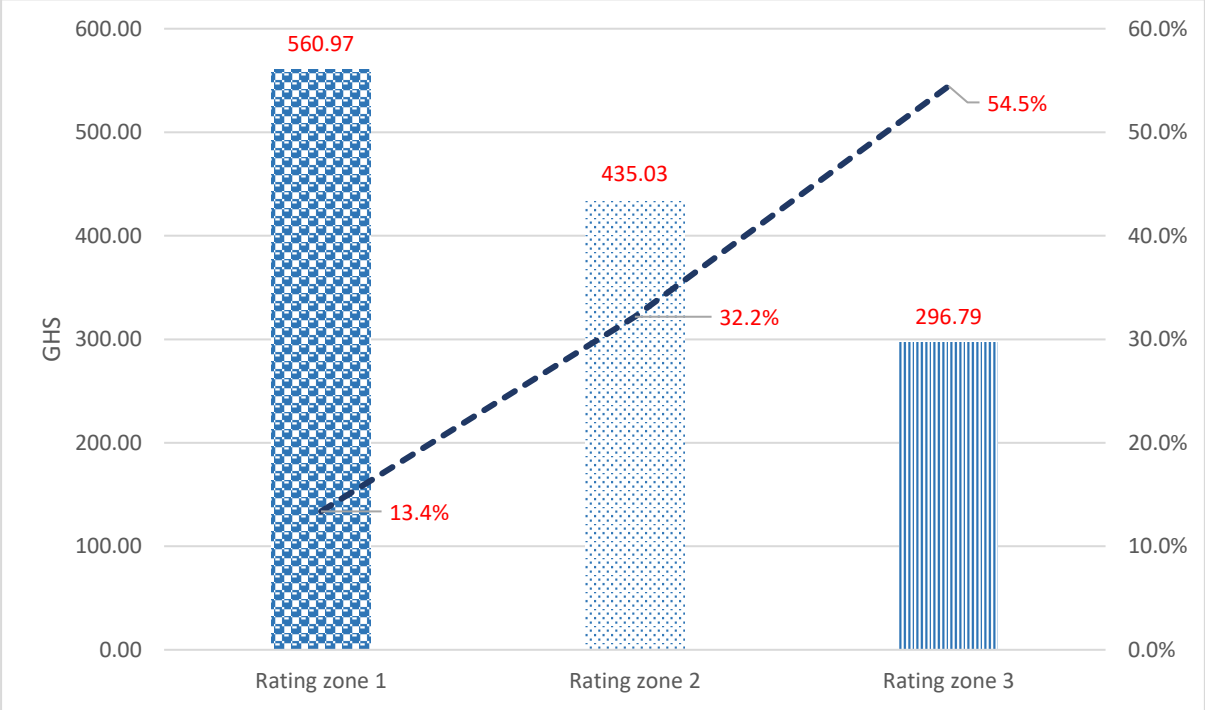
The figure shows how the dwelling units in the final data sample, as of 2018, are split (in percentage terms) across the sub-metropolitan district councils (sub-metros) of the Accra Metropolitan Assembly (AMA). These sub-metros exist to further deepen decentralisation within the AMA. However, new Metropolitan, Municipal, and District Assemblies (MMDAs) have recently been carved out of the AMA, in line with legislative provisions. Thus, the AMA currently has 3 sub-metros.

A.2 Distribution of Average Cumulative Property Tax Arrears by AMA Sub-Metro



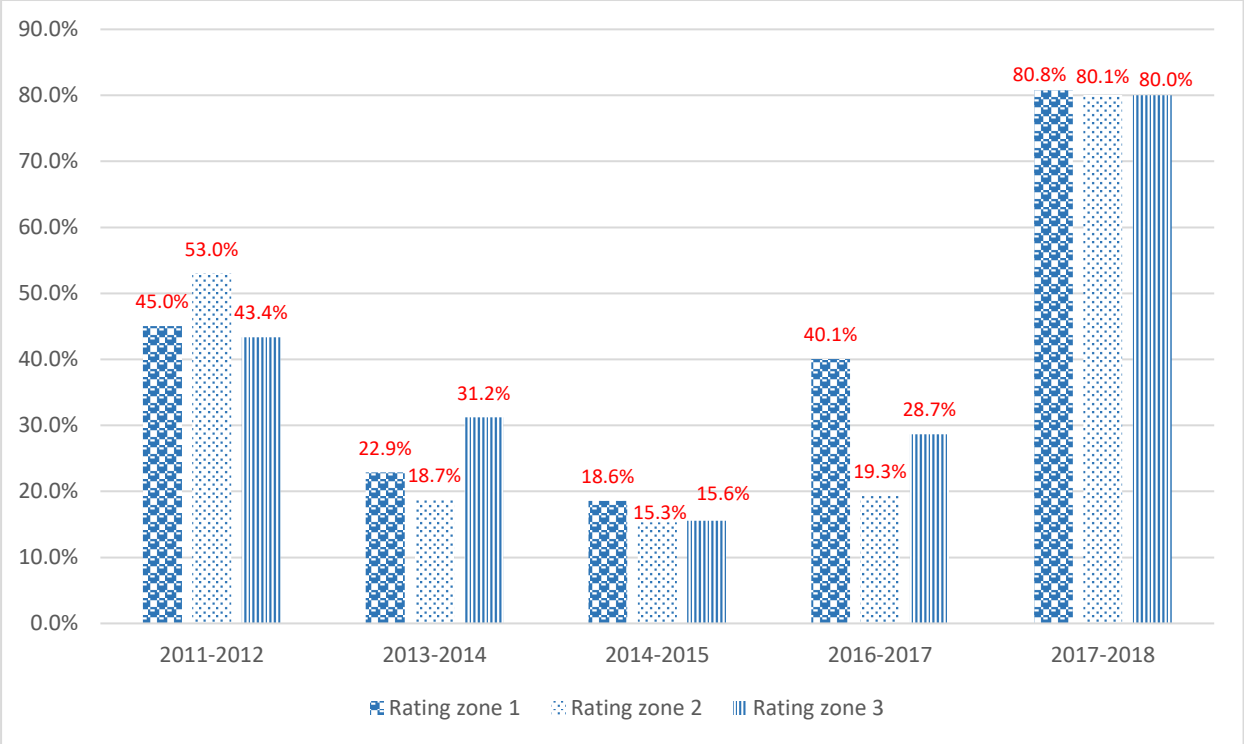
The figure shows the average cumulative property tax arrears (GHS) as of 2018 for each sub-metropolitan district councils (sub-metro) of the Accra Metropolitan Assembly (AMA). These sub-metros exist to further deepen decentralisation within the AMA. However, new Metropolitan, Municipal, and District Assemblies (MMDAs) have recently been carved out of the AMA, in line with legislative provisions. Thus, the AMA currently has 3 sub-metros.

A.3 Average Percentage Property Rate Changes and Average Cumulative Property Tax Arrears



The figure shows, in the broken line, the percentage distribution of dwelling units in the final data sample into the rating zone classes of the Accra Metropolitan Assembly (AMA). This is based on their average property rate changes from 2011-2018. Additionally, this figure also illustrates (in bars) the average cumulative property tax arrears (GHS) as of 2018 for each of the rating zone classes. The AMA's residential rating zone classes are: 1A, 1B, 2A, 2B, 3A, 3B, and 3C, with 1A representing the most prime areas within the AMA and 3C the least endowed. However, the A, B, and C sub-categories are jointly considered for simplification purposes. This results in three main rating zone classes.

A.4 Distribution of Average Property Rate Percentage Increases by Rating Zone Class

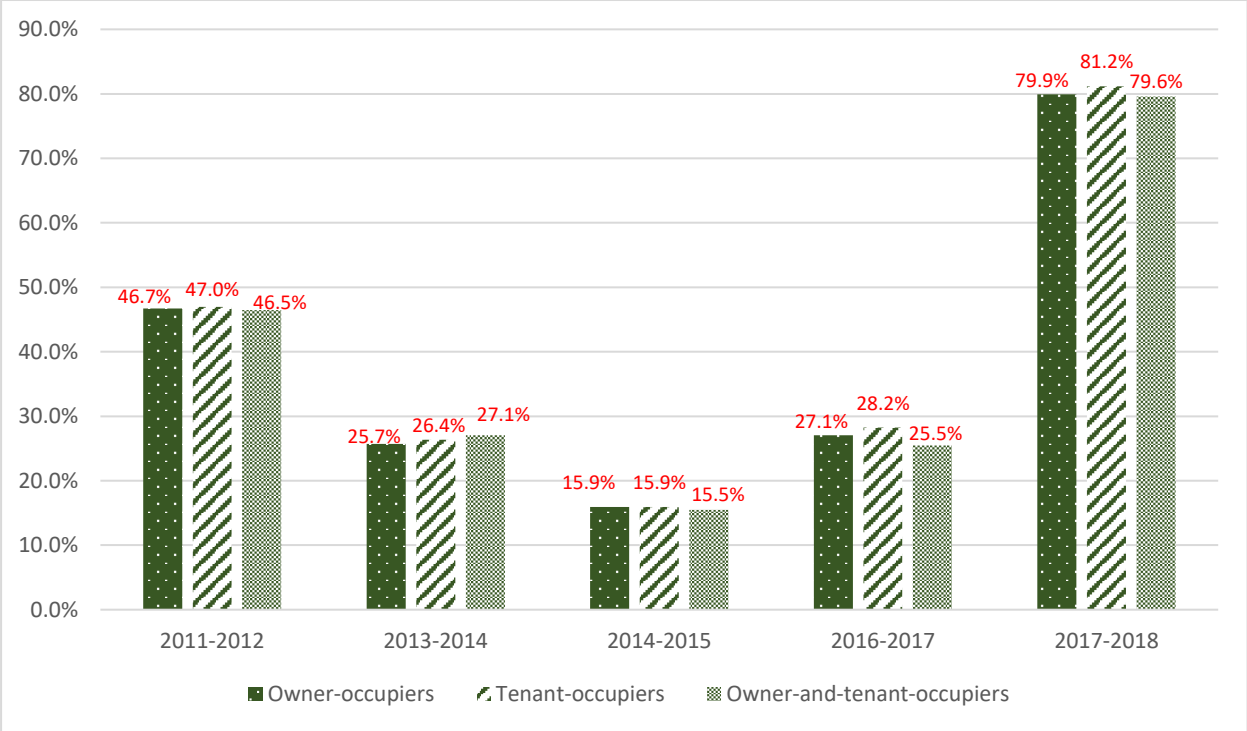


The figure shows the average property rate percentage increase for each of the rating zone classes of the Accra Metropolitan Assembly (AMA). The percentage increases are based on the five main instances of property rate increases in the data: 2011-2012, 2013-2014, 2014-2015, 2016-2017, and 2017-2018. The AMA's residential rating zone classes are: 1A, 1B, 2A, 2B, 3A, 3B, and 3C, with 1A representing the most prime areas within the AMA and 3C the least endowed. However, the A, B, and C sub-categories are jointly considered for simplification purposes. This results in three main rating zone classes.

A.5 Distribution of Average Rateable Values by Rating Zone Class

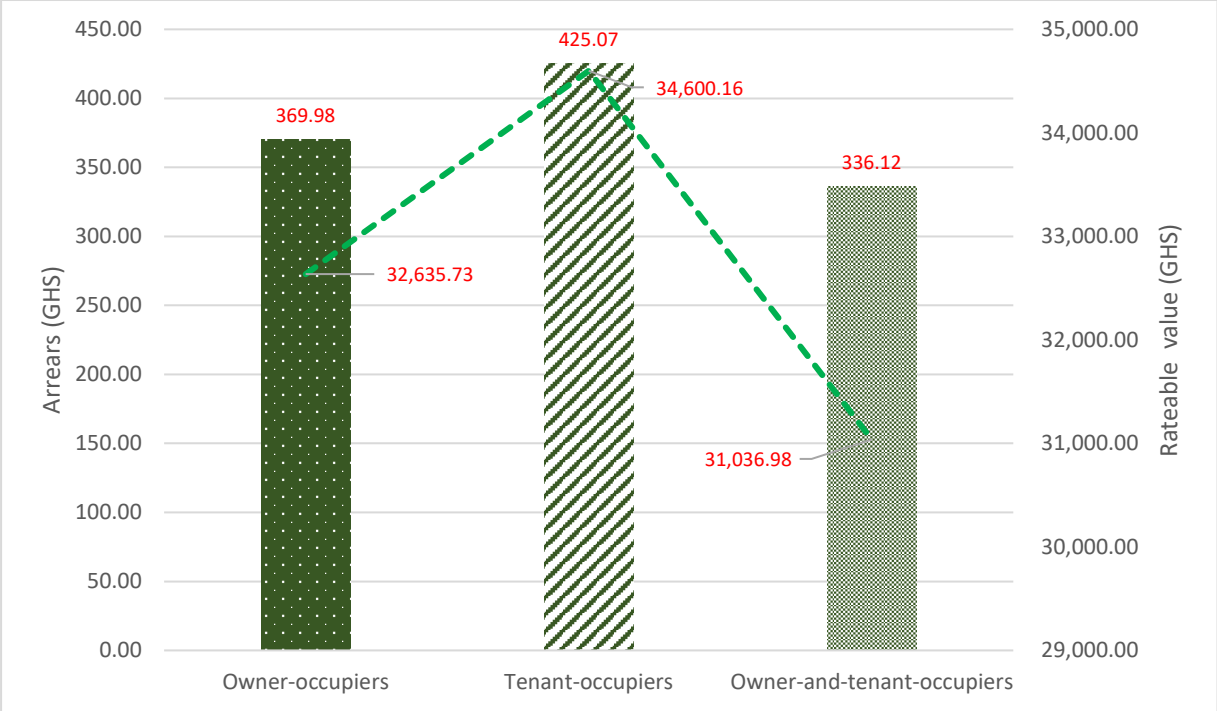
The figure shows the average rateable value (GHS) for each of the rating zone classes of the Accra Metropolitan Assembly (AMA). Rateable values are valuation-based property values as opposed to market-value estimates. The AMA's residential rating zone classes are: 1A, 1B, 2A, 2B, 3A, 3B, and 3C, with 1A representing the most prime areas within the AMA and 3C the least endowed. However, the A, B, and C sub-categories are jointly considered for simplification purposes. This results in three main rating zone classes.

A.6 Distribution of Average Property Rate Percentage Increases by Occupancy Status



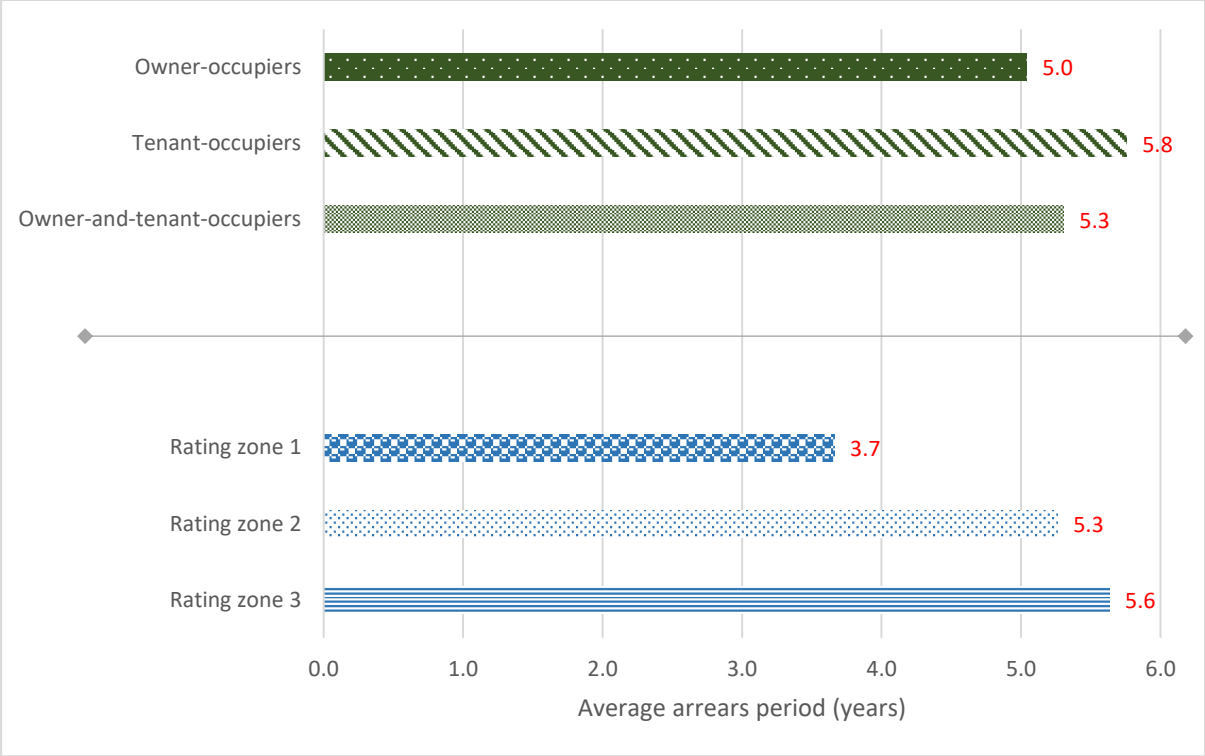
The figure shows the average property rate percentage increase by dwelling unit type in the Accra Metropolitan Assembly (AMA). The percentage increases are based on the five main instances of property rate increases in the data: 2011-2012, 2013-2014, 2014-2015, 2016-2017, and 2017-2018. Owner-occupiers denote dwelling units which are solely occupied by the homeowners. Tenant-occupiers denote dwelling units which are solely occupied by tenants. Owner-and-tenant-occupiers denote dwelling units which are jointly occupied by the homeowners and tenants.

A.7 Average Cumulative Property Tax Arrears and Rateable Values by Occupancy Status



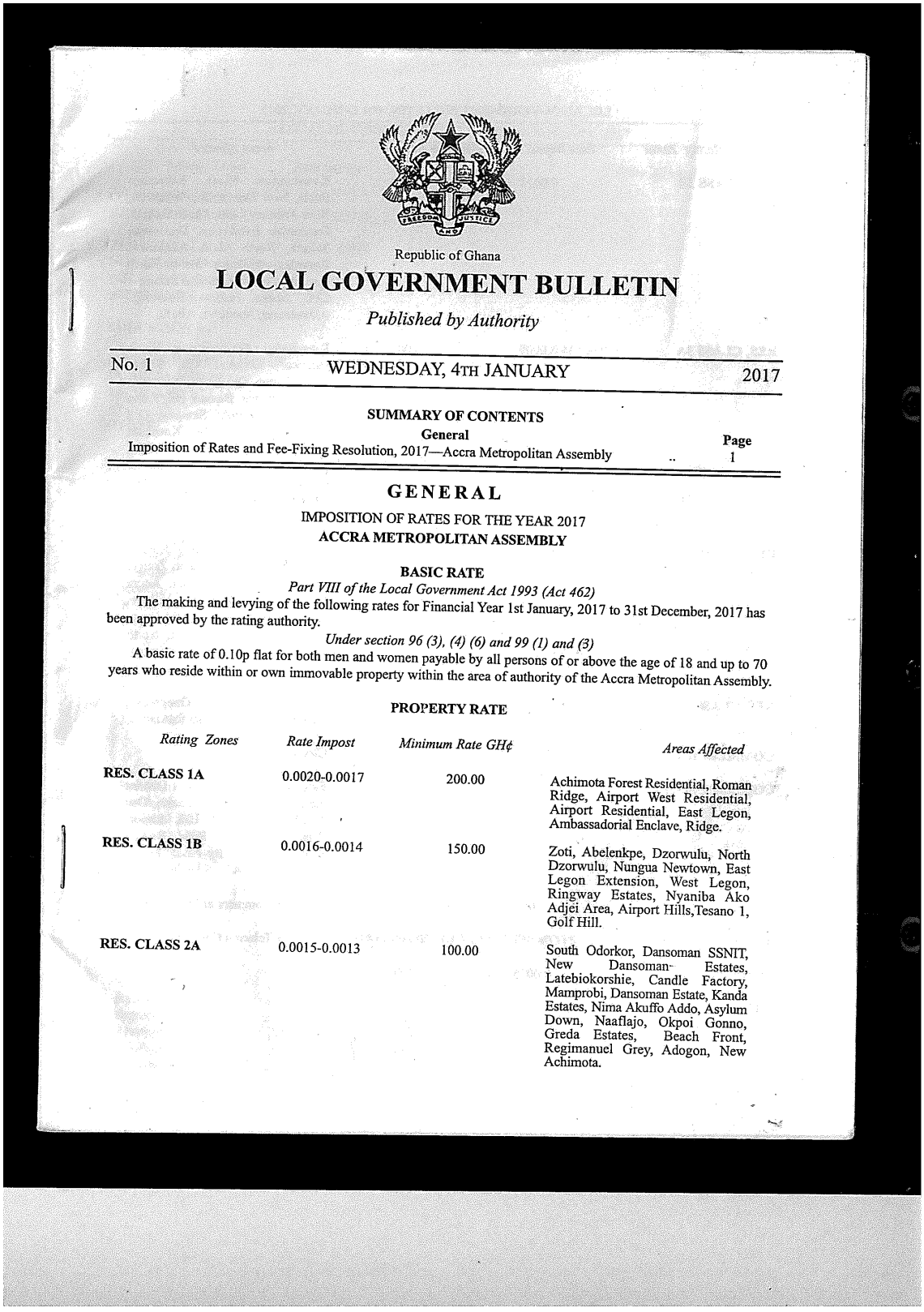
The figure shows, in the broken line, the average rateable value (GHS) for each dwelling unit type, in the final data sample from the Accra Metropolitan Assembly (AMA). Additionally, this figure also illustrates (in bars) the average cumulative property tax arrears (GHS), as of 2018, per dwelling unit type. Rateable values are valuation-based property values as opposed to market-value estimates. Owner-occupiers denote dwelling units which are solely occupied by the homeowners. Tenant-occupiers denote dwelling units which are solely occupied by tenants. Owner-and-tenant-occupiers denote dwelling units which are jointly occupied by the homeowners and tenants.

A.8 Average Property Tax Arrears Period by Occupancy Status and Rating Zone Class



This figure, based on the final data sample, illustrates the average property tax arrears period (years) for each dwelling unit type as well as by the rating zone classes of the Accra Metropolitan Assembly (AMA). Owner-occupiers denote dwelling units which are solely occupied by the homeowners. Tenant-occupiers denote dwelling units which are solely occupied by tenants. Owner-and-tenant-occupiers denote dwelling units which are jointly occupied by the homeowners and tenants. The AMA's residential rating zone classes are: 1A, 1B, 2A, 2B, 3A, 3B, and 3C, with 1A representing the most prime areas within the AMA and 3C the least endowed. However, the A, B, and C subcategories are jointly considered for simplification purposes. This results in three main rating zone classes.

A.9 Sample of Local Government Bulletin Displaying Property Rates for the AMA (first page only)



Republic of Ghana

LOCAL GOVERNMENT BULLETIN

Published by Authority

No. 1 WEDNESDAY, 4TH JANUARY 2017

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GENERAL

IMPOSITION OF RATES FOR THE YEAR 2017

ACCRA METROPOLITAN ASSEMBLY

BASIC RATE

Part VIII of the Local Government Act 1993 (Act 462)

The making and levying of the following rates for Financial Year 1st January, 2017 to 31st December, 2017 has been approved by the rating authority.

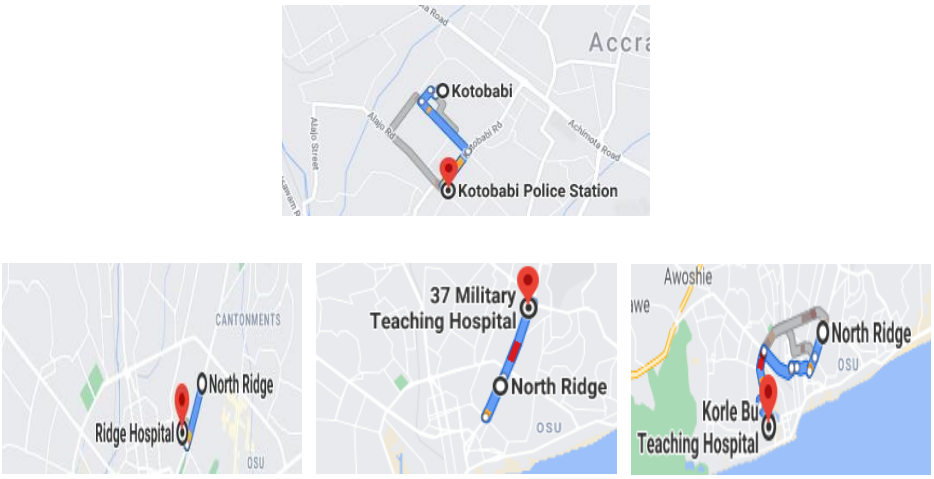
Under section 96 (3), (4) (6) and 99 (1) and (3)

A basic rate of 0.10p flat for both men and women payable by all persons of or above the age of 18 and up to 70 years who reside within or own immovable property within the area of authority of the Accra Metropolitan Assembly.

PROPERTY RATE

Rating Zones	*Rate Impost*	*Minimum Rate GH¢*	*Areas Affected*
RES. CLASS 1A	0.0020-0.0017	200.00	Achimota Forest Residential, Roman Ridge, Airport West Residential, Airport Residential, East Legon, Ambassadorial Enclave, Ridge.
RES. CLASS 1B	0.0016-0.0014	150.00	Zoti, Abelenkpe, Dzorwulu, North Dzorwulu, Nungua Newtown, East Legon Extension, West Legon, Ringway Estates, Nyaniba Ako Adjei Area, Airport Hills,Tesano 1, Golf Hill.
RES. CLASS 2A	0.0015-0.0013	100.00	South Odorkor, Dansoman SSNIT, New Dansoman Estates, Latebiokorshie, Candle Factory, Mamprobi, Dansoman Estate, Kanda Estates, Nima Akuffo Addo, Asylum Down, Naaflajo, Okpoi Gonno, Greda Estates, Beach Front, Regimanuel Grey, Adogon, New Achimota.

A.10 Pictorial Examples of Distance Measures to Police Stations and Hospitals

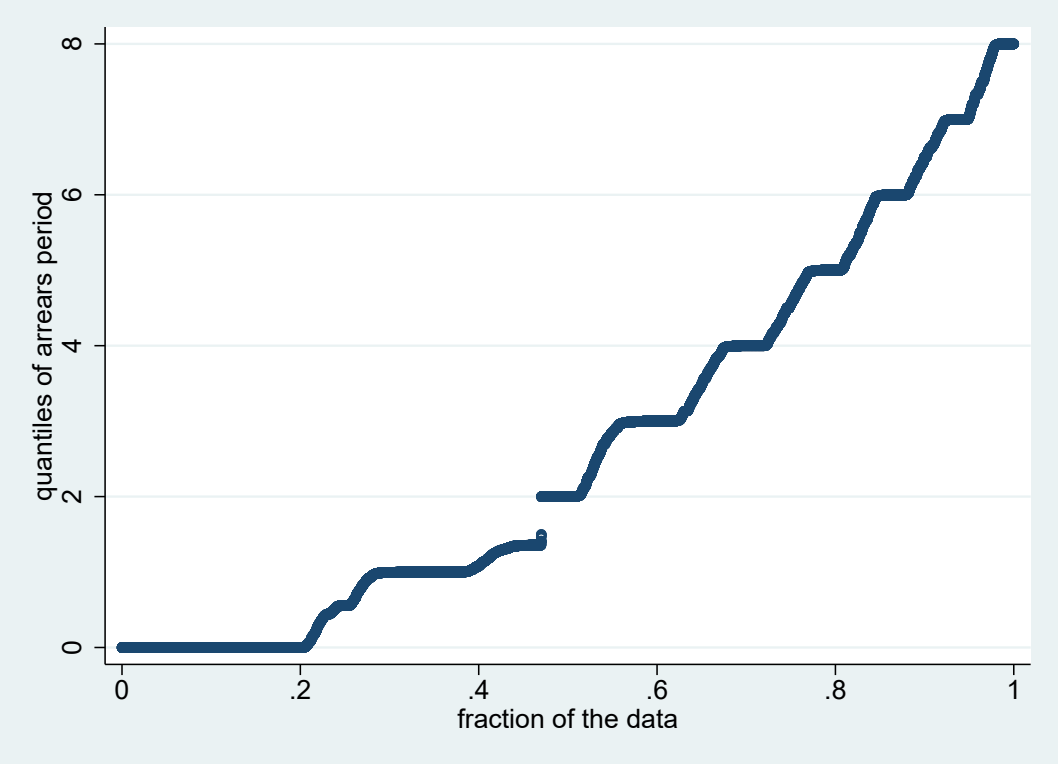


This figure illustrates how the distance estimates to police stations and hospitals are derived, using two suburbs under the Accra Metropolitan Assembly (AMA) as examples. The topmost picture shows the Kotobabi Police Station as the nearest suburban police station to the Kotobabi suburb. The shortest road-based distance to this police station is what is used in the analysis. The bottom three pictures for North Ridge, another suburb, highlight which hospital's distance estimates is selected. Among the three hospitals, the Greater Accra Regional Hospital (Ridge Hospital) is closest to North Ridge. Thus, the shortest road-based distance to this hospital is what goes into the analysis. (*Source: Google Maps*).

Appendix B

Appendix to Chapter 5

B.1 Quantiles of the Dependent Variable: Arrears Period



The figure shows quantiles of the arrears period, from a range of zero to eight years.

B.2 Reduced-Form OLS and Probit Estimates (using rate standard deviation shock)

	Arrears period (1)	Arrears or not (2)
Peer Dwelling Unit Averages		
Rate std. dev. shock	4.369***	0.676***
	(0.9772)	(0.2177)
Owner-Tenant	0.006	0.001
	(0.0060)	(0.0010)
Tenant	-0.003	0.0005
	(0.0094)	(0.0015)
Property size	0.014	0.002
	(0.0082)	(0.0020)
Dwelling Unit-Specific Attributes		
Rate std. dev. shock	0.091***	0.023
	(0.0325)	(0.0144)
Owner-Tenant	0.194***	0.018***
	(0.0442)	(0.0067)
Tenant	0.156***	0.005
	(0.0395)	(0.0064)
Property size	-0.384***	-0.031***
	(0.0374)	(0.0048)
Suburb Attributes		
Ratezone 1	-0.456**	-0.029
	(0.1786)	(0.0326)
Ratezone 2	0.032	0.031
	(0.1574)	(0.0293)
CBD	0.098**	0.022***
	(0.0455)	(0.0075)
Safety	-0.089	-0.001
	(0.0975)	(0.0169)
Healthcare	0.106*	0.008
	(0.0542)	(0.0085)
_cons	0.963**	
	(0.4448)	
Observations	34,253	34,253
adj. R-sq.	0.06	

The table reports reduced-form regression estimates on the effect of peer dwelling units on individual dwelling unit arrears period outcomes. The dependent variable is shown at the top of each column. That of column (1) is the dwelling unit-specific property tax arrears length and reports the estimated OLS coefficients. Column (2) has the dependent variable as the analogous dummy variable version which takes on the value of one if a dwelling unit has arrears, and zero otherwise. It reports the average marginal effects. Rate std. dev. shock is the residual error term, after estimating the standard deviation of effective property tax rates from 2011 to 2018. Owner-Tenant (Tenant) takes the value of one if a dwelling unit is owner-and-tenant-occupied (tenant-occupied), and zero otherwise. Property size takes on the value of one if a property is above the median rateable value, and zero otherwise. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. CBD measures the shortest travel distance from a suburb to the central business district. Safety measures the shortest travel distance from a suburb to the nearest suburban police station. Healthcare measures the shortest travel distance from a suburb to the nearest of three public hospitals: Korle-bu, 37 Military, and Greater Accra Regional hospitals. Standard errors clustered by suburb are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

B.3 Reduced-Form Quantile Regression Estimates (using rate standard deviation shock)

	Arrears period		
	q0.25	q0.50	q0.75
	(1)	(2)	(3)
Peer Dwelling Unit Averages			
Rate std. dev. shock	3.874**	6.866***	5.975***
	(1.6900)	(2.0111)	(1.2279)
Owner-Tenant	0.004	0.004	0.010
	(0.0068)	(0.0110)	(0.0082)
Tenant	0.002	-0.008	-0.013
	(0.0085)	(0.0136)	(0.0136)
Property size	0.005	-0.001	0.016
	(0.0121)	(0.0127)	(0.0095)
Dwelling Unit-Specific Attributes			
Rate std. dev. shock	0.1182***	0.126***	0.094***
	(0.0186)	(0.0416)	(0.0234)
Owner-Tenant	0.112***	0.311***	0.291***
	(0.0422)	(0.1124)	(0.0750)
Tenant	0.047‡	0.201***	0.294***
	(0.0278)	(0.0741)	(0.0836)
Property size	-0.159***‡	-0.536***	-0.587***‡
	(0.0490)	(0.1038)	(0.0738)
Suburb Attributes			
Ratezone 1	-0.157‡	-0.492*	-0.640***
	(0.1462)	(0.2642)	(0.1971)
Ratezone 2	0.102	-0.024	-0.052
	(0.2032)	(0.2771)	(0.2065)
CBD distance	0.072*	0.116	0.154***
	(0.0412)	(0.0704)	(0.0508)
Safety	-0.061	-0.154	-0.131
	(0.1008)	(0.1698)	(0.1125)
Healthcare	0.078	0.206**	0.108*
	(0.0478)	(0.0884)	(0.0634)
_cons	-0.510‡	0.757	2.430***‡
	(0.7026)	(0.5744)	(0.5533)
Observations	34,253	34,253	34,253
Parente-Santos Silva Test Statistic	212.97	161.98	59.95
R-sq.	0.06	0.06	0.06

The table reports reduced-form quantile regression estimates on the effect of peer dwelling units on individual dwelling unit arrears period outcomes. The dependent variable is shown above the columns which represent three conditional quantile distributions: Columns (1), (2), and (3), representing quantiles 0.25, 0.50, 0.75 respectively. Coefficients are estimated using Parente-Silva *qreg*2 user-written command in Stata, which accounts for intra-cluster correlation and allows for clustering of standard errors. Rate std. dev. shock is the residual error term, after estimating the standard deviation of effective property tax rates from 2011 to 2018. Owner-Tenant (Tenant) takes the value of one if a dwelling unit is owner-and-tenant-occupied (tenant-occupied), and zero otherwise. Property size takes on the value of one if a property is above the median rateable value, and zero otherwise. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. CBD measures the shortest travel distance from a suburb to the central business district. Safety measures the shortest travel distance from a suburb to the nearest suburban police station. Healthcare measures the shortest travel distance from a suburb to the nearest of three public hospitals: Korle-bu, 37 Military, and Greater Accra Regional hospitals. Standard errors clustered by suburb are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively. ‡ denotes quantile regression coefficients that are significantly different from OLS coefficients at the 5% level.

B.4 Instrumental Variable Results I (using rate standard deviation shock)

	Arrears period (1)	Arrears or not (2)
Peer Dwelling Unit Averages		
Peer arrears period	0.989***	0.162***
	(0.0089)	(0.0205)
Owner-Tenant	-0.001**	0.0002
	(0.0006)	(0.0004)
Tenant	-0.002***	0.001
	(0.0008)	(0.0005)
Property size	0.020*	0.002
	(0.0108)	(0.0028)
Dwelling Unit-Specific Attributes		
Rate std. dev. shock	0.079***	0.034**
	(0.0320)	(0.0152)
Owner-Tenant	0.194***	0.018***
	(0.0435)	(0.0067)
Tenant	0.158***	0.005
	(0.0385)	(0.0064)
Property size	-0.386***	-0.029***
	(0.0380)	(0.0049)
Suburb Attributes		
Ratezone 1	0.029	0.021
	(0.0256)	(0.0174)
Ratezone 2	0.015	0.026**
	(0.0283)	(0.0106)
CBD	0.001	0.007**
	(0.0011)	(0.0032)
Safety	0.001	0.015**
	(0.0027)	(0.0062)
Healthcare	0.001	-0.008**
	(0.0017)	(0.0040)
_cons	-0.806	
	(0.5426)	
First-Stage Results		
Peer avg. rate std. dev. shock	4.418***	
	(0.9757)	
Observations	34,253	34,253
First-stage F-statistic	20.51	
Kleibergen-Paap rk LM statistic	12.74	
R-sq.	0.12	

The table largely reports second-stage instrumental variable regression estimates. The dependent variable is shown at the top of each column. That of column (1) is the dwelling unit-specific property tax arrears period and reports estimated coefficients. Column (2) has the dependent variable as the analogous dummy variable version which takes on the value of one if a dwelling unit has arrears, and zero otherwise. It reports the average marginal effects. Peer arrears period is the average arrears period for peer dwelling units. Rate std. dev. shock is the residual error term, after estimating the standard deviation of effective property tax rates, which serves as the instrument. Owner-Tenant (Tenant) takes the value of one if a dwelling unit is owner-and-tenant-occupied (tenant-occupied), and zero otherwise. Property size takes on the value of one if a property is above the median rateable value, and zero otherwise. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. CBD measures the shortest travel distance from a suburb to the central business district. Safety measures the shortest travel distance from a suburb to the nearest suburban police station. Healthcare measures the shortest travel distance from a suburb to the nearest of three public hospitals: Korle-bu, 37 Military, and Greater Accra Regional hospitals. Standard errors clustered by suburb are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

B.5 Instrumental Variable Results II (using rate standard deviation shock)

	Arrears period (1)	Arrears or not (2)
Peer Dwelling Unit Averages		
Perc. of peers with arrears	0.072***	0.009***
	(0.0081)	(0.0007)
Owner-Tenant	-0.005	-0.0003
	(0.0036)	(0.0003)
Tenant	-0.008*	-0.0004
	(0.0048)	(0.0003)
Property size	0.009	0.001
	(0.0148)	(0.0037)
Dwelling Unit-Specific Attributes		
Rate std. dev. shock	0.080***	0.034**
	(0.0322)	(0.0148)
Owner-Tenant	0.188***	0.017***
	(0.0436)	(0.0066)
Tenant	0.154***	0.005
	(0.0389)	(0.0063)
Property size	-0.388***	-0.029***
	(0.0382)	(0.0050)
Suburb Attributes		
Ratezone 1	-0.138	-0.010
	(0.1345)	(0.0089)
Ratezone 2	-0.102	0.017***
	(0.0811)	(0.0063)
CBD	-0.090***	-0.002
	(0.0270)	(0.0023)
Safety	-0.070	0.001
	(0.0428)	(0.0042)
Healthcare	0.079***	0.005*
	(0.0251)	(0.0024)
_cons	-2.700***	
	(0.9235)	
First-Stage Results		
Peer avg. rate std. dev. shock	60.820***	
	(17.2578)	
Observations	34,253	34,253
First-stage F-statistic	12.42	
Kleibergen-Paap rk LM statistic	12.40	
R-sq.	0.10	

The table largely reports second-stage instrumental variable regression estimates. The dependent variable is shown at the top of each column. That of column (1) is the dwelling unit-specific property tax arrears period and reports estimated coefficients. Column (2) has the dependent variable as the analogous dummy variable version which takes on the value of one if a dwelling unit has arrears, and zero otherwise. It reports the average marginal effects. Perc. of peers with arrears is the average proportion of peer dwelling units with an arrears period greater than zero. Rate std. dev. shock is the residual error term, after estimating the standard deviation of effective property tax rates, which serves as the instrument. Owner-Tenant (Tenant) takes the value of one if a dwelling unit is owner-and-tenant-occupied (tenant-occupied), and zero otherwise. Property size takes on the value of one if a property is above the median rateable value, and zero otherwise. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. CBD measures the shortest travel distance from a suburb to the central business district. Safety measures the shortest travel distance from a suburb to the nearest suburban police station. Healthcare measures the shortest travel distance from a suburb to the nearest of three public hospitals: Korle-bu, 37 Military, and Greater Accra Regional hospitals. Standard errors clustered by suburb are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

B.6 Reduced-Form OLS and Probit Estimates (using rate difference)

	Arrears period (1)	Arrears or not (2)
Peer Dwelling Unit Averages		
Rate difference	2.488***	0.406***
	(0.5598)	(0.1368)
Owner-Tenant	0.008	0.002*
	(0.0059)	(0.0010)
Tenant	-0.003	0.0005
	(0.0092)	(0.0015)
Property size	0.014*	0.002
	(0.0082)	(0.0020)
Dwelling Unit-Specific Attributes		
Rate difference	0.049***	0.012
	(0.0162)	(0.0080)
Owner-Tenant	0.198***	0.019***
	(0.0440)	(0.0067)
Tenant	0.154***	0.004
	(0.0395)	(0.0064)
Property size	-0.385***	-0.032***
	(0.0373)	(0.0047)
Suburb Attributes		
Ratezone 1	-0.341**	-0.012
	(0.1690)	(0.0307)
Ratezone 2	-0.009	0.026
	(0.1550)	(0.0286)
CBD	0.114**	0.025***
	(0.0446)	(0.0074)
Safety	-0.080	-0.0005
	(0.0969)	(0.0166)
Healthcare	0.095*	0.007
	(0.0538)	(0.0083)
_cons	0.245	
	(0.4884)	
Observations	34,253	34,253
adj. R-sq.	0.06	

The table reports reduced-form regression estimates on the effect of peer dwelling units on individual dwelling unit arrears period outcomes. The dependent variable is shown at the top of each column. That of column (1) is the dwelling unit-specific property tax arrears length and reports the estimated OLS coefficients. Column (2) has the dependent variable as the analogous dummy variable version which takes on the value of one if a dwelling unit has arrears, and zero otherwise. It reports the average marginal effects. Rate difference is the difference between a dwelling unit's average effective property tax rates and the average original tax rates of the suburb in which the dwelling unit lives, from 2011 to 2018. Owner-Tenant (Tenant) takes the value of one if a dwelling unit is owner-and-tenant-occupied (tenant-occupied), and zero otherwise. Property size takes on the value of one if a property is above the median rateable value, and zero otherwise. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. CBD measures the shortest travel distance from a suburb to the central business district. Safety measures the shortest travel distance from a suburb to the nearest suburban police station. Healthcare measures the shortest travel distance from a suburb to the nearest of three public hospitals: Korle-bu, 37 Military, and Greater Accra Regional hospitals. Standard errors clustered by suburb are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

B.7 Reduced-Form Quantile Regression Estimates (using rate difference)

	Arrears period		
	q0.25	q0.50	q0.75
	(1)	(2)	(3)
Peer Dwelling Unit Averages			
Rate difference	2.291**	3.854***	3.341***
	(0.8459)	(1.2311)	(0.6810)
Owner-Tenant	0.004	0.005	0.012
	(0.0064)	(0.0110)	(0.0088)
Tenant	0.002	-0.007	-0.013
	(0.0086)	(0.0151)	(0.0141)
Property size	0.008	0.001	0.017*
	(0.0078)	(0.0229)	(0.0096)
Dwelling Unit-Specific Attributes			
Rate difference	0.061***	0.065***	0.048***
	(0.0147)	(0.0192)	(0.0123)
Owner-Tenant	0.090*‡	0.311***	0.273***
	(0.0479)	(0.0955)	(0.0888)
Tenant	0.044‡	0.203***	0.288***
	(0.0327)	(0.0727)	(0.0882)
Property size	-0.177***‡	-0.532***	-0.580***
	(0.0500)	(0.0937)	(0.0773)
Suburb Attributes			
Ratezone 1	-0.079‡	-0.359	-0.475**
	(0.1259)	(0.2596)	(0.2047)
Ratezone 2	0.043	-0.113	-0.135
	(0.1802)	(0.2718)	(0.2092)
CBD	0.092**	0.146**	0.176***
	(0.0393)	(0.0719)	(0.0548)
Safety	-0.059	-0.142	-0.121
	(0.1044)	(0.1701)	(0.1176)
Healthcare	0.065	0.187**	0.093
	(0.0461)	(0.0901)	(0.0653)
_cons	-1.298***‡	-0.419	1.453**‡
	(0.4561)	(1.2539)	(0.5847)
Observations	34,253	34,253	34,253
Parente-Santos Silva Test Statistic	207.57	162.32	62.67
R-sq.	0.06	0.06	0.06

The table reports reduced-form quantile regression estimates on the effect of peer dwelling units on individual dwelling unit arrears period outcomes. The dependent variable is shown above the four columns which represent three conditional quantile distributions: Columns (1), (2), and (3), representing quantiles 0.25, 0.50, 0.75 respectively. Coefficients are estimated using Parente-Silva *qreg*2 user-written command in Stata, which accounts for intra-cluster correlation and allows for clustering of standard errors. Rate difference is the difference between a dwelling unit's average effective property tax rates and the average original tax rates of the suburb in which the dwelling unit lives, from 2011 to 2018. Owner-Tenant (Tenant) takes the value of one if a dwelling unit is owner-and-tenant-occupied (tenant-occupied), and zero otherwise. Property size takes on the value of one if a property is above the median rateable value, and zero otherwise. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. CBD measures the shortest travel distance from a suburb to the central business district. Safety measures the shortest travel distance from a suburb to the nearest suburban police station. Healthcare measures the shortest travel distance from a suburb to the nearest of three public hospitals: Korle-bu, 37 Military, and Greater Accra Regional hospitals. Standard errors clustered by suburb are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively. ‡ denotes quantile regression coefficients that are significantly different from OLS coefficients at the 5% level.

B.8 Instrumental Variable Results I (using rate difference)

	Arrears period (1)	Arrears or not (2)
Peer Dwelling Unit Averages		
Peer arrears period	0.992***	0.162***
	(0.0081)	(0.0202)
Owner-Tenant	-0.001**	0.0001
	(0.0006)	(0.0004)
Tenant	-0.002***	0.001
	(0.0008)	(0.0005)
Property size	0.020*	0.002
	(0.0108)	(0.0028)
Dwelling Unit-Specific Attributes		
Rate difference	0.042***	0.017**
	(0.0156)	(0.0083)
Owner-Tenant	0.198***	0.019***
	(0.0435)	(0.0067)
Tenant	0.156***	0.005
	(0.0385)	(0.0064)
Property size	-0.386***	-0.030***
	(0.0379)	(0.0048)
Suburb Attributes		
Ratezone 1	0.032	0.019
	(0.0255)	(0.0169)
Ratezone 2	0.014	0.027**
	(0.0281)	(0.0105)
CBD	0.001	0.006**
	(0.0013)	(0.0032)
Safety	0.001	0.015**
	(0.0026)	(0.0063)
Healthcare	0.0003	-0.008**
	(0.0015)	(0.0040)
_cons	-0.824	
	(0.5433)	
First-Stage Results		
Peer avg. rate difference	2.509***	
	(0.5596)	
Observations	34,253	34,253
First-stage F-statistic	20.11	
Kleibergen-Paap rk LM statistic	13.35	
R-sq.	0.12	

The table largely reports second-stage instrumental variable regression estimates. The dependent variable is shown at the top of each column. That of column (1) is the dwelling unit-specific property tax arrears period and reports estimated coefficients. Column (2) has the dependent variable as the analogous dummy variable version which takes on the value of one if a dwelling unit has arrears, and zero otherwise. It reports the average marginal effects. Peer arrears period is the average arrears period for peer dwelling units. Rate difference is the difference between a dwelling unit's average effective property tax rates and the average original tax rates of the suburb in which the dwelling unit lives, from 2011 to 2018, which serves as the instrument. Owner-Tenant (Tenant) takes the value of one if a dwelling unit is owner-and-tenant-occupied (tenant-occupied), and zero otherwise. Property size takes on the value of one if a property is above the median rateable value, and zero otherwise. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. CBD measures the shortest travel distance from a suburb to the central business district. Safety measures the shortest travel distance from a suburb to the nearest suburban police station. Healthcare measures the shortest travel distance from a suburb to the nearest of three public hospitals: Korle-bu, 37 Military, and Greater Accra Regional hospitals. Standard errors clustered by suburb are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

B.9 Instrumental Variable Results II (using rate difference)

	Arrears period (1)	Arrears or not (2)
Peer Dwelling Unit Averages		
Perc. of peers with arrears	0.070***	0.009***
	(0.0073)	(0.0007)
Owner-Tenant	-0.005	-0.0004
	(0.0035)	(0.0003)
Tenant	-0.008*	-0.0004
	(0.0046)	(0.0003)
Property size	0.009	0.001
	(0.0145)	(0.0037)
Dwelling Unit-Specific Attributes		
Rate difference	0.043***	0.018**
	(0.0157)	(0.0081)
Owner-Tenant	0.192***	0.019***
	(0.0436)	(0.0066)
Tenant	0.153***	0.004
	(0.0389)	(0.0063)
Property size	-0.389***	-0.030***
	(0.0380)	(0.0049)
Suburb Attributes		
Ratezone 1	-0.148	-0.010
	(0.1278)	(0.0088)
Ratezone 2	-0.101	0.017***
	(0.0770)	(0.0063)
CBD	-0.084***	-0.002
	(0.0262)	(0.0023)
Safety	-0.069*	0.001
	(0.0410)	(0.0041)
Healthcare	0.078***	0.005**
	(0.0244)	(0.0024)
_cons	-2.592***	
	(0.8808)	
First-Stage Results		
Peer avg. rate difference	35.681***	
	(10.4318)	
Observations	34,253	34,253
First-stage F-statistic	11.70	
Kleibergen-Paap rk LM statistic	13.00	
R-sq.	0.10	

The table largely reports second-stage instrumental variable regression estimates. The dependent variable is shown at the top of each column. That of column (1) is the dwelling unit-specific property tax arrears period and reports estimated coefficients. Column (2) has the dependent variable as the analogous dummy variable version which takes on the value of one if a dwelling unit has arrears, and zero otherwise. It reports the average marginal effects. Perc. of peers with arrears is the average proportion of peer dwelling units with an arrears period greater than zero. Rate difference is the difference between a dwelling unit's average effective property tax rates and the average original tax rates of the suburb in which the dwelling unit lives, from 2011 to 2018, which serves as the instrument. Owner-Tenant (Tenant) takes the value of one if a dwelling unit is owner-and-tenant-occupied (tenant-occupied), and zero otherwise. Property size takes on the value of one if a property is above the median rateable value, and zero otherwise. Rating zone 1 (Rating zone 2) takes the value of one if a dwelling unit is in rating zone class 1 (rating zone class 2), and zero otherwise. CBD measures the shortest travel distance from a suburb to the central business district. Safety measures the shortest travel distance from a suburb to the nearest suburban police station. Healthcare measures the shortest travel distance from a suburb to the nearest of three public hospitals: Korle-bu, 37 Military, and Greater Accra Regional hospitals. Standard errors clustered by suburb are in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

B.10 Suburb Names

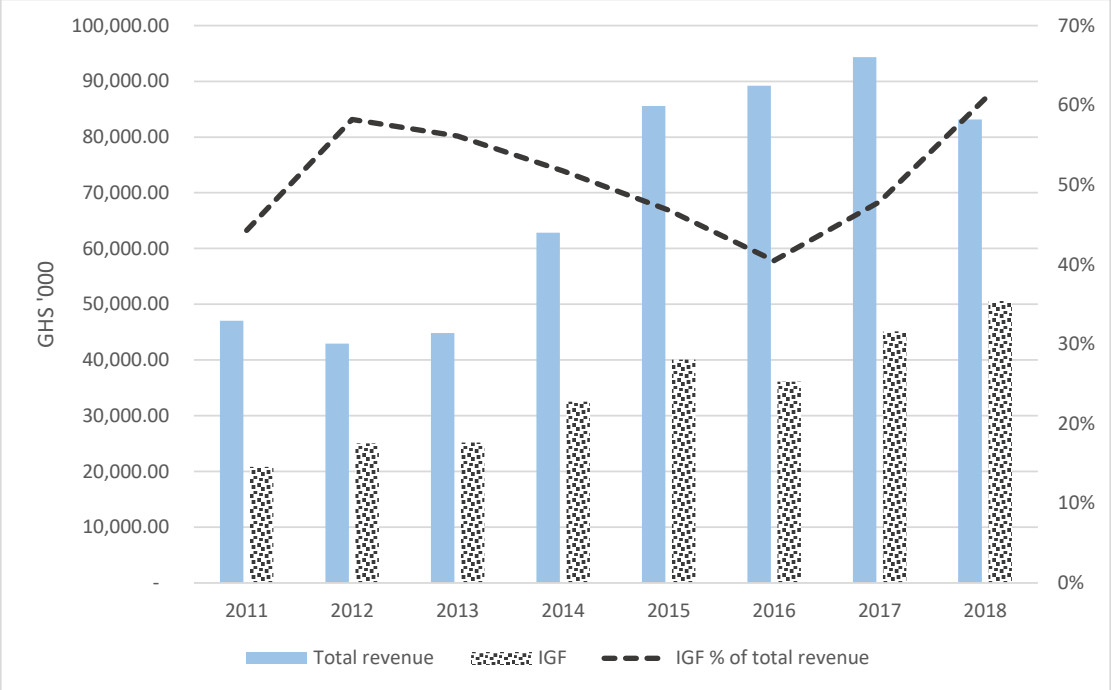
1.	Abeka	46.	Danyame	91.	North Darkuman
2.	Abeka Lapaz	47.	Darkuman	92.	North Dzorwulu
3.	Abelenkpe	48.	Dzorwulu	93.	North Kaneshie
4.	Abossey Okai	49.	East Legon	94.	North Kwashieman
5.	Accra Central	50.	East Legon Extension	95.	North Odorkor
6.	Accra New Town	51.	Fadama	96.	North Ridge
7.	Achi-Kopevi	52.	Flag Staff House	97.	Odorkor
8.	Achimota	53.	G.B.C. Area	98.	Odorkor Official Town
9.	Achimota Abofu	54.	Gbegbeyise	99.	Odorkor Old Town
10.	Achimota Christian Village	55.	Gleefe	100.	Old Bubiashie
11.	Achimota Forest Resi.	56.	Hong Kong	101.	Old Camara
12.	Adabraka	57.	James Town	102.	Old Dansoman
13.	Adedenkpo/Timber Market	58.	Kanda	103.	Osofo Dadzie
14.	Airport by-pass	59.	Kanda Estates	104.	Osu
15.	Airport City	60.	Kaneshie	105.	Osu Amantra
16.	Airport West	61.	Kokomlemle	106.	Osu Anorho
17.	Akweteman	62.	Korle Gonno	107.	Pig Farm
18.	Alajo	63.	Korle-Bu	108.	Ridge
19.	Alogboshie	64.	Kotobabi	109.	Ringway Estates
20.	Ambassadorial Enclave	65.	Kotobabi Police Station	110.	Ringway Sidi
21.	Amnafon Alata	66.	Kpehe	111.	Roman Ridge
22.	Apenkwa	67.	Kuku Hill	112.	Russia
23.	Asylum Down	68.	Kwash. Off.	113.	Sahara Down
24.	Avenor	69.	Kwashiebu	114.	Sakaman
25.	Avenor Village	70.	Kwashieman	115.	Sempe Newtown
26.	Awoshie	71.	Kwashieman O.	116.	Shiabu
27.	Awudome Estate	72.	Larterbiokoshie	117.	Shiashie
28.	Banana Inn	73.	Luga	118.	Soko
29.	Bawaleshie/Mpehuasem	74.	Mamobi	119.	South Legon
30.	Bubiashie Wireless	75.	Mamponsee	120.	South Odorkor
31.	Bubiashie/ Cable & W.	76.	Mamprobi	121.	SSNIT Flats
32.	Bubuashie	77.	Marine Drive	122.	Sukura
33.	Bubuashie/Accra Academy	78.	Mataheko	123.	Tesano
34.	Busia	79.	Ministerial Area	124.	Tesano 1
35.	C.F.C. Estates	80.	Mpoase	125.	Tesano 2
36.	Camara	81.	New Abossey Okai	126.	Town Council Line
37.	Chorkor	82.	New Achimota	127.	Trinity College
38.	Chorkor Chem.	83.	New Fadama	128.	Tudu
39.	Damba-Dansom	84.	New Mamprobi	129.	West Okaikoi
40.	Dansoman Last Stop	85.	Nhyiaso	130.	Zabon Zongo
41.	Dansoman	86.	Nhyiaso Ext	131.	Zamarama Line
42.	Dansoman - T	87.	Nii Boi Town	132.	Zongo Extension
43.	Dansoman Estates	88.	Nima	133.	Zoti
44.	Dansoman Exhibition	89.	Nima Akufo Addo		
45.	Dansoman Oto	90.	North Alajo		

The table presents the names of the 133 suburbs, which serve as peer groups, for the analysis. In most cases, the names are as recorded in the data. However, in a few instances, suburbs are merged where it is apparent that they are the same except for reasons such as spelling errors.

Appendix C

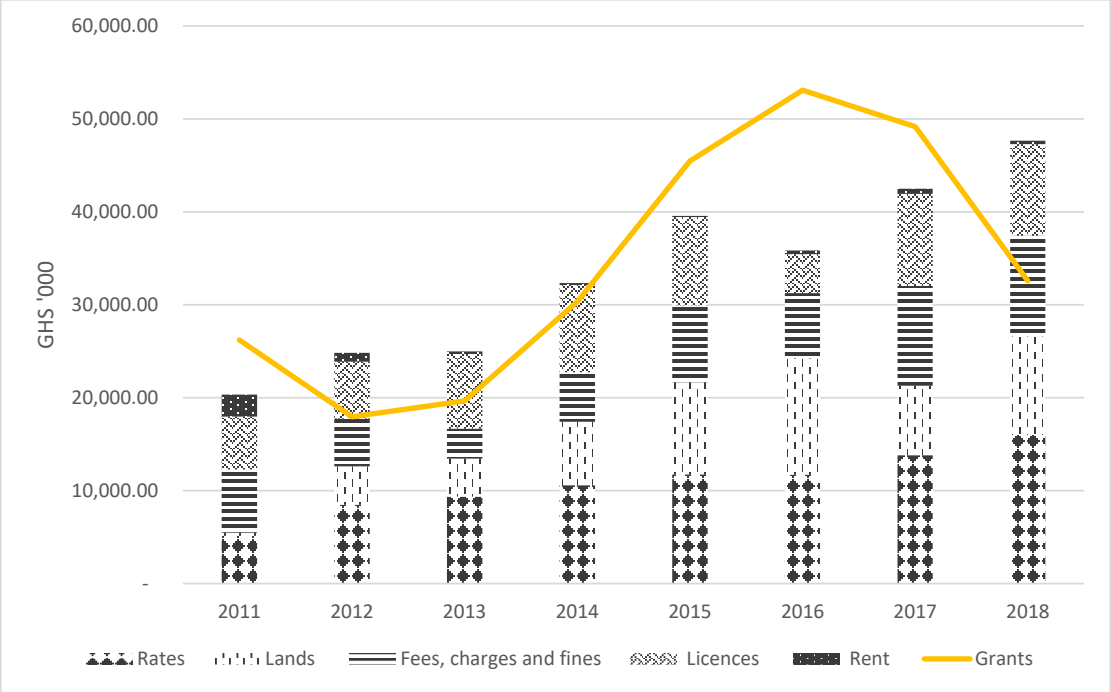
Appendix to Chapter 6

C.1 Total Revenue and Internally Generated Funds (IGF)



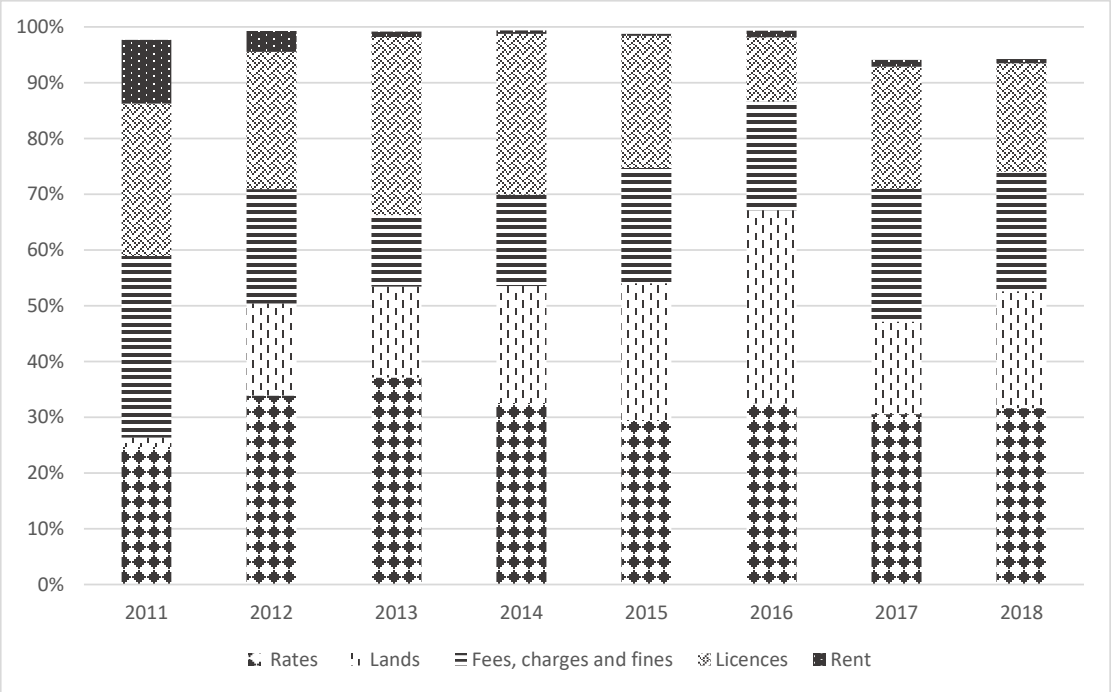
The figure shows yearly total revenue and internally generated funds (IGFs) in the local currency, Ghana Cedi (GHS), for the Accra Metropolitan Assembly (AMA). All the monetary values come from the income and expenditure statements of the AMA. The internally generated funds (IGF) are a sub-component of total revenue.

C.2 Grants and Breakdown of Internally Generated Funds (IGF)



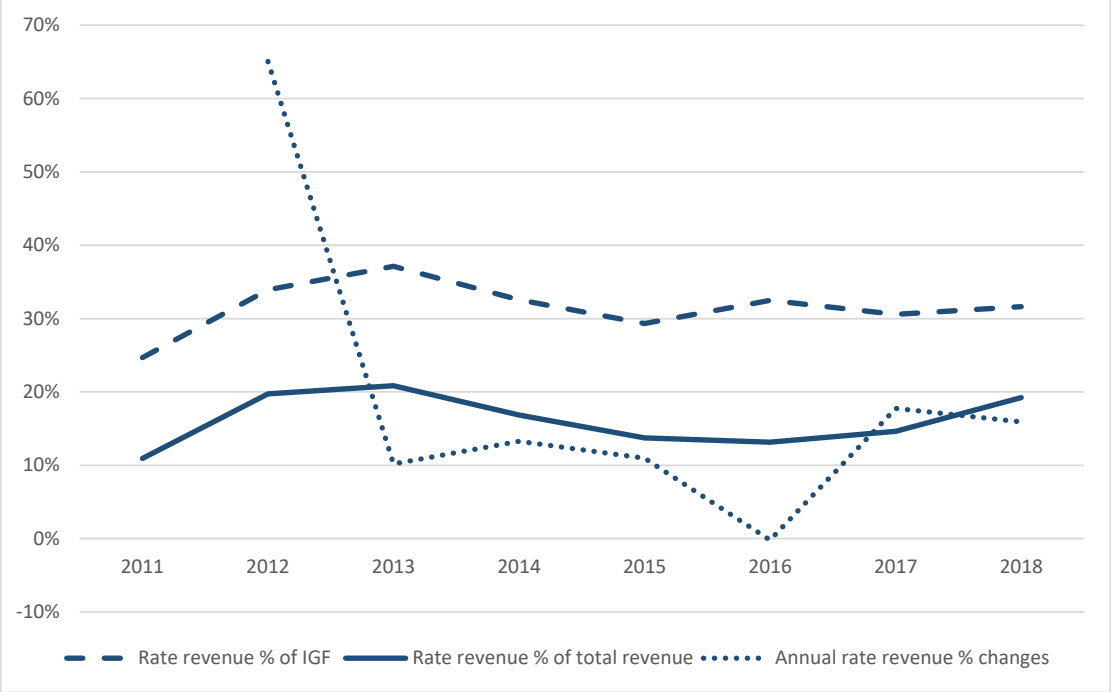
The figure shows yearly grants and internally generated funds (in GHS). All the monetary values come from the income and expenditure statements of the Accra Metropolitan Assembly (AMA). Grants are part of the total revenue but not internally generated funds (IGF). IGF breakdown shows only major components and thus excludes "Miscellaneous" and "Investment Income". Most of the revenues from Rates come from property rates/taxes.

C.3 Breakdown of Internally Generated Funds (IGF)



The figure shows the annual percentage breakdown of internally generated funds (IGFs) for the Accra Metropolitan Assembly (AMA). All the monetary values on which the percentage splits are based come from the income and expenditure statements of the AMA. IGF breakdown shows only major components and thus excludes "Miscellaneous" and "Investment Income". Most of the revenues from Rates come from property rates/taxes.

C.4 Analysis of Rate Revenues



The figure shows the annual rate revenue expressed as a percentage of internally generated funds (IGFs) and also as a percentage of total revenue for the Accra Metropolitan Assembly (AMA). It also shows the annual percentage changes in rate revenues. All the monetary values on which the figure is based come from the income and expenditure statements of the AMA. Most of the revenues from Rates come from property rates/taxes. The annual rate revenue percentage changes shown are for: 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016, 2016-2017, and 2017-2018.

C.5 Yearly Breakdown of Capital Expenditure (Capex) and Comparison with Total Expenditure (Totex)

	2011	2012	2013	2014	2015	2016	2017	2018
Economic Capex:								
Construction of toilet/bathhouses	10,431.75	-	-	-	-	-	-	-
Rehabilitation/refurbishment of markets	6,815.75	-	-	-	-	-	-	-
Construction of roads/drains	132,088.50	-	-	-	-	-	-	-
Other economic activities	477,830.86	-	-	-	-	-	-	-
Maintenance of roads	334,415.44	365,125.00	156,146.36	1,161,110.31	124,337.35	63,756.54	246,435.41	9,400.00
Maintenance of markets	1,924.00	113,462.35	373,702.52	232,685.00	48,227.79	-	-	-
Maintenance of public toilets	-	3,500.00	67,463.20	3,900.00	10,200.00	4,000.00	-	-
Economic Capex[§]	29,340.00	60,991.74	-	-	3,380,217.83	-	1,643,970.08	6,823,910.05
Social Capex:								
Rehabilitation/refurbishment of school	87,311.63	-	-	-	-	-	-	-
Construction of schools	941,354.56	-	-	-	-	-	-	-
Rehabilitation of dest. homes/homes of aged	18,025.00	-	-	-	-	-	-	-
Construction of school library	2,000.00	-	-	-	-	-	-	-
Provision of overhead tank	11,840.26	-	-	-	-	-	-	-
Construction of sports facilities	2,192.00	-	-	-	-	-	-	-
Electoral area development project	16,626.78	-	-	-	-	-	-	-
Community-based rural dev. proj.	2,500.00	-	-	-	-	-	-	-
Purchase of school furniture	653,740.00	-	-	-	-	-	-	-
Sports development	10,077.76	29,109.72	-	-	-	-	-	-
Youth development activities	28,380.00	39,557.70	-	-	-	-	-	-
Awards/scholarships	81,200.63	168,022.12	92,558.20	312,970.75	1,940.00	2,765,737.96	7,357.50	391,646.75
Ghana school feeding programme	-	3,042,554.23	-	2,415,449.20	2,654,404.00	-	-	-
Maintenance of schools/nurseries	1,350.00	8,652.00	161,707.52	208,360.64	12,987.83	6,496.00	58,103.86	-
Maintenance of traditional authority properties	4,719.16	3,500.00	-	-	-	-	-	-
Maintenance of recreational parks	8,280.00	87,044.62	75,412.50	33,792.66	23,153.00	-	-	36,200.00
Social Capex[§]	5,824,313.14	6,627,969.00	5,058,825.79	7,367,048.57	12,034,631.42	26,270,818.08	12,137,937.19	20,492,571.81
Environmental Capex:								
Construction of roads/drains	59,976.04	-	-	-	-	-	-	-
Infrastructure upgrade and sanitation	324,847.28	-	-	-	-	-	-	-
Health/sanitation campaign	574,512.80	49,800.16	-	-	-	-	-	-
Maintenance of drains (desilting)	151,844.50	131,521.00	725,875.39	600,439.85	203,447.51	227,873.50	223,042.07	406,680.89
Maintenance of cemeteries	-	10,236.00	10,000.00	321,420.91	2,975.00	5,790.00	-	5,908.00
Maintenance of sanitary sites	106,952.48	101,161.17	74,494.57	585,079.09	26,073.00	24,400.00	31,850.00	494.00
Environmental Capex[§]	3,211,996.93	925,379.58	1,347,654.42	795,495.01	5,000,000.00	-	85,799.93	-
Security Capex:								
Provision of street lights	350,666.65	-	-	-	-	-	-	-
Provision of security lights/fence	78,515.86	-	-	-	-	-	-	-
Maintenance of street lights	33,830.70	100,289.03	58,154.71	975,229.20	32,222.40	1,875.00	31,661.25	837
Maintenance of traffic lights	-	100,289.03	58,154.71	975,229.20	32,222.40	1,875.00	31,661.25	837
Security Capex [§]	-	236,592.71	142,500.00	-	800,000.00	-	208,701.70	-
Total Capex	13,579,900.46	12,204,757.15	8,402,649.88	15,988,210.38	24,387,039.54	29,372,622.08	14,706,520.23	28,168,485.50
Totex	39,065,476.93	38,969,123.71	33,478,526.25	58,530,712.13	73,009,410.89	86,148,506.72	96,760,139.04	84,418,879.62
Total Capex / Totex:	34.8%	31.3%	25.1%	27.3%	33.4%	34.1%	15.2%	33.4%
Economic Capex / Totex	2.5%	1.4%	1.8%	2.4%	4.9%	0.1%	2.0%	8.1%
Social Capex / Totex	19.7%	25.7%	16.1%	17.7%	20.2%	33.7%	12.6%	24.8%
Environmental Capex / Totex	11.3%	3.1%	6.4%	3.9%	7.2%	0.3%	0.4%	0.5%
Security Capex / Totex	1.2%	1.1%	0.8%	3.3%	1.2%	0.004%	0.3%	0.002%

The table presents a breakdown (in GHS) of capital expenditure, as also compared with total expenditure (in ratio terms). The figures are derived from the income and expenditure (I & E) statements of the AMA. I exclude from the table all capital expenditure items which have no entries for the years under consideration (2011-2018). The I & E statements also list "Administration" as capital expenditure which we omit, as it does nor directly improve the lives of the residents and will ordinarily be classified under recurrent expenditure. Maintenance expenses which relate to the specific capital expenditure items are included as the amounts spent improve the capital expenditure items.
Because expenditure on roads and drains are lumped together as "Construction of roads/drains" in the year 2011, we use the ratio of "Maintenance of roads" to "Maintenance of drains(desilting)" to split "Construction of roads/drains" between Economic and Environmental Capex. [§]This shows the aggregated capital expenditure for each sub-category (main record) as reported in the financial statement, except for some instances in the year 2011, where most of the main capital expenditure items are individually listed under their respective sub-categories.

C.6 Capital Expenditure Breakdown - Coefficient Equality Test Results

Test	Coefficient
Econcapex/Totex_L1 - Soccapex/Totex_L1 = 0	0.044***
Econcapex/Totex_L1 - Envcapex/Totex_L1 = 0	0.049***
Econcapex/Totex_L1 - Secucapex/Totex_L1 = 0	0.076***
Soccapex/Totex_L1 - Envcapex/Totex_L1 = 0	0.005***
Soccapex/Totex_L1 - Secucapex/Totex_L1 = 0	0.033***
Envcapex/Totex_L1 - Secucapex/Totex_L1 = 0	0.027***

The table reports results of coefficient equality tests among the capital expenditure categories, based on coefficients from Table 6.5. Econcapex/Totex_L1 is the annual economic capital expenditure expressed as a percentage of total expenditure and lagged 1 year. Soccapex/Totex_L1 is the annual social capital expenditure expressed as a percentage of total expenditure and lagged 1 year. Envcapex/Totex_L1 is the annual environmental capital expenditure expressed as a percentage of total expenditure and lagged 1 year. Secucapex/Totex_L1 is the annual security capital expenditure expressed as a percentage of total expenditure and lagged 1 year. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.