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Macroeconomic Instabilities and Cost-Recovery Potentials of Public Sector Organisations

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ABSTRACT

The 2008 financial crisis raised concerns over the performance of public sector organisations operating under different cost recovery regimes. These concerns were linked to potential failure in attaining cost recovery targets as a result of declining revenues during economic downturn. This study utilised the Linear Mixed Effect (LME) models to analyse the data from the World Bank Indicator website and from six national Land Administration Organisations (LAOs), two of which being under "No cost recovery" (NCR) and the remaining being in "Full Cost Recovery" (FCR). Cost recovery indicators were computed from financial statement of national LAOs of these countries. The findings establish that a global financial crisis that is associated with declining GDP and a higher inflation rate can insignificantly reduce the level of cost recovery for LAOs while persistent decline in GDP growth rate significantly eliminates potentials for cost recovery. However prospects for recovery can be traced within the cost-revenue microstructures of LAOs themselves. With a significantly negative relationship between spending in information and technology as a ratio of GDP to the degree of cost recovery, LAOs need only to eliminate rigidities in their cost-revenue structure which tie them to macro-instabilities of the real estate market. Such flexibility can be attained through elastic cross-substitution in the LAO's gross cost-revenues schedules for registration tasks in favour of information delivery tasks.

1. Introduction

Traditionally public finance is based on a system of tax levied either directly on lump-sum bases or indirectly on goods and services. The basic question in applying any tax is whether it fulfils some basic traits such as equity, fairness and distributive justice. Economists argue that a progressive tax system will fulfil the equity requirement.

By progressivity it means that those with a higher ability to pay, as measured, for example, by income (or consumption, or wealth) should pay a greater share of their before-tax income than those with a lower ability to pay. This assertion can justify the implementation of different forms of cost recovery as some sort of indirect taxes. However Auerbach, [1] argues that systems of indirect taxation that are transaction-based (for which cost recovery

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is) are much more difficult to make progressive, because they relate only indirectly to individuals. Therefore in the provision of Public Sector Information (PSI) it may be impossible to implement a pricing/charging policy that is rationally progressive. Thus most Land Administration Organisations (LAOs) that depend on general tax revenues typically rely on government budgets which is not in any way linked to their generated revenues. [2] This financing approach is criticised on the ground that it advocates free provision of PSI. Free provision of PSI approach is unlikely to meet the growing demand of land related services because users are likely to lodge frivolous demand contrary to their actual demand leading to wastage of valuable resources. [3]

Given the criticism associated with budgetary finance of quas-public goods and services a number of policy options have emerged in the literature including cost recovery. [4;5] Having its origin in the Pigouvian economic theory, cost recovery may be favoured as a public financing option because first; it is an important means of improving the efficiency with which products and services are produced and consumed. [3; 6; 7] This is because the adoption of a business like model of delivering government services and products has proven to be more efficient and sustainable than the conventional public delivery approaches. [8] Secondly; it can improve LAO's efficiency by instilling cost consciousness and promoting demand responsiveness charges for goods and services. [7; 9; 10; 11] Thirdly; Cost recovery can give an important message to users or customers about the costs of resources involved and improve equity by ensuring that those who use products and services or who create the need for information bear the costs. [7; 10; 12] GINIE [9] observed that, cost recovery can make possible offsetting cuts in taxation or the provision of additional government products. Fifthly; The UN. [11] argues that cost recovery can be an alternative means of allocating budget funding. Lastly; It can promote more efficient use of government services by reducing frivolous demand often associated with free services. [10; 13]

In additional to the previously noted advantages of cost recovery, cost recovery seem to be a viable financing option for LAOs because it facilitate reduction in waste in both material and human resources, ensures competitive neutrality when LAOs provide products in competition with the private sector by forcing the organisation to charge prices that unfairly undercut commercial suppliers and Lastly, it aids to conform to international agreements especially those relating to the protection of other people's intellectual property rights, specifically copyright. [10] Generally, cost recovery can facilitate improvements in the delivery of public products and services by intro-ducing more business-like and client-oriented practices.[10; 12] Other financing options such as performance subsidies, contracts, quality assurance, and PPP can be used to complement cost recovery initiatives. [13; 14]

Following the 2008 financial crisis, a number of land administration experts were concerned with the performance of public sector organisations operating under different cost recovery regimes. [15] Such concern emanated from the view that these organisations are likely to be negatively affected following the crisis hence fail to realise the planned levels of cost recovery. [16; 17] Such failure could results from declining revenues from the limited transactions during economic downturn. [15] However for public sector Land Administration Organisations (LAOs) with a substantial dependence in revenues from land information delivery, this may not be the case because the nature of information products necessitates for its higher demand during economic downturn. Crises are basically associated with higher uncertainty in economic opportunities while information acquisitions tend to facilitate access to these opportunities. Therefore the demand for information products is likely to be higher if uncertainties for undertaking economic transactions are relatively higher. [18]

Despite the above promising outcome for adapting cost recovery for LAOs, its ability as a financing option, to withstand macroeconomic instabilities is still questionable. This is because economic development is highly tied to the use of information and technology which in turn also depend on economic development. [19; 20] Therefore the negative development of the economy directly casts their shadow on the financial position of LAOs. [15] With rigid factor substitution and fixed pricing strategies, LAOs cannot respond adequately to the need of the economy during declining Macro-variables, hence fail to meet cost recovery targets. There are also cases in other sectors of the economy suggesting that when cost recovery is introduced for the purpose of repaying previous debt finances on the same product or service it can lead to unaffordable tariffs and consumer debt for those services. [8]

The view that economic crises affect negatively on real estate transactions can be linked to the observations that the values of most real properties tend to fluctuate over time hence disposing or using them as collateral is limited by under-pricing during economic downturn. [18] This mean that vacated and unsold property i.e. houses, tend to stay in inventory longer eliminating any prospect of a property recovery. [21] In order to avoid such high transaction failure risks, the purchaser may require addition information which under any "positive" cost recovery regime can only be obtained at additional fee or user charge. [2] This will add to the revenues of the LAO hence facil-

itate it in achieving the cost recovery targets. Therefore, whether a LAO will be affected by an economic crisis or not may be influenced by the level of its reliance, financially, to real estate market transactions.

Given the preceding seemingly contradictory observations, this study examines the extent to which macroeconomic variables relates to the financial performance of LAOs across six. [21] countries in terms of cost recovery. The focus being to evaluate the performance of countries operating under different cost recovery levels The main contribution of the study Public Land Administration Organisations that operates under cost recovery can severely be affected by a financial crisis only when the crisis is persistently retarding GDP growth rates. A general decline in GDP plus inflationary environment can hardly affect the performance of Land Administration organization. It is further evident that a cost-revenue structure that favour information delivery rather than revenues from real estate transaction tends to yield the highest cost recovery benefit to these types of public sector organizations.

2. Literature Review

LAOs are basically public organisations that specialises in the collection, maintenance and dissemination of land information. There are limited studies that have attempted to examine the effects of macroeconomic instabilities on the performance of these LAOs. However, some few studies have explored such effect on other public sectors of the economy. In the energy sector for example the ADB, [16] evaluated the financial cost recovery performance of the power sector in 14 developing member countries (DMCs) during the 1990s. It was observed that cost recovery by state-owned power utilities was important because of its significant macroeconomic linkages and its impact on the fiscal balances of the country. Furthermore the cost recovery ability of most power organisations was significantly affected by the onset of the Asian financial Crisis where the cost of supply dramatically increased, and most developing countries faced serious political difficulties, in varying degrees, in making timely and full adjustments to tariffs.

Macroeconomic instabilities may however, not amount to a global financial crisis. Minor shocks can be contained domestically while major shocks cannot only influence domestic macro-variables but also significantly influence macroeconomic performance of other countries via for example private capital flows. [22] A financial crisis is a reversal of the factors that fuel booms and economic optimism. [23] According to Crotty, [24] a financial crisis is often associated with economic pessimism and risk aversion or liquidity preference, inducing investors to sell risky assets

and rush into safe assets such as treasury bills. This destroys liquidity in troubled markets so that assets can only be sold at a large capital loss. For a LAO whose revenues are highly tied to dealings in real estate assets, a decline in real estate transactions automatically means to decline in its revenues. However, such decline in revenues resulting from declining real estate transactions may be offset by an increase in demand for land information induced by higher uncertainties in the real estate market. Whether this offsetting effect will be partial or full depends to a certain extent on the degree of cross substitutability of factor cost in registration task against information dissemination tasks.

Most macroeconomic variables can be highly unstable during a financial crisis. Some empirics suggest that public sector organisations' ability to generate revenues through cost recovery tends to be limited at initial stages and can only be effective at relatively higher operational stages. [25] This casts some doubts over optimistic adoption of cost recovery during economic booms. According to Minsky's financial instability hypothesis, financial bubbles often give rise to excessive investment in certain sectors which are incompatible with the returns under normal conditions. Akyüz, [26] while studying the causes of a financial crisis in Latin America and USA observed that excessive investment was dominant in highly speculative sectors such as residential and commercial property which are the sources of revenues for cost recovery LAOs. Excessive investment was a result of increased access of households to credits which curtailed the Keynesian link between income and consumption causing consumption booms which are associated with asset-price inflation and credit expansion. This culminated into the housing market bubble in the late 1990s which accelerated in the early-mid 2000s. [24] Therefore the repercussion of a boom is a burst which may culminate into a financial crisis. A financial crisis per capita income tend to decline as a result of reduced household savings and increased debts leading to limited real estate transactions. Thus it is hypothesised as follows:

Hypothesis 1: Per capita income significantly reduces the degree of cost recovery of LAOs

The underlying economic mechanisms for any financial crisis can be traced within the booms prior to the crisis as indicated by low inflation, strong economic growth, higher credit, greater risk-taking, greater debt for households and companies, and the emergence of speculative pricing bubbles [22]. Theoretically, cost recovery should reduce production cost to public sector organisation by simply transferring some to the final consumer. [27] However during the financial crisis, economies experiences rising

prices for goods and services, reduced real household income through several channels i.e. job losses, depressed wages, lowered remittances and falling profits for the self-employed. With rising general price level, any attempted increase in fees and charges for registering property is unlikely to enhance the degree of cost recovery for LAOs rather it can trigger a series of fee increments in an attempt to attain cost recovery. Similarly the increasing prices in an attempt to achieve full cost recovery for a good that is somehow public may be associated with limited effectiveness or socially unacceptable. [14] The ultimate outcome for this process could be a costly registrations service which reduces the likelihood that people will dispose or purchase properties. Therefore, it can be hypothesised that higher costs for property registration leads to limited transactions in real estate which in turn is directly related to lower levels of cost recovery for LAOs. This hypothesis is formulated as follows:

Hypothesis 2:Costs of registering properties as a percentage of property significantly reduce the degree of cost recovery of LAOs.

The performance of any LAOs is highly dependent on the level of use of Information and Communication Technology (ICT) in a given country. The aggregate level of spending in ICT can reflect potentials for efficient land information delivery and hence cost recovery. [23] This can be translated to mean that if more spending (whether from public sources or otherwise) in an economy are directed towards ICT, the more efficient land information delivery will be. [28] Therefore, LAOs are likely to generate more revenues with fully fledged information systems supported with limited public funds. By considering aggregate spending on ICT as a percentage of GDP, it can be expected that the increase in spending in ICT means to reduce spending in other sectors. Thus increased spending in ICT as a percentage of GDP can only enhance the level of cost recovery for LAOs largely based in land information delivery tasks. Otherwise, such increase will lead to a decline in the level of cost recovery. Based on these observations, the following hypothesis can be formulated:

Hypothesis 3: ICT expenditure as a percentage of GDP significantly reduces the levels of cost recovery of registration-dependent LAOs.

The conceptual relationship between cadastral function of property registration and cost recovery during both crisis and no-crisis situation are presented in Figure 1. Figure 1 suggest that a financial crisis can create uncertainties in attaining intended levels of most economic variables leading to undesired outcome i.e. unintended inventories. This is due to a highly fragile economic environment characterised by unstable prices, declining GDP and unemployment. The resulting uncertainty can trigger a set of information search behaviour where citizens and customers demand more information in an attempt to reduce such uncertainty. At the organisation level, Bin [18] examined the moderating effect of task uncertainty and
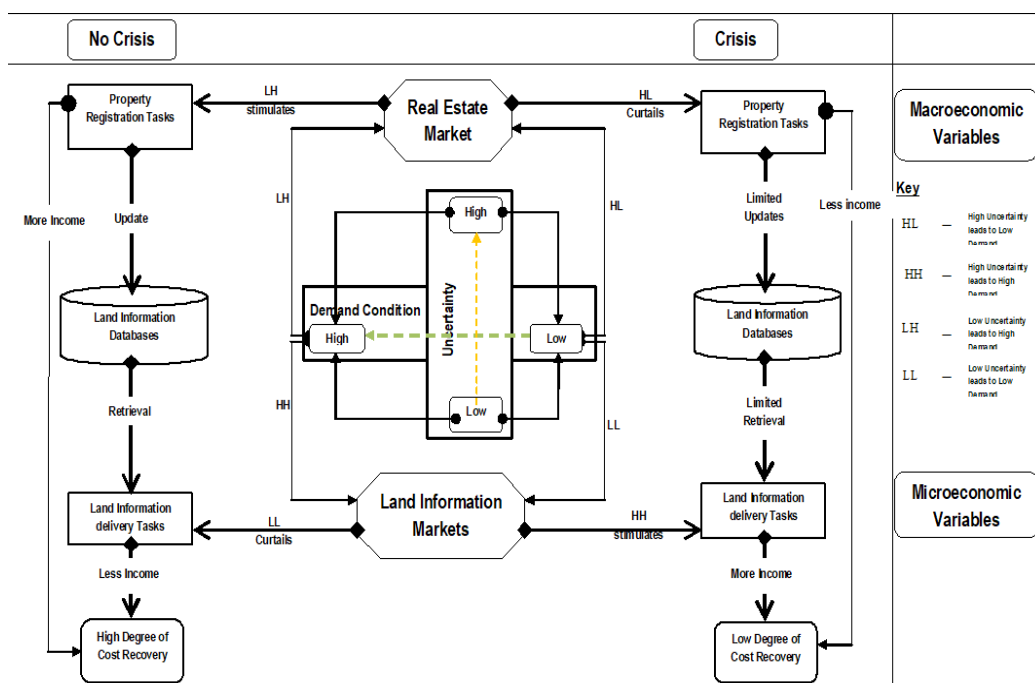

Figure 1. A conceptual model of cost recovery for LAOs under economic crisis

complexity on source use frequency. From his perspective uncertainty implies a lack of predictability, structure and information concerning the problem being addressed. He found that task uncertainty insignificantly moderated the frequency of information source use. He associated this to the offsetting effect in relation to information quality at different levels of task uncertainty. That is at low levels of task uncertainty. The information seeker relies more on solution-driven search and tends to seek the information that can directly provide the solution to the problems they encounter in completing the task. However at higher level of task uncertainty people may try to gather more information and use more information sources to help themselves make better decisions instead of directly finding the answer/solution. Thus the shift to other sources of information might offset the effect of increased use of a particular information source.

Some public organisations operating under full cost recovery have recognised the risk for over-recovery and under-recovery due to macroeconomic instabilities. For example IP Australia [17] identifies two major sources of risk namely business revenue risk and business expenditure risk. One of the main drivers of business revenue risks are domestic and global economic growth or contraction. As long as the global economic contraction is directly impacting the real estate markets, the information market provides a safe haven for LAOs. In terms of the relationship between cost recovery regimes and levels of financial cost recovery for LAOs across countries, it can be argued that LAOs that depend on information delivery tasks can attain positive levels of cost recovery during a period of economic downturn. Under these circumstances, a decline in demand for products and services of the LAOs as a result of a financial crisis, poses a real challenge to the continued provision of cadastral products and services. [15] The major concern for LAOs operating under cost recovery is dealing with the adverse impact associated with a financial crisis. This is because the property market which is in most cases a major source of revenues to them is highly tied to the financial market (mortgages and loans). Cost recovery provides promising governance model for public sector organization but they are not shielded from the adverse consequences pertinent in a competitive environment. As such understanding the different ways through which these organizations might be affected by an adverse economic pressure is paramount in the design as well as the implementation of cost recovery strategies.

3. Research Approach

In order to understand and explain the relationship between Cost Recovery (CR) and macroeconomic variables across countries, it is important to define the macroeconomic variables. These are indicators of the performance of the economy which are theoretically correlated to variations in aggregate demand as envisaged in the business cycle. Based on the literature reviewed inflation rate, GDP growth rate and per capita GDP are unstable during macroeconomic disturbances. Also CR may be influenced by the aggregate commitment of resources in information and communication technology and the costs associated with registration of properties. The data on macroeconomic variables were compiled from the Word Bank Database Indicators (WDI) while cost recovery for each LAO was computed from Annual Financial reports obtainable on request from the six participating countries i.e. Czech Republic, Australia New Zealand, Netherlands, United Kingdom and Ireland. The selection of participating countries or organisation depended on access to the requisite data. These variables were combined quantitatively using a Linear Mixed Effect (LME) model in nlme library of "R software". [29]

The data are longitudinal thus requires modelling heteroscedasticity and dependence in the errors (ε_{ij}) i.e. structured covariance models (λ). Longitudinal data typically possess a hierarchical structure that the repeated measurements/observations are nested within an individual group. Therefore the structure of the λ's was specified to capture autocorrelation among the errors in a LME models. The basic model at the within-country/LAO level can be specified in Matrix notations as in Equation 1:

Level -1: $y_{ti} = Cti + \beta + Z_i b_i + \varepsilon_i$

$$b_i \sim N_q(0, \psi)$$

$$\varepsilon_i \sim N_{ii}(0, \sigma^2 \Lambda_i) \dots\dots\dots\dots\dots\dots \qquad [1]$$

where:

y_{ti} = the $n_i x 1$ response vector for observations in the ith Country at time t.

C_{ti} = the $n_i x p$ model matrix for the fixed effects for observations in Country i at time t.

β = the $p x 1$ vector of fixed-effect coefficients.

z_{qij} = the $n_i x q$ model matrix for the random effects for observations in group i.

b_i = the $q x 1$ vector of random-effect coefficients for group i.

ε_{ii} = the $n_i x 1$ vector of errors for observations in group i at time t.

Ψ = the $q x q$ covariance matrix for the random effects.

$\sigma^2 \Lambda_i$ = the $n_i x n_i$ covariance matrix for the errors in group i.

The level 2 between-country/LAO model can be specified as in Equation 2;

Level – 2: $\beta_{1i} = \gamma_{10} + \gamma_{11}w_{i1} + \mu_{1i}$

$\beta_{2i} = \gamma_{20} + \gamma_{21}w_{i1} + \mu_{2i}$

$\beta_{pi} = \gamma_{p0} + \gamma_{p1}w_{i1} + \mu_{pi}$ \hfill [2]

In level-2 equations, "w" is the time- invariant covariate for a particular LAO i. Substituting level-2 equations into level-1 equation leads to equation 3:

$y_{ti} + \gamma_{0i} + \gamma_{pi}c_{ti} + \gamma_{pi}z_{qij} + \gamma_{pi}w_{ij} + \gamma_{pij}w_{ij}c_{ti} + \gamma_{pij}z_{qij}w_{ij} + \mu_{0i} + \mu_{pi}c_{ti} + \mu_{pi}z_{qij} + \varepsilon_{ti}$ \hfill [3]

Note that there is no time-invariant covariate in level-2 before introducing the variable w. The variance and covariance of the μ's are the variances and covariance of the random intercept and slopes. After introducing the variable w, the variance and the covariance of μ's are the variance and covariance of residual intercept and slopes after partialing out the variable w. The model allows the sequential addition of more time-invariant variables into level-2 to get different models. The reduction in variance of μ's could provide an estimate of variance in intercepts and slopes which is accounted for by those $w's$.

The response variable y_{ti} was specified to be CR_{it} which is the degree of Cost Recovery measured as a ratio of revenues to cost for a particular country i's LAO, in period t. The fixed effects covariates are, GDP_{it} defined as the Gross Domestic Product for country i in period t, $GDPC_{it}$ is the per Capita Gross Domestic Product for country i in period t, IR_{it} is the inflation rate for country i in period t and ICT_{it} is the ratio of spending in Information and Communication Technology to GDP for LAO i in period t, Cty_{qij} refers to a categorical variable $q(z_{qij})$ "Country" with six levels (q=1:6) and $Year_{qij}$ is also a categorical variable "Year" referring to the period between 2003 and 2009 (q=1:7) for which data were collected i.e seven levels. Lastly LAOs often operate under a predefined CR mode which sets a legal limit upon which that LAO can generate revenues through charging for its products. Therefore all the six LAOs were further regrouped into two Cost Recovery mode $\left(CRMode_{qij}\right)$ i.e. q=1:2). Thus the implemented model was specified as in equation 4;

$CR_{ti} = \gamma_{0i} + \gamma_{pi}GDP_{ti} + \gamma_{pi}GDPperCapita_{ti} + \gamma_{pi}GDPGrowthRate_{ti} + \gamma_{pi}InflationRate_{ti} + \gamma_{pi}COST_{ti} + \gamma_{pi}ICTGDPRatio + \gamma_{pi}Country_{qij} + \gamma_{pi}Year_{qij} + \gamma_{pi}Cost\operatorname{Re}cMode_{qij} + \gamma_{pi}Crisis_{qij} + ..\gamma_{pij}Country_{qij} : Year_{pij} + Year : Crisis\gamma_{pij} + \gamma_{pij}Country_{qij} : Cost\operatorname{Re}cMode_{pij} + \varepsilon_{ti}$ \hfill [4]

In estimating the LME model, one may specify the form of the covariance matrix structure in order to incorporate the time-dependent co-movement of variables. If the variables have some underlying relationship over time and the model is not a pure time series, then it might lead to spurious regression. In this study the structure of the covariance matrix takes the form of Auto-Regressive Moving-Average models of order 1 i.e. ARMA(1,1) based on the belief that most economic variables operates with a multiplier effect but the immediate effect tend to be larger as a result of the MA process. The process is a combination of both Auto Regressive process of order 1 (AR1) and a Moving Average process (MA). Therefore it is presumed that the time series exhibit a MA process which basically has a memory of one period hence its contribution to the autocorrelation function will cut off after one period.

4. Findings and Discussion

The distribution of the degree of cost recovery for specified countries is displayed in Figure 2. It shows that the range of the degree of cost recovery has been narrowed for two LAOs i.e. in Czech Republic and Australia. However for the rest of the LAOs the degree of cost recovery exhibits a wider dispersion. The widest range of cost recovery is observed for the Ireland national LAO with a highly skewed distribution in favour of high degree of cost recovery. For the rest of the LAOs the degree of cost recovery had been closer to the mean for the period under study with the average for the Kadaster in the Netherlands and Land Information New Zealand being about the same but below 100% whereas the UK's Land Registry managed to stay above the average for the whole period under study. The conclusion that can be drawn from Figure 2 is that although different LAOs might have been affected by similar global phenomenon for a period of 2003-2009, there is no obvious signs that such global effects has created similar patterns in the cost and revenue structure of these organisations.

Figure 3 examines trends in the level of cost recovery for the six LAOs investigated. It is clear that for the local LAO in Australia and the Czech National LAO there is no any obvious trend in terms of directional bias for the period under study. However some other LAOs in the other countries showed some similar patterns including failure to attain 100% cost recovery for the period 2006 − 2009. The period was characterised by declining levels of cost recovery. It is only the Natherland's Kadaster that experienced some increase in cost recovery but failed to recoup the total costs. The Ireland LAO which had been operating above 100% cost recovery level experienced a decline in the level of cost recovery although it still operated above 100% cost recovery for the whole period under study. Despite the above observable patterns, it is not clear whether they are linked to any global economic phenomenon or not. To understand this it is necessary to

examine the influence of macroeconomic variables on the financial performance of LAOs. This is because it is through these variables that one can reveal the influence of any global phenomenon on the performance of LAOs. Such relationship as derived through LME is presented next.

Table 1 provides the results of Model One (M1) which related the degree of cost recovery to macroeconomic variables including group and interaction variables. It shows that the group variable "Country" strongly influenced the degree of cost recovery. About 59% of the total variation in the degree of cost recovery (6.9525+2.0464+928.2367+1496.2034+99.1450= 2532.584) is explained by the variable "Country" whereas the interaction variable for country and Cost recovery mode "Country: CRmode" accounts for 37% of the total variation. The two together explain 96% of the total variation in cost recovery.
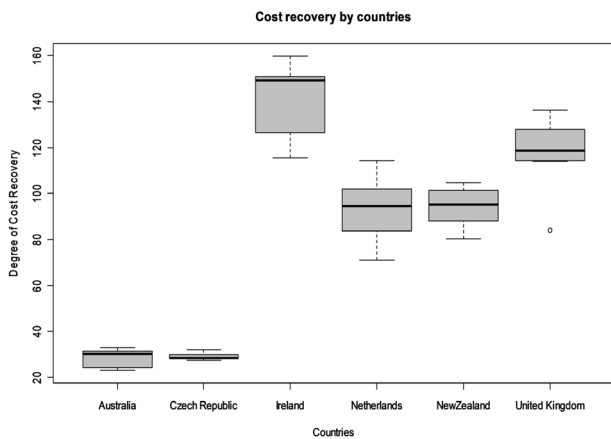

Figure 2. Distribution of cost recovery across countries

The results in Table 1 also suggest that for each unit increase in GDP per capita, there is a corresponding 0.14 unit decline in the degree of cost recovery. In this case it means if GDP per capita increased by one percentage point, the level of cost recovery declined by at least 0.14 times percentage point. Using the results of model 1, it is evident that GDP per capita is negatively correlated to the degree of cost recovery for LAOs. While Model 1 and Model 6 show a negative relationship between GDP per capita and the degree of cost recovery for LAOs, other models implemented show the reverse. However M1 reflects the effect of group variables which in this case the group variable "Country" explain more than 93% of the total variation in the degree of cost recovery. With this in mind, it is clear that the observations in M1 have a higher explanatory power and hence GDP per capita is negatively correlated to the degree of cost recovery contrary to expectations. [15]
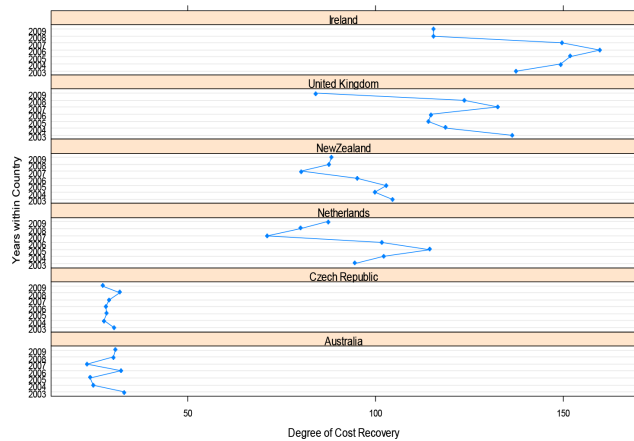

Figure 3. Trends in the degree of cost recovery per country

In model 6, autocorrelation in GDP values is modelled where by the direction of effect of the variable GDPperCapita is retained. It seems autorrelation in the values of GDP per Capita has limited impact on the direction of effect of GDP per capita on cost recovery of LAOs. However when autocorrelation in GDPGrowthRate, InflationRate and ICTGDPRatio is modelled independently, the direction of effect changes as shown in Table 3. It seems the strength of autocorrelation in these variables influenced the direction of effect of GDP per capita. This can be associated to the view that GDP per capita relates to the population hence reflects the actual expenditure of households. By construing directly from the conceptual framework in Figure 1, individual spending in products and services as a component of the GDP tends to increase with higher levels of uncertainty in the economy. With a lower GDP per capita in response to population growth, a given sum in GDP terms will be spread to a larger population where by each gets lesser and lesser over time. This lower GDP per capita can trigger an information search behaviour leading to more demand for land information which will ultimately improve the financial position of the LAO. The lower GDP per capita may also emanate from declining GDP in which case land information will be demanded more. Thus the ultimate effect will be an increase the degree of cost recovery for the LAOs as household attempts to iron out uncertainties pertaining to the real estate market. However in this case it is the within country autocorrelation for certain variables that eliminates the positive relationship observed in Model 1. That means on average the "Country" variable has a negative effect on cost recovery which outweighs the positive fixed effect caused by the variable "GDPperCapita" in M1. Generally it can be urged that the relationship between the two variables is determined by the within-country autocorrelation for specified variables.

Table 1. Model 1 Results for random and fixed effects

Linear mixed model fit by REML	Formula: CR ~ 1 + Cost + GDPperCapita + GDP + GDPGrowthRate + InflationRate + ICTGDPRatio + (1 | Country) + (1 | Year) + (1 | Year:Rec) + (1 | Country:CRmode)				
AIC	344.7				
BIC	365.6				
logLik	-160.4				
deviance	338.1				
REMLdev	320.7				

	Groups;	**Name**	**Variance**	**Std.Dev.**	
	Year:Rec	(Intercept)	6.95	2.64	
	Year	(Intercept)	2.05	1.43	
Random effects:	Country:CRmode	(Intercept)	928.24	30.47	
	Country	(Intercept)	1496.20	38.68	
	Residual		99.15	9.96	
	Number of obs: 42, groups: Year:Rec, 7; Year, 7; Country:CRmode, 6; Country, 6				

	Variable/Constant	**Estimate**	**Std. Error**	**t value**	
	(Intercept)	85.01	64.63	1.32	
	Cost	2.57	3.60	0.72	
	GDPperCapita	-0.14	1.89	-0.07	
Fixed effects:	GDP	0.05	0.03	1.64	
	GDPGrowthRate	0.83	0.70	2.63	
	InflationRate	1.19	1.31	0.91	
	ICTGDPRatio	-3.00	5.32	-0.56	

	Variable/Constant	**(Intercept)**	**Cost**	**GDPper Capita**	**GDP**	**GDP GrowthRate**	**Inflation Rate**
	Cost	-0.10	1.00				
	GDPperCapita	-0.78	-0.18	1.00			
Correlation of Fixed Effects:	**GDP**	0.08	-0.04	-0.02	1.00		
	GDPGrowthRate	0.04	-0.01	0.01	-0.05	1.00	
	InflationRate	-0.02	-0.10	-0.19	-0.09	-0.45	1.00
	ICTGDPRatio	-0.76	-0.03	0.40	-0.14	-0.10	0.25

The observations with respect to the variable "COST" in model 1 were contrary to expectations since the cost of registering properties as a percentage of property value was positively correlated to the degree of cost recovery for LAOs. If the cost of registering properties as a percentage of property value increased by one unit, the degree of cost recovery increased by more than 2.5 times. Using model 1 results it is clear that higher costs of registering properties tend to reduce the degree of cost recovery. Table 3 for M1, M3, M4 and M5 suggests that cost of registering properties and degree of cost recovery move in the same directions. This signals that higher costs of registering properties tend to increase revenues from registration tasks by the LAO. This impliedly means registrations task are monopolised by LAOs and they are mandatory to all players, the consumption of which exhibit the characteristics of a necessity good. This explanation is supported by reaction by some LAOs i.e. the Netherland's Kadaster where following downturn in revenue in 2007/08, the immediate reaction was to increase fees charged which directly increases costs for products and services. This strategy can only be effective if the elasticity of demand for registration services is inelastic where higher charges do not significantly reduce the amount of registered transactions.

With the autocorrelation in GDP values (M2) such relationship is however negated. This signals that higher costs for registering properties tend to reduce registered transactions hence less revenues for the LAO. This is only relevant under situations where GDP values are significantly correlated. These findings in M2 provide some evidence that a higher cost for registering properties can reduce the revenues of LAOs. This could be the case if registration is not mandatory and limitedly enforced through legislation. This pattern of behaviour emanates from autocorrelation of GDP value which seems to be unidirectional. The gross effect of GDP variations over time seems to be positive but a marginal analysis entails a downswing. If this autocorrelation in GDP is modelled it curtails the original positive effect of higher cost on the level of cost recovery. This is because with declining increment in GDP over time households might be cautious in undertaking real estate transactions. Thus any attempted increase in registration cost is not adequately responded to. This will ultimately reduce the degree of cost recovery.

The variable "ICTGDPRatio" had a negative relationship with the degree of cost recovery for LAOs. Thus the effect of spending in information and communication technology on the level of cost recovery is negative for all models except when autocorrelations for GDPGrowthRate and ICTGDPRatio are considered in M2 and M4

respectively as shown in Table 3. Higher spending in ICT as a percentage of GDP seems to reduce the level of cost recovery for LAOs. This observation relate to the fact that most of the spending in ICT is either directed to other non land information systems thus contributing little to the revenues of the LAO or though directed to the provision of land services, are only used to build the capital base rather than direct provision of information or registration services. Further evidence can be traced on the current situation for LAOs investigated. It seems most of these LAOs have well established information systems such that current spending is negatively related to the growth in the level of cost recovery. In the case of the positive relationship between cost recovery and ICTGDPRatio attributed to autocorrelation in GDPGrowthRate, it can be linked to marginal decline in the incremental growth rate over time during the period under study. Such decline reduces the negative effect of ICT to GDP ratio on the level of cost recovery. Therefore with a slight autocorrelation between the negative effects reducing parameter, the relationship between the two is likely to change. This is also the case for autocorrelation in ICTGDPRatio. Its effect is to reduce or eliminate the negative effect of ICT to GDP ratio on cost recovery leading to a positive effect.

The variable GDP is positively correlated to the degree of cost recovery. Each unit increase in GDP (in billion $) increased the degree of cost recovery for LAOs by about 0.05 degree. This study concludes that the higher the GDP the higher is the likelihood for cost recovery. This implies that higher economic performance is directly reflected on the financial performance of LAOs. These finding support the view that during economic crisis the GDP figures will be declining thus creating a high degree of uncertainty in the economy. [15] The most probable explanation for this observation could be the possibility that most LAOs rely on the real estate market for revenue generation. The real estate market often booms with the economy and thence more transactions are taking place during economic upswing. These transactions must be registered through which the LAO will generate revenues. If information consumption is lower as a result of higher certainty people place on land service delivery tasks, its negative revenue effect will not offset the positive effect caused by changes in GDP as long as LAOs do not rely on information delivery tasks as a main source of their revenues. Similar to GDP, GDP growth rate is positively correlated to the degree of cost recovery for LAOs. In this case a unit increase in GDP growth rate resulted into a more than a unit increase in the degree of cost recovery (1.8). This mean as the economy booms the financial position of LAOs tend to improve and as the economy falls or experiences retarded

growth LAOs financial positions deteriorates. The observation can be linked to the nature of LAOs as explained above. Most of them seem to rely heavily on the real estate market and hence movement of the economy will be reflected in their financial performance.

Results in Model 1 further show that the higher the inflation rate the higher will be the degree of cost recovery. A unit increase in inflation rate improves the degree of cost recovery by more than one degree. Thus a higher level of inflation rate in the economy will stimulate land information search which will enhance the degree of cost recovery of LAOs in line with pessimistic view of financial crisis. [24] With the introduction of autocorrelation in ICTGDPRatio such relationship changes to negative as shown in Table 3. These contradictory observation means that the negative effect of Inflation rate on the level of cost recovery is only relevant when a particular LAO relies in revenues from information delivery tasks. Such LAOs are rare and in this case autocorrelation for the variable ICT-GDPRatio is almost zero. All other models results suggest that a higher level of inflation rate enhances the degree of cost recovery for the LAO. This supports the view that most LAOs are tied to the economy but lack the necessary mechanism to escape or avoid the negative impacts of economic crises. Considering the above observations that most LAOs still rely on registration tasks to generate revenues, the higher levels of cost recovery realised during periods of higher inflation are in no way related to the increased demand for land information resulting from greater uncertainty associated with inflation. It seems higher

inflation rate is often associated with periods of booms in the economy. That means higher inflation attracts more real estate transactions. These transactions must be registered hence more revenues to the LAOs.

The results in Table 2 also suggest that LAOs under NCR were able to improve their financial positions during the period under study while those under FCR did not. This is a likely scenario as long as LAOs under NCR regime depend on government budget and most government having projected potentials for economic downturn increased spending for the provision of land information products and services. However this was not the case for LAOs under FCR because their revenues seem to have directly responded to the economic downturn thus lower degrees of cost recovery were attained. For these LAOs the period was on average a bad period and was not a worthwhile an option to operate under FCR.

Column 2 and 3 of Table 2 show variation in the degree of cost recovery in the years where there was a global financial crisis as against those where there wasn't. For example in 2007-08 the degree of cost recovery was below average given the effect of the crisis. However even without the introduction of the crisis, it was lower but the crises seem to have magnified it. In 2008 the degree of cost recovery with the effect of the crisis was about 1.4 degrees below average while it was only 0.4 degree below average without such effect. Also with the effect of the crisis in 2007 cost recovery was about 2 degrees below the average while it was only 0.6 degree below average in 2007. In all the remaining years the effect of "nocrisis" has been

Table 2. Cost recovery groups and country specific effect in the LME model

(a) Model 1 results for group variables by years				(b) Model 1 results for group variables by country			
Year	(Intercept)	Year:Crisis	Intercept	Country	(Intercept)	Country: CRmode	Intercept
2009	0.10	2009:crisis	0.35				
2008	-0.41	2008:crisis	-1.39	Australia	-37.30	Australia:NCR	-23.14
2007	-0.56	2007:crisis	-1.89	Czech Republic	-30.62	Czech Republic: NCR	-19.00
2006	0.08	2004:nocrisis	0.27	Netherlands	5.65	Netherlands: FCR	3.51
2005	0.26	2006:nocrisis	0.88	New Zealand	11.04	NewZealand:FCR	6.85
2004	0.11	2005:nocrisis	0.38	United Kingdom	27.97	United Kingdom:FCR	17.35
2003	0.41	2003:nocrisis	1.40	Ireland	23.26	Ireland:FCR	14.43

Table 3. LME modes results for significant parameter effects

	Model 1	t value	Model 2	t value	Model 3	t value	Model 4	t value	Model 5	t value
Autocorrelation information										
Phi1			0.91		0.44		0		-0.65	
Theta1			-0.43		0.99		0.11		-0.43	
Significance of parameter estimates										
Random Effect Variable										
	None		GDPGrowthRate		Inflation Rate		ICTGDP Ratio		GDP	
Intercept	85.01	**1.32**	19.52	**0.28**	93.07	**1.45**	8.08	**0.13**	124.59	**2.13**
Cost	2.57	**0.72**	-0.49	**-0.14**	2.9	**0.9**	3.06	**1.13**	2.9	**0.79**
GDPPerCapita	-0.22	**-0.08**	1.93	**0.89**	0.65	**0.34**	1.5	**0.8**	-2.01	**-1.18**
GDP	0.05	**1.64**	0.05	**1.98**	0.02	**0.93**	0.06	**2.58**	0.05	**1.59**
GDPGrowthRate	0.83	**2.63**	1.39	**1.62**	1.4	**2.07**	2.52	**3.25**	1.98	**3.48**
InflationRate	1.19	**0.91**	0.8	**0.64**	1.54	**1.1**	-0.46	**-0.41**	1.75	**1.52**
ICT-GDPRatio	-3	**-0.56**	3.13	**0.53**	-6.63	**-1.14**	4.15	**0.84**	-3.54	**-0.77**

to improve somehow the degree of cost recovery. These data though of marginal significance still display positive differences in the years without crisis and negative margin for 2007 and 2008 due to the crisis. Therefore cost recovery cannot improve during periods of economic crisis alongside ADB [2]. When the economy was improving in 2009 slightly some LAOs revenues showed a sign of relief. In time of a financial crisis GDP tend to go down. This automatically will reduce the degree of cost recovery for LAOs. If LAOs had a strong information base where information delivery task revenues substantially outweigh registration task revenues, the increased uncertainty during a financial crisis would have caused an increase in their financial position. This is because uncertainty could have caused an increase in demand for cadastral products which in turn would enhance the revenues of the LAO.

Row 5 and 6 of Table 2, display the intercept for the random effect of the variable "Country". The data revealed a "deep" for the Netherlands "Kadaster". This is the only LAO whose cost recovery was closest to the average cost recovery amongst all the LAOs investigated during the period under study. The Australia LAO seems to be far from the average on the negative side having

about 37.3 degrees lower than the average. United Kingdom on the other hand attained the highest difference of about 28 degree of cost recovery above the average. Row 7 and 8 display the intercept for the random effect of the interaction variable "Country:CRmode". The data still show a deep for the Netherlands "Kadaster" but slightly reduced by the mode of cost recovery adopted. It seems that full cost recovery (FCR) mode had on average a negative effect on the degree of cost recovery for the period under study with the exception of Australia and Czech Republic. With the effect of cost recovery mode it seems that LAOs in Australia and Czech Republic have attained higher degrees of cost recovery. This leads to a conclusion that the No Cost Recovery (NCR) was on average favoured in terms of the degree of cost recovery of LAOs during the period under study. [2]

5. Conclusions

From the above observations and discussions it is evident that LAOs implementing some forms of cost recovery face a real challenge in periods of economic downturn. With lower GDP, lower GDP growth rate and higher

inflation LAOs are unlikely to attain 100% cost recovery. Any pricing strategy attempting to increase revenues will increase registration cost which acts as a disincentive to property owners or buyer to register their properties. Thus if the crisis persists for a longer period of time each increase in fee must be followed by a subsequent increase in the previous fee. This creates a crisis fragile environment characterised by declining real estate transactions which forces LAOs to further increase fees and charges. When transactions are very marginal, the cost for the provision or running of the LAO could be borne by only a few individuals in the society. Worse still as the crisis unfold many people's income is eaten up, unemployment increases hence there will be very few people to afford purchase of properties let alone registering them. Therefore it is logical to conclude that high reliance on registration task revenues for the LAO is detrimental to its financial performance and may substantially jeopardise the realisation of intended levels of cost recovery in time of a financial crisis.

Likewise it has been noted that higher levels of inflation rate encourages the realisation of higher degrees of cost recovery. Theoretically higher inflation rate coincides with shorter periods of economic booms while in the long run inflation rate tend to stabilise and skyrocket during a crisis. That however should not directly be translated to mean that LAOs are likely to attain the intended levels of cost recovery during periods of financial crisis. Inflation does not encourage transaction in real estate which is a revenues base for most LAOs but tends to encourage land information transaction which in effect increases the level of cost recovery. However the negative real estate effect might outweigh the positive information delivery effect. Thus based on limited substitutability between registration tasks and information delivery, the net effect of inflation on the degree of cost recovery can be regarded as negative.

Information products are favoured by most of the characteristics of an economic crisis. The crisis will certainly create uncertainties in real estate transactions which will require more land information. With increased demand for land information LAO's revenues improves. The major problem here is rigidity in the cross-substitution between registration tasks and information products delivery. The task of creating an elastic gross revenue schedule for LAOs in response to its main sources of revenue (between land title delivery and information dissemination tasks) can potentially eliminate any prospects for a crisis-riddled LAO. Despite these observations and recommendation, a caveat is in order; the limited data used for this study pose challenges in interpretation of results. Technically a small

number of observations per country/LAO are unlikely to yield good estimates of the within country regression coefficients. [29] However the study examines not only the magnitude but also the direction of effect which can be useful for policy decision on cost recovery for LAOs.

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