

การประยุกต์จากขนาดในองค์กรปกครองท้องถิ่น: กรณีศึกษาสำนักงานเขตกรุงเทพมหานคร

ECONOMIES OF SCALE IN LOCAL ADMINISTRATION: A CASE STUDY OF BANGKOK METROPOLITAN ADMINISTRATION DISTRICTS

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บทคัดย่อ

บทความนี้คือการประยุกต์จากขนาดในการบริหารองค์กรปกครองท้องถิ่นไทย โดยใช้ข้อมูลของสำนักงานเขตกรุงเทพมหานครจำนวน 50 แห่ง ระหว่างปี พ.ศ. 2542-2556 นำมาทดสอบข้อสันนิษฐาน เบื้องต้นว่า ก) จำนวนพนักงานมีความสัมพันธ์แบบเชิงบวกและแบบเส้นตรงกับตัวแปรที่สั่งท่อน ความต้องการบริการสาธารณะ และ ข) รายจ่ายบุคลากรแปรผันแบบเส้นตรงกับตัวแปรที่สั่งท่อน ความต้องการบริการสาธารณะ อีกนัยหนึ่งต้นทุนการบริหารแปรผันเป็นเชิงบวกและเป็นเส้นตรงกับตัวแปรอิสระ ผลการศึกษาพบว่า มีการประยุกต์จากขนาดในกิจการของสำนักงานเขตกรุงเทพมหานครมีแนวโน้มลดลงและกลับเพิ่มขึ้นในภายหลัง ตอนท้ายของบทความเสนอเชิงนโยบายการควบรวมหน่วยงานท้องถิ่นในประเทศไทย ซึ่งคาดว่าจะนำมาใช้ปฏิรูปเทศบาลตำบลและองค์กรบริหารส่วนตำบลที่มีขนาดเล็กและฐานะการเงินไม่เข้มแข็ง ทั้งนี้ผู้วิจัยเสนอว่าควรมีการค้นคว้าวิจัยก่อนและควบคู่กับดำเนินการปฏิรูป

คำสำคัญ: การประยุกต์จากขนาด จำนวนพนักงานต่อประชากร ค่าใช้จ่ายบุคลากร ตัวแปรที่สั่งท่อน ความต้องการบริการสาธารณะท้องถิ่น สำนักงานเขตกรุงเทพมหานคร

Abstract

This paper presents a case study of economies-of-scale in local administration using data from Bangkok Metropolitan Administration Districts (BMADs) based on panel data that comprised of 50 units over the period 1999-2013. Specifically two null hypotheses are empirically tested: i) that the number of staff per 1000 population is positively and linearly related to the proxies for demand for local public services, and ii) that the personnel-related expenditure per capita is positively and linearly related to proxies for demand for local public services. Alternative hypotheses are that the relationships are concave and that the unit cost curves follow a typical U-shaped pattern. A graphical analysis confirms an alternative hypothesis and lends support to an existence of economies-of-scale. The last section discusses policy implication for local amalgamation which is expected to be enforced for some small-sized and financially-weakened municipalities and tambon administrative organizations; anyhow, there should be researches prior to and along with policy reform.

Keywords: Economies-Of-Scale, Unit Cost Curve, Staff Per Population, Personnel-Related Expense, Bangkok Metropolitan Administration Districts

Introduction

There has long been an observation that hundreds of local administrative organization in Thailand are operating inefficiently especially those situated in rural area with small number of residential population—as such these local administrative units are financial weak with small amount of budget for development after the personnel expense. The concerns for local administration operating inefficiently has drawn public attention with the policy recommendation by the Committee for Local Administration under the National Legislation Council that some of local units be enforced to amalgamated.¹ However it is unclear how the amalgamation reform be taken and the reasons behind: local amalgamation, by and large, is based on an intuition that “the bigger is better” or the “bigger is more efficient” or the “bigger is cost effective” or the amalgamation has proven to be successful from experience of other countries.

In this connection, the Bangkok Metropolitan Administration Districts (BMADs) is chosen as our case study to test existence of an economies-of-scale for practical reasons. First, the BMADs has long history² and obviously one of the leading local units that serve more than 5 million people in our capital city and its boundary covers an area of 1,569 square kilometers. The BMADs organizes its administration into two-tiers; the upper tier is administered by the team of BMADs governor and 16 Divisions; the lower-tier refers to Bangkok Metropolitan Administrative Districts (BMADs). The BMADs are assigned responsibilities to collect tax- and nontax revenues, and to perform activities with the budget amount allocated for every districts. Along the balance of power principle, each district has council members who are elected by people³. It maybe safe to say that BMADs have been playing an important role in the provision of local public services that serve over 5 million population in the capital city. Second, the BMAD has developed very well database and allow for public access. It maybe worths mentioning fiscal data that are useful of our case study. On the fiscal side, the database contain revenue data by districts and categorized by item such as i) the land and building tax which is taxation levied on commercial enterprise, hotel, restaurant, rental apartment and factory; ii) *the land development tax* which is levied on agricultural land plots based on the land value and size of land plot⁴; iii) *the signboard tax* which is based on the size of signboard and the languages⁵; and iv) grant money. Regarding

¹ The National Legislation Council was established by the National Peace and Order Maintaining Council in July 2014.

² The Bangkok Administration has long history; in BE25440 (1897) under the King Rama V, it was established as Sukhaphiban to provide basic local government functions. Later on, the Municipality Act was enacted in BE2476 (1933) which led to an establishment of the Bangkok Municipality and the Thonburi Municipality. In BE2518 (1975) an administrative reform was taken through a unification of the Bangkok and the Thonburi municipalities united into one entitled the Bangkok Metropolitan Administration. Ten years later a law amendment which involved a reform of districts, then the number of district was 24.

³ The last election of District Council Members were taken in 2013. Of the total number of 256 members; 210 members are associated with the Democratic Party, 39 with the Peua Thai Party, and 7 independent local politician. After the military took over the executive power, all forms of political election are temporarily not permitted.

⁴ The tax rates are varied with an increasing rates at start, and later on, decreasing.

⁵ The signboard with foreign language(s) is normally higher than that of Thai language.

the budget data, the BMAD accounting system categorizes spending into items such as wage and salary, personnel compensation, construction cost and investment, etc. Two variables of interest in this case study are: the number of employment (staffs) and the personnel-related expense. We formulate two null hypotheses that [A] the number of BMADs staff correspond linearly to the proxies for demand for local public services and that [B] the personnel related expense is linearly correlated to the proxies of demand for local public services. If so, then we shall conclude in favor of constant returns and constant unit cost; if otherwise the functional forms proven to be concave, then we shall expect decreasing unit cost and an economies-of-scale is applicable for the Bangkok Metropolitan Administration.

It may be worthwhile to mention statistics related to BMADs manpower and their budget data to realize an importance of the case study: a) On average, each district hires 805 staff members to serve people needs, the number of staff, of course, vary from one district to another, the number of staff ranged from 570 to 1273 according to the fiscal budget year of 2013; b) In total 50 districts employed 40,242 staff members; c) All districts are delegated power to collect taxes and fees—in total the own-revenue collection by 50 districts amounted to 11.1 billion Baht according to the fiscal budget year of 2013.

Our paper is organized into 5 sections as follows: Section I an introduction and followed by Section II in which a notion of economies-of-scale discussed and its linkage with cost curve and a brief review of literature are discussed. Section III describes the unit of analysis and definition of terms or variables that are used in econometric model with a highlight on personnel cost and staff member per 1000 population. Section IV discusses the policy for local consolidation but warns that there should be empirical evidences with the cases of municipality and tambon administrative organizations and further studies after consolidation taken place. Section V concludes.

Research Questions and Methodology

Economies-of-scale is a widely known concept in economics and practically adopted in all business enterprises. The relationship can be expressed in terms of production in relation to the use of factor of production or alternatively can be expressed as cost versus output. The cost curve is frequently used to illustrate the case—in the normal case, a cost curve follows the U-shaped pattern. In the nutshell, the unit cost tends to decrease along an expansion of scale of operation in the first phase due to a falling in the average fixed cost; the unit cost reaches a minimum which is perceived to be optimal; beyond this level the unit cost tend to increase due to rapid increase of variable cost. It is commonly believed that the notion of cost is taken seriously by business enterprises especially those operate in competitive atmosphere. It is, however, not clear that the managers of public agencies (such as municipalities) has taken cost or efficient scale of operation into consideration as in the cases of business enterprise. It is simply because the public agencies are driven by bureaucratic rules, custom, or convention inherited from the past. The BMADs and municipalities have planned to utilize annual budget for activities and functions with the revenue from 3 sources: i) own revenue from tax and nontax; ii) shared taxes; and iii) intergovernmental grant. The amount of budget for the current year tends to be explained by “an incremental rule”

The Context of Thailand's Local Administration

Local administration in Thailand has undergone big transformation over the past two decades (1992-2012). This was driven by two enactments, namely, the Constitution of 1997 and the Decentralization Act of 1999. An interesting study by the team from Chulalongkorn University led by Wirasak Khruathep (2015) and commissioned by the Decentralization Office entitled "Fifteen Years Experience of Decentralization in Thailand" summarizes major achievements of local governance in extension and improved quality of local public services. Structurally speaking, local authorities comprise 7,853 units and divide into 3 types. First, the provincial administrative organizations which is to be referred as the first tier and their responsibility cover the whole provincial area. The second tier, local administration comprise the municipality and the Tambon Administrative Organization whose responsibilities are limited by boundary with in a province. Two special organizations are the Bangkok Metropolitan Administration (BMA) and the Pattaya City. All executives and local councils are in generally elected by people, except for the Pattaya City which is modeled after the American appointed and professional manager. The third type is a special-status organization comprises of 2 units, namely, the Bangkok Metropolitan Administration and the Pattaya City Administration.

Each local authority has its own budget with the revenue that are generated from 3 sources, namely, its own revenue, shared taxes, and intergovernmental grant. All local authorities adopt an annual budget and follow the 'local budgetary cycle' monitored by the Department of Local Administration (DLA), the Ministry of Interior. The budget audit process comprises an internal audit and an external audit, a common practice of government agency. An external and ex post budget audits are performed by the Office of Auditor General (OAG) supervised by the Board of Audit whose members are appointed by the Parliament.

Review of Literature

There exists an extensive research on topics optimal size of local government and whether or not economies-of-scale is relevant for local administration. A study by Callanan, Murphy and Quinlivan (2014) notes that the majority of people tend to adopt an intuitive view that "bigger is better" "bigger is cheaper" or "bigger is more efficient". They noted that this assumption has been extended to political discussion and media commentary with little evidences to support their views. They took case study of local merge that took placed in early 2000s and resulted in a reduction of local units from 114 to 31; specifically they examined local expenditure by selected items, such as, housing maintenance, overhead expenditure, and information technology expense against population size or housing stocks. Their conclusions are summarized: [A] Ireland which is a small country has relatively few local authorities and the size are large by international standards; [B] local government services are by and large labor intensive, hence, the potential gain from merging is unlikely to be significant. [C] economies-of-scale might be applicable for specialized services and overhead expense but not across the board. [D] they remind that amalgamation or merging of local authorities involves transformation cost and the probability of diseconomies-of-scale. Yaniv Reingewertz (2012) presented a case studies based on a panel data of Israel municipalities between 1999-2007. They reported that amalgamation actually reduced municipality expenditures by 9% and that did not affect the quality of service provision—in their words "*municipal amalgamation do bring economies-of-scale into practice*".

Sampaio De Sousa (2005) applied the technique called data envelopment analysis (DEA) to a case studies of nearly five thousand units of Brazilian municipalities in which they reported: a) that the computer usage in municipal administration had increased efficiency markedly; b) that urban municipalities tend to perform more efficiently than the rural counterparts; c) that there was evidence of excess spending in those local units that enjoyed higher revenue from royalty fees; d) that there was evidence of economies of scale when the number of population increases.

In Germany, Fritz and Feld (2015) studied municipal amalgamation in the state of Baden-Wurttemberg in early 1970s and reported that i) municipal amalgamation created a common pool effect in the sense that the common pool resources were utilized intensively when more numbers of municipality participated and when municipalities were amalgamated by annexation, ii) and that the number of voter turned out to be lowered in the amalgamated municipalities. Holcombe and William (2008) took a case study of 487 municipalities with population exceeding 50,000 people in the United States. They report that at first it seems to be diseconomies-of-scale. After careful study of municipal expenditure and the degrees of population density accounted for, the cost structure follow a constant returns to scale.

Dur and Staal (2008) studied local consolidation in the United States and tried to link with motivations for consolidation by large-sized and small-sized municipalities. Their findings are summarized: First, municipalities with a large difference in predicted costs between the original and merged municipalities are likely to consolidate. The efficiency gains from consolidation are a key impetus for decision-making. Second, large municipalities agree to merge because they would be a decisive voter, whereas small municipalities anticipate that the consolidation would help solve financial difficulties caused by declining birthrate and aging population. Third, larger unconditional grants before consolidation weaken incentive for consolidation.

Morikawa (2011) took a study on personal service industry in Japan which included municipalities. They reports that economies of scale and economies of density are observed, and that productivity increases by 7% to 15% when the municipality population density doubles.

Empirical Evidences

The unit of analysis in our study refers to 50 BMADs and they can be grouped under 3 zones, namely, the inner districts, the middle ring districts, and the outer ring districts. Two variables of attention are: i) the number of staff members per 1000 population; and ii) the per capita spending on personnel (wages and salaries plus personnel compensation). They are referred as dependent variables and hypothesized that they are positively and linearly related to proxies for local public services. In symbol:

$$(1) \quad S_{it} = f \{ \text{proxy for demand for BMAD services} \} \\ = f (N_{it}, H_{it}, B_{it}, z_i)$$

Where

S = staff member per 1000 population

N = population in the i^{th} district

H = housing stock in the i^{th} district

B = business enterprise in the i^{th} district

Z = other variables

(2)---

$$E_{it} = g(\text{proxy for demand for BMAD services}) \\ = g(N_{it}, H_{it}, B_{it}, z_i)$$

where

E = wages and salaries plus personnel compensation (e.g., bonus, overtime payment) per capita

 i = district code t = period

Table 1 displays statistics (as of 2013) of population, housing stock which are presumed to represent proxies for the demand of BMAD public services. The District's staff members seems to vary along population and housing stock. The majority of districts have resident population in the range of 100000-200000 people; there are however 8 districts whose resident population less than 100000 people. Housing stock and population seem to be very well correlated with population size (the correlation coefficient of 0.8). The number of BMADs' staff and the population size are positively correlated but not as strong as the house and the population size (the correlation coefficient of 0.3)

Table 1: Housing Stock, Population and BMADs' Staff Statistics (as of 2013)

Population size	Freq.	Population	House	Staff
Less than 50000	2	36,523	20,015	649
50001-75000	6	62,754	29,025	869
75001-100000	13	86,647	43,431	714
100001-200000	29	141,734	62,588	843
Total	50			

Source: Bangkok Metropolitan Administration

In Table 2 presents descriptive statistics of the selected variables of interested: On average and over the whole period, the population size averaged 113,955 people with the housing stock of 43,643, and staff member 779 per district. BMADs' expenditure averaged 228 million Baht of which the personnel-related expenditure was 142 million Baht per district, which accounted for 62 percent of the total expenditure.

Table 2: Staff Members And Personnel Expenditure

Variable	Observation	Mean	Std. Dev.	Min	Max
Population size	750	113,955	36,431	26,932	193,478
Housing stock	750	43,643	16,323	13,183	96,304
Staff member	750	779	144	489	1,278
Personnel expense	750	141,564	50,655	35,894	351,893
Total expense	750	227,625	93,967	80,692	547,593
Population density	750	7,476	5,858	373	39,670

Source: Bangkok Metropolitan Administration

Unit: population: person
 housing stock: number of housing
 staff members: person
 personnel expenditure: thousand baht
 total expenditure: thousand baht
 population density: person per 1 square kilometer

Since sizes of district can vary widely, it is better to normalize by population for comparison sake. Two variables of our interest are: i) staff member per 1000 population, and ii) per capita personnel expenditure. It is reasonable to first take a look at their distributions. The staff per 1000 population averaged 8.2 with wide range from 3.4 to 21.3. The per capita personnel expenditure averaged 2,265 Baht per population with the minimum of 1,099 and the maximum of 5,738.

Table 3: Statistics Of Dependent Variables as of 2013

Statistics	staff member per 1000 people	per capita personnel expenditure unit: baht per person
Mean	8.20	2,265
SD	3.95	962
Min	3.39	1,099
Max	21.33	5,738
Percentile 10	4.73	1,361
Percentile 25	5.65	1,671
Percentile 50	7.03	2,017
Percentile 75	9.15	2,465
Percentile 90	13.59	3,466

Source: Bangkok Metropolitan Administration

Table 4 compares statistics over 15 years (BE2542 to BE2556) and take not salient changes. The total expenditure of all BMADs had risen from 6.3 billion Baht in BE2542 (about three times) to 17.5 billion Baht in BE2556 whereas the personnel-related expense from 3.9 to 11.3 billion Baht. Population size, however, has been stabled at about 5.6 million people—but the housing stock noticeably increased from 0.188 to 0.259 million unit. We do not quite sure why this happened, it might be the cases that: i) family size is getting smaller through child separation from parent; ii) some families might have acquired new home in the middle-or outer-ring for more space or better environment but retain homes or apartment in the inner zone; and iii) due to higher demand for apartment or condominium from influx of tourists the supply responded.

Table 4: BMADs Important Statistics Over 15 Years

Year	Total expenditure million Baht (sum)	Personnel expense million Baht (sum)	Staff (sum)	Population (sum 1000 unit)	house (sum 1000 units)
2542	6,276	3,856	37,892	5,662	188
2543	7,048	4,410	37,403	5,680	190
2544	7,300	4,988	37,231	5,726	194
2545	7,726	5,205	37,646	5,782	196
2546	8,153	5,423	38,114	5,743	202
2547	8,580	5,640	37,711	5,634	205
2548	8,869	6,156	38,738	5,659	209
2549	9,360	7,054	39,089	5,696	215
2550	11,900	7,298	39,812	5,669	221
2551	14,000	8,682	40,046	5,706	226
2552	15,700	8,844	40,231	5,703	233
2553	15,100	9,063	39,690	5,701	240
2554	16,500	7,860	39,879	5,675	245
2555	16,700	10,400	40,234	5,674	249
2556	17,500	11,300	40,242	5,686	259

Source: Bangkok Metropolitan Administration

Figure 1 illustrates a distribution of staff member per 1000 population that ranges from 3 to 10 staffs—there are extreme cases with staff members exceed 15 person but that is only a small portion.⁶

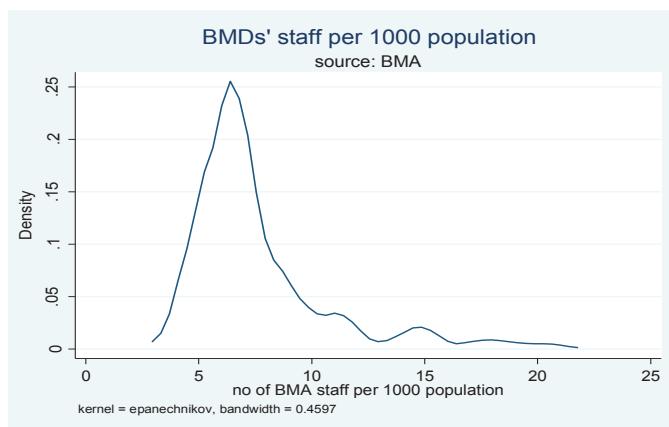


Figure 1: Distribution Of Staff Member Per 1000 Population

⁶ There were 10 districts in which the staff-population ratio are relatively high--these refer to districts situated in inner-circle namely Phranakorn, Samphanthavong, Patumwan, Bangrak, and Pomprabsatupai perhaps due to special responsibility regarding cultural heritage, old market place and old government offices.

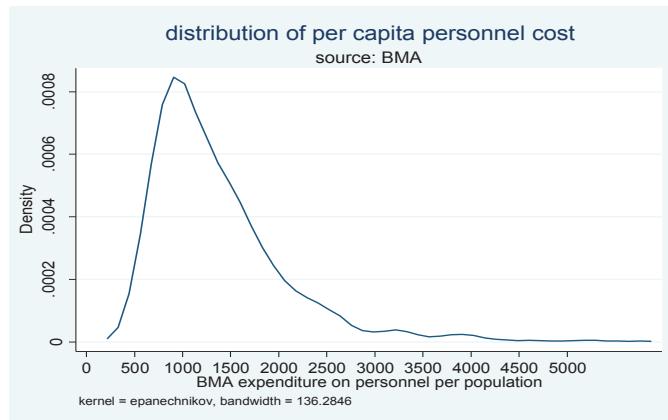


Figure 2: Distribution Of Per Capita Personnel Expense

Table 5 presents the regression estimate in which the staff (in natural logarithm) fitted against the proxies for BMADS' demand for local public services (also in natural logarithm). The estimated coefficients are known in economic textbooks as elasticities. The coefficients for population size, housing stock and population density are positive and statistically significant although the latter coefficient is clearly larger. Next, a test whether the sum of coefficient are equal to unity or not. According to Table 5, the sum of coefficients is equal to 0.33 which is clearly less than unity and this indicate a tendency that staff member per population increase at decreasing rate along the proxies for demand for local service.

Table 5: Regression Estimate: Staff Member Per 1000 Population (equation 1)

Robust regression				
Log of staff	Coefficient	Std. Err.	T	P>t
Population, log	0.070	0.028	2.510	0.012
House, log	0.185	0.027	6.770	0.000
Density, log	0.072	0.007	9.930	0.000
Constant term	3.222	0.208	15.480	0.000
test: the sum of 3 coefficients = 1				
F(1,746) = 1174.45				
Prob > F = 0.0000				
statistical goodness of fit				
R-square = .215				
AICR = 724.0				
BICR = 744.3				

Source: Bangkok Metropolitan Administration

Note: Inpop = natural log of population
 Lnhouse = natural log of housing stock
 Lndens = natural log of population density

Next, the estimate for equation 2 in which the personnel-related expense (in natural logarithm) is tested against proxies for BMADs' demand. Of notes are: i) housing stock and number of signboard (which is a proxy for business enterprises) are positively related to the dependent variable; and ii) to our surprise, the population density seem to vary negatively with the personnel expense per capita. The test for sum of coefficients, again, suggests that we should reject the constant cost and conclude in favor of economies-of-scale.

Table 6: Regression Estimate For Equation 2 : Personnel Expense Per Capita

Robust regression				
Number of observation	=	750		
F(3,746)	=	116.35		
Prob > F	=	0		
Log of personnel expense	Coef.	Std. Err.	T	P>t
House, log	0.373	0.032	11.750	0.000
Density, log	-0.065	0.020	-3.260	0.001
Signboard, log	0.332	0.028	11.760	0.000
Constant term	12.880	0.395	32.630	0.000
test: the sum of 3 coefficients = 1				
F(1,746)	=	81.94		
prob > F	=	0		
R-square	=	0.289		
AICR	=	564.7		
BICR	=	585.6		
Deviance	=	60.3		

Source: Bangkok Metropolitan Administration

Note: Inpop = natural log of population

Lnhouse = natural log of housing stock

Lndens = natural log of population density

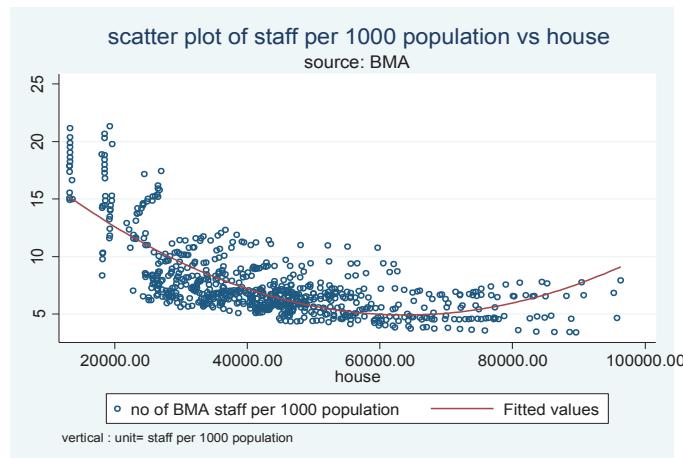


Figure 3: Scatter Plot Of Staff Members Per Population VS Housing Stock

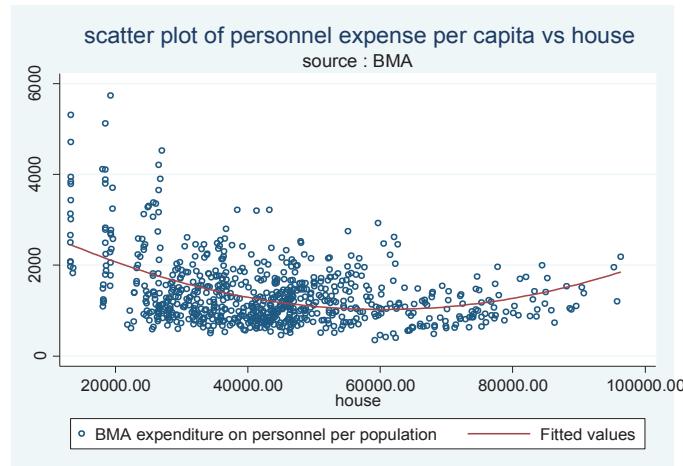


Figure 4: Scatter Plot Of Personnel-Expense Per Capita VS Housing Stock

Discussion

Our findings clearly indicate an existence of economies-of-scale for the case of Bangkok Metropolitan Districts, yet, it is premature to assume that economies-of-scale prevail in the cases of municipalities or the tambon administrative organizations. The methodology as used in our case study maybe apply to study other case studies, especially those small-sized local administration along with the program to implement local amalgamation which has received wide public attention. It is also important that we take into consideration of the cultural background and residential population. The potential gain from local amalgamation has been confirmed in many studies in other countries and also in this case study.

Conclusion

This paper presents a case study of Bangkok Metropolitan Administration Districts to test hypothesis of constant returns or otherwise. The unit of analysis in this study refers to 50 Bangkok Metropolitan Administration Districts over 1999-2013. Two equations are estimated using the panel regression techniques: i) BMAD staff member per 1000 population and ii) BMAD personnel-expense per capita. Both are assumed to vary positively and linearly with proxies for demand for local public services. The robust regression method was applied to estimate elasticities (or responsiveness) and the coefficients are tested whether they are summed to unity (i.e. the constant cost). Our estimate lends strong support in favor of economies-of-scale for the Bangkok Metropolitan Administration Districts. Policy discussion on the issue of local amalgamation which is currently an issue for national policy reform is offered and in which we assert that the same methodology could be applied to estimate potential gains from local amalgamation.

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6 วิทยาลัย และ 6 คณะที่ตอบโจทย์อนาคต

**วิทยาลัยบริหารธุรกิจนวัตกรรมและการบัญชี
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