

A STUDY ON THE PERFORMANCE OF LABOUR OUTSOURCING IN THE PUBLIC SECTOR

Hong-Cheng Liu*

Department of Public Policy and Management, I-Shou University, Taiwan

Abstract

Governments in many countries are gradually adjusting their traditional concepts and committing private businesses to conducting governmental business and services in order to achieve economic and operational goals and to introduce more dynamic technologies from private organisations for better financial flexibility. With a freely competitive mechanism in private markets, the quality and efficiency of public services could be effectively promoted in order to enhance economic benefits. Using data from garbage clean-up outsourcing in various districts under the 2008-2010 Environmental Protection Bureau, Kaohsiung City Government, the Data Envelopment Analysis (DEA) and the Malmquist Productivity Analysis were combined to measure the total efficiency (TE), pure technical efficiency (PTE), and scale efficiency (SE) of the garbage clean-up services in 11 districts in Kaohsiung City to provide follow-up information on the garbage clean-up outsourcing initiative of the Environmental Protection Bureau, Kaohsiung City Government. The empirical results for overall efficiency show that optimal total efficiency was reported in the Hsin-hsing District (0.99), optimal pure technical efficiency in the Hsin-hsing District (0.99), and optimal scale efficiency in the San-min District (1.00).

Key words: public sectors, Data Envelopment Analysis, labour, outsourcing, pure technical efficiency, scale efficiency, performance, decision-making units

JEL: H000, M100

1 Introduction

With economic development and the enhancement of economic awareness, the desire of the public is to see that the service provided by the government is multifaceted in scope and quality. One of the facets of this service is dealing with the garbage clean-up problem (closely related to public living). This has become a complicated issue. There have been numerous instances in Western countries and Japan where garbage clean-up outsourcing is practiced to simplify government functions, saving personnel expenses and enhancing service quality and efficiency. According to a survey carried out by the Japanese Ministry of Home Affairs, about 40 per cent of garbage clean-up is outsourced to the commercial sector and the expenses are merely one-third of the expenses when this function is managed by the public sector. When garbage clean-up services were outsourced in Wandsworth, England, savings on personnel and service expenses amounted to about 44 per cent.

About 80 per cent of the garbage in the USA is cleaned up by the commercial sector, thereby trebling efficiency. Privatisation of garbage clean-up in Canada saves more than 30 per cent of the expenses incurred when this function is managed by the public sector.

Since 1991, Taichung Ching-shui, Nantou Puli, Miaoli Xihu, Miaoli Toufen, Miaoli City, Chunan City, Taichung City, Hsinchu City, and Tainan City in Taiwan have all had experience of garbage clean-up outsourcing. Taichung City, Hsinchu City and Tainan City implemented outsourcing in 2000 and achieved favourable efficiency and service quality. As a result, the Environmental Protection Bureau of the Kaohsiung City Government decided to implement outsourcing in some districts with the objective of reaching environmental protection policy goals. With industrialization, Kaohsiung City represents a typical pattern of metropolitan living. There is a rapid flow of population and exchange of information; traffic flows are heavy. Sustainable development concepts, including modern waste treatment and environmental ecology creation and waste

treatment for renewable energy, have been implemented. Nevertheless, the government cannot increase the number of cleaners and vehicles in such a short period of time because there is a policy of downsizing and a shortage of financial resources. Pressure on public services is increasing, but the bureaucracy cannot effectively respond to the demands of the public, which considers the quality and effectiveness of government services inadequate. The enhancement of environmental awareness has meant that public requirements in respect of the scope and quality of government services have increased, resulting in an expansion of executive and operational manpower, high personnel expenses and social and public comments. In addition to the restrictions imposed by the downsizing policy and the shortage of financial resources, Kaohsiung City Government also faces the dilemma of increasing environmental work. Satisfying public expectations and promoting overall environmental quality has become a major objective for the Kaohsiung City Government.

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Literature review

2.1 Labour outsourcing

Labour outsourcing refers to an organisation's selecting some or all functions other than those that affect its score competitiveness for external suppliers to execute so that the organisation can concentrate on the most precise and valuable activities and commit the rest of the business functions to external suppliers (Quinn, 1999). In other words, outsourcing where external private groups provide internal services has become one of the most popular innovations that has been applied on a large scale to enterprises and government organisations for years. For organisational functions not related to core competitiveness, Quinn (1992) argued that labour outsourcing is not a critical strategy or an activity with special benefits. Labbs (1993) considers outsourcing to be trusting necessary functions for organisational operation (non-core parts) to external service providers on contract. Lu (2001) regards labour outsourcing as transferring the continuous management of a certain labour service to a

third party in terms of a service agreement. Fong (2009) regards outsourcing as part of organisational management where the relative assets are managed by external suppliers at a price agreed by both parties (with provisos). F.G. Maurice (1999) considered labour outsourcing in terms of a contract as the allocation of some organisational activities and decisions to an external supplier for execution. Handy says in *The Elephant and the Flex: Looking Backwards to the Future* in 2001 that an organisation is like an oxalis which is composed of three leaves: (1) core work team, (2) contract workers, and (3) flexible labour in an organisation. Chen (2009) considers labour outsourcing to be an obvious improvement when the organisation appears to be showing poor operating performance and showing low value (e.g. in physical work).

2.2 Labour outsourcing performance

The success of labour outsourcing relies on the ability of an organisation to exercise control (Charles & James, 2000). Each section in an organisation has to engage in mutual negotiation and cooperative functions when selecting external suppliers, signing contracts, transferring labour services, controlling the quality of labour services and managing prices in order to fulfil the original purpose of labour outsourcing and reap the benefits. Corbett (1996) and Rendon (2002) mention that a correct and suitable external supplier with competitiveness should be selected for labor outsourcing. When selecting external suppliers, a contract agreement is necessary in order to reduce the amount of supervision required afterwards. Lin (2009) says that the key factors in evaluating labour outsourcing performance in the construction industry are quality, costs and time effectiveness. After researching labour outsourcing of governmental sectors, Dehoog (1984) proved that strong professional ethics and the capability of external suppliers were the key factors in the success of actual outsourcing performance and the achievement of a satisfactory standard. Niimura Satoshi (2010) proposes the following three elements for labour outsourcing contracts: 1. Quality assurance requires the technical quality of all operations to be achieved. 2. Appropriate price refers to achieving the desired quality at a

price below the target price. In other words, when the quality and price have been agreed upon at the lowest contract cost, the required quantity and quality may be completed before the delivery date. Gilley and Rasheed (2000) studied the effects of the items and organisational strategies for labour outsourcing and environmental change on the labour outsourcing performance and found correlations with the strategies and environmental change, rather than with the items themselves.

2.3 Data envelopment analysis

Data envelopment analysis, proposed by Charnes, Cooper and Rhodes (1978), is a performance evaluation approach which mainly evaluates efficiency by means of the model that estimates the production frontier using a non-parametric approach proposed by Farrell (1957) (i.e. estimation with non-default functions replacing traditional default functions). Taking Pareto optimality as the definition of efficiency, the other benefits would not suffer, no matter how the resources were re-allocated in order to make higher profits. Charnes, Cooper and Rhodes further expanded DEA to a multiple evaluation with several inputs and outputs in the constant returns to scale, (i.e. they applied the measurement with various inputs and outputs to the performance evaluation). As DEA acquires the production frontier with mathematical models, the comparison between the actual data of various decision-making units (DMUs) and the production frontier could measure the relative efficiency and relative inefficiency of DMUs without default production functions and parameters to achieve the improvement suggestions for relative efficiency. Farrell (1957) proposed the efficiency models of Input Orientation and Output Orientation. The former advocated efficiency evaluations with minimum input, under the current output. The latter compared the efficiency of decision-making units with maximum output, under the restricted input resources. In general, the inputs of profit-making businesses are controlled by the decision-making units, but the output can hardly be controlled because of the restriction on the market commonly imposed by Input Orientation. This study therefore applies DEA with Input Orientation to analyse the operational performance of the

assembly industry. Further applications of DEA are discussed by Cooper et al. (2000).

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Research methods

When using Data Envelopment Analysis to evaluate efficiency, each increased input/output item would reduce the discrimination of the Data Envelopment Analysis. Suppose that there are four inputs and five outputs for twenty input-output ratios. Theoretically, at least two DMUs are required for the discrimination. Golany and Roll (1989) further propose the rule of thumb for Data Envelopment Analysis that the number of evaluated decision-making units should be twice the sum of the number of inputs and outputs.

A total of three input/output variables were selected for this study, and 11 DMUs were strictly selected to ensure that the rule of thumb is adhered to.

All the data on variables are acquired from publicly issued prospectuses and annual reports.

The definitions of the variables are given below.

I Input variable

- 1 Number of employees: the sum of the employees
- 2 Operating costs: expenditure on labour services for the Environmental Protection Bureau

II Output variable

Volume of garbage clean-up: the volume of garbage delivered to rubbish disposal stations

3.1 Empirical analysis

3.1.1 Analysis of relative efficiency

Table 1 shows the relative efficiency of the districts in Kaohsiung City. The average total efficiency in the three years was 0.90; Hsin-hsing District recorded the optimal total efficiency (0.99) in 2003, followed by San-min District and Chien-chin District (0.98), and Nan-tzu District exhibited the worst (0.78). San-min District and Hsin-hsing District reported the optimal total efficiency (0.99) in 2004 and Nan-tzu District had the worst (0.79). Apparently, the Hsin-hsing District achieved the best total efficiency in the three years, while the Nan-tzu District reported the worst.

Table 1
Relative efficiency of the districts in Kaohsiung City

District in Kaohsiung City	Total efficiency	Pure technical efficiency	Scale efficiency
Yen-chen District	Average in 2008	0.96	0.90
	Average in 2009	0.96	0.90
	Average in 2010	0.96	0.91
	Three-year average	0.96	0.90
Ku-san District	Average in 2008	0.80	0.82
	Average in 2009	0.81	0.80
	Average in 2010	0.80	0.81
	Three-year average	0.81	0.81
Tso-ying District	Average in 2008	0.92	0.89
	Average in 2009	0.92	0.89
	Average in 2010	0.91	0.88
	Three-year average	0.92	0.89
Nan-tzu District	Average in 2008	0.78	0.83
	Average in 2009	0.79	0.84
	Average in 2010	0.79	0.84
	Three-year average	0.79	0.84
San-min District	Average in 2008	0.98	1.00
	Average in 2009	0.99	1.00
	Average in 2010	0.99	1.00
	Three-year average	0.99	1.00
Hsin-hsing District	Average in 2008	0.99	0.94
	Average in 2009	0.99	0.92
	Average in 2010	0.99	0.93
	Average in three years	0.99	0.93
Chien-chin District	Average in 2008	0.98	0.90
	Average in 2009	0.98	0.91
	Average in 2010	0.97	0.91
	Three-year average	0.98	0.91
Ling-ya District	Average in 2008	0.88	0.96
	Average in 2009	0.89	0.94
	Average in 2010	0.89	0.95
	Three-year average	0.89	0.95
Chien-chen District	Average in 2008	0.90	0.97
	Average in 2009	0.91	0.95
	Average in 2010	0.91	0.96
	Three-year average	0.91	0.96
Chi-chin District	Average in 2008	0.82	0.74
	Average in 2009	0.83	0.76
	Average in 2010	0.83	0.75
	Three-year average	0.83	0.75
Hsiao-kang District	Average in 2008	0.83	0.86
	Average in 2009	0.84	0.85
	Average in 2010	0.84	0.86
	Three-year average	0.84	0.86
Total	Average in 2008	0.89	0.89
	Average in 2009	0.90	0.89
	Average in 2010	0.90	0.89
	Three-year average	0.90	0.89

The average pure technical efficiency in the three years was 0.88. Hsin-hsing District achieved the optimal pure technical efficiency (0.99) in 2003, followed by Chien-chin District

(0.97), and Nan-tzu District had the worst (0.74). Hsin-hsing District achieved the optimal pure technical efficiency (0.99) in 2004 and Hsiao-kang District showed the worst (0.76). Further, Hsin-hsing District displayed the best pure technical efficiency in the three years, while Hsiao-kang District and Nan-tzu District recorded the worst.

The average scale efficiency in the three years was 0.89. San-min District achieved the optimal scale efficiency (1.00) in 2003 and Chi-chin District had the worst (0.74). San-min District showed the optimal scale efficiency in 2004 (1.00) and Chi-chin District had the worst (0.76). Apparently, San-min District demonstrated the best scale efficiency for the

three years, and Chi-chin District the worst.

3.2 Sensitivity analysis

In this study, the input and output variables were gradually deleted for the DEA so as to investigate the sensitivity of efficiency to such changes. When the gross fixed assets and the volume of garbage clean-up were deleted from Table 2, two relatively efficient DMUs still remained, showing that two such variables had little effect on efficiency. When the number of employees and costs were deleted, the number of relatively efficient DMUs was reduced, which reflects the importance of these two variables in that they are able to affect the relative efficiency evaluated by the DEA.

Table 2
Sensitivity analysis of the deletion of single input and output items

DMU	Original relative efficiency	Deleting number of employees	Deleting costs	Deleting gross fixed assets	Deleting volume of garbage clean-up
Yen-chen District	0.96	0.90	0.91	0.87	0.94
Ku-san District	0.81	0.80	0.80	0.76	0.77
Tso-ying District	0.92	0.90	0.88	0.85	0.82
Nan-tzu District	0.79	0.77	0.73	0.74	0.76
San-min District	1.00	0.96	0.95	1.00	1.00
Hsin-hsing District	1.00	0.98	0.98	1.00	1.00
Chien-chin District	0.98	0.94	0.95	0.88	0.90
Ling-ya District	0.89	0.86	0.82	0.85	0.84
Chien-chen District	0.91	0.87	0.87	0.82	0.83
Chi-chin District	0.83	0.78	0.76	0.79	0.81
Hsiao-kang District	0.84	0.80	0.74	0.81	0.80
Number of efficient DMUs	2	0	0	2	2

Data source: Own results

3.3 Analysis of slack variable

According to Table 3, the relative efficiency could be achieved by reducing the number of employees by 1 per cent in the Yen-chen District, by 1 per cent in the Tso-ying District, by 2 per cent in the Nan-tzu District, by 1 per cent in the Chien-chin District, by 2 per cent in the Ling-ya District, by 1 per cent in the Chien-chen District, and by 3 per cent in the Hsiao-kang District. Relative efficiency could be achieved by increasing the costs by 2 per cent in the Hsiao-kang District, by 1 per cent in the Ling-ya District, and by 2 per cent in the

Chien-chen District.

Relative efficiency could be achieved by reducing the gross fixed assets by 2 per cent in the Tso-ying District, by 3 per cent in the San-min District, and by 1 per cent in the Chi-chin District. Relative efficiency could be achieved by increasing the volume of garbage clean-up by 2 per cent in the Ku-san District, by 1 per cent in the Tso-ying District, by 6 per cent in the Nan-tzu District, by 1 per cent in the Ling-ya District, by 1 per cent in the Chien-chen District, and by 3 per cent in the Hsiao-kang District.

Table 3
Improvement of the districts in Kaohsiung City

Decision-making unit (DMU)	Improvement in input item			Improvement in output item
	Number of employees	Costs	Gross fixed assets	Volume of garbage clean-up
Yen-chen District	-1	-2	0	0
Ku-san District	0	0	0	2
Tso-ying District	-1	0	-2	1
Nan-tzu District	-2	0	0	6
San-min District	0	0	-3	0
Hsin-hsing District	0	0	0	0
Chien-chin District	-1	0	0	0
Ling-ya District	-2	-1	0	1
Chien-chen District	-1	-2	0	1
Chi-chin District	0	0	-1	0
Hsiao-kang District	-3	0	0	3

Data source: Own results

4

Conclusions and Suggestions

Based on the survey of the 2008-2012 garbage clean-up outsourcing performance of the Environmental Protection Bureau, Kaohsiung City Government, a total of 11 districts were analysed on the basis of garbage clean-up performance with the aid of Data Envelopment Analysis. According to the research results, Hsin-hsing District in Kaohsiung City achieved optimal efficiency in the four years, with a total efficiency and pure technical efficiency that surpassed those of the other districts. This is possibly because Hsin-hsing District is the first district to have implemented garbage clean-up outsourcing. Before then, the Environmental Protection Bureau, Kaohsiung City Government, sent representatives to inspect and learn from Taichung City and Tainan City about the feasibility reports, and held forums with relevant sections and the leaders of towns and villages conducting such businesses. They also formulated a trial plan in Hsin-hsing District

and strove to gain the support of elected representatives, local citizens and internal staff. They drafted the contract for outsourcing, and thoroughly communicated and propagated this initiative by dealing with any questions. During the planning process, the schedule control appointed the Hsin-hsing District to promote garbage clean-up outsourcing.

Based on research analyses, Hsin-hsing District has identified the following characteristics for successful garbage clean-up outsourcing. (1) The residences in the Hsin-hsing District were concentrated and the volume of garbage to be cleaned up was moderate. The short distance to the Xichingpu rubbish disposal station reduced the costs and the businesses showed greater willingness to bid for the contract. (2) The development of the Hsin-hsing District is almost complete and the volume of garbage is stable. Moreover, it is situated in a business district where there are less harmful and toxic wastes. (3) The area of Hsin-hsing District is small with a definite boundary and the clean-up business is easily supervised.

Acknowledgments

The author would like to thank the National Science Council of the Republic of China for financially supporting this research under Contract No. NSC: 102-2410-H-214-008.

The authors are grateful to the valuable comments made by the reviewers.

*CORRESPONDING AUTHOR CONTACT
Hong-Cheng Liu, hcliu@isu.edu.tw

References

- CHARLES, L.G. & JAMES, E. 2000. *Inside outsourcing/the insider's guide to managing strategic sourcing*. Naperville: Brealey.
- CHARNES, A., COOPER, W.W. & RHODES, E. 1978. Measuring the efficiency of decision making units. *European Journal of Operational Research*, 2(6):429-444.
- CHEN, JIA-RONG. 2009. A study on outsourcing management mechanism-CHT as an example. *Sun Yat-Sen Management Review*, 2(3):42-73.
- COOPER, W.W., SEIFORD, L.M. & TONE, K. 2000. *Data envelopment analysis: a comprehensive text with model, applications, references and DEA-solver software*. Kluwer Academic.
- CORBETT, M.F. 1996. Outsourcing as a strategic tool. *Canadian Business Review*, 23(2):14-16.
- DEHOOG, R.H. 1984. *Contracting out for human service*. State University of New York Press.
- FARRELL, M.J. 1957. The measuring of productive efficiency. *Journal of the Royal Statistical Society*: 253-281.
- FONG, FENG-LIEH. 2009. Research on the relationship among labor outsourcing management, job satisfaction. *Management Magazine*, 298:66-71.
- GILLEY, K.M. & RASHEED, A. 2000. Making more by doing less: an analysis of outsourcing and its effects on firm performance. *Journal of Management*, 26(4):763-790.
- GOLANY, B. & ROLL, Y. 1989. An application procedure for DEA. *OMEGA*, 17(3):237-250.
- LABBS, J.J. 1993. Successful outsourcing depends on critical factors. *Personnel Journal*:51-60.
- LIN, KUN-ZONG. 2009. *A study of outsourcing companies management strategies in the construction industry*. Management Magazine, 293:44-46.
- LU, NA. 2001. Outsourcing mode - how to use external resources to enhance their competitiveness, *Taipei: Business Weekly*.
- MAURICE, F.G. 1999. *Strategic outsourcing: a structured approach to outsourcing decisions and initiatives*. New York: AMA.
- NIIMURA SATOSHI. 2010. Considerations of diversification. *Technology and Training*, 19(4):7-16.
- QUINN, J.B. 1992. Leveraging knowledge and sever ice based strategies through outsourcing. *Intelligent Enterprise, Free Press*:71-97.
- QUINN, J.B. 1999. Strategic outsourcing: leverage knowledge capabilities. *Sloan Management Review*:9-21.
- RENDON, R.G. 2002, World class contracting: how winning companies build successful partnerships in the e-business age. *Project Management Journal*, 33(3):66-67.