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Assessing the performance of co-operatives in Malaysia: an analysis of co-operative groups using a data envelopment analysis approach

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This study assesses the performance of co-operatives in Malaysia by evaluating 56 out of the 70 co-operative groups. The productivity and efficiency of the groups were evaluated in the first- and second-stage analysis by employing the data envelopment analysis and Tobit regression model. Despite the financial and non-financial support by the federal government and perceived significant role played by the co-operatives in the country's development, the findings indicate that the performance of co-operatives have not been satisfactory. Only 19.6% of the groups under study were found to be efficient and the 'big co-operatives' that comprise less than 2% of total co-operatives in the country dominated among the successful ones. The results endorse the general perception that co-operatives in Malaysia are facing challenges necessitating immediate attention.

Keywords: co-operatives; DEA; efficiency; Malaysia; productivity; Tobit regression

1. Introduction

Although co-operatives were first introduced to Malaysia by the British colonial administration 90 years ago, they were not considered as a significant vehicle of economic growth in the national development plans. The primary objective of co-operatives then was to assist people in the rural areas to combat pervasive rural and urban indebtedness (Fredericks 1986). While the economic policies are dominated by neo-Keynesian philosophy, Malaysia believes in free market, focusing on private sector enterprise and since the mid-1980s on foreign direct investment to propel economic growth. Despite greater state involvement in the economy through the introduction of the New Economic Policy (1970–1990) with the twin objectives of eradicating poverty and restructuring of society with very strong identification of race with economic activities, social enterprises such as co-operatives were hardly viewed as one of the mechanisms to spur growth. However, in the Fourth Malaysia Plan (1981–1985), the role of the co-operative movement was recognized by the government as a third sector besides government and the private sector in contributing to the economy (Malaysia 1981). Nonetheless, no serious effort was made to the development of the co-operative sector per se. Post-1997 Asian Financial Crisis (AFC), when private investments plunged (National Economic Advisory Council 2010), the government began to consider co-operatives. However, it took a decade for the government to reform the institutional support for co-operatives by establishing a

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commission, the Malaysia Co-operative Societies Commission (MCSC), in 2008. The objective of the Commission is to ensure the stability and soundness of financial and management operations of co-operatives. However, the following questions remain. How sustainable are the co-operatives? Is the co-operative a suitable institution for development?

Hence, the objective of this paper is essentially to assess the performance of co-operatives in Malaysia. In keeping this objective in perspective, this paper aims to answer the following questions. How efficient are the co-operatives? Which co-operative is the most efficient and productive? What are the factors that influence the performance of co-operatives? The paper is organized as follows. The first section is the introduction, followed by the review of the literature. The third section provides an overview of the co-operative movement in Malaysia, the fourth part discusses the methodology employed in this study, followed by the deliberations on findings in part five; in part six are the discussions, and the final section highlights some theoretical and policy implications.

2. Literature review

Co-operatives are a user-owned, user-controlled enterprise that benefits its members on the basis of use (Zeuli and Cropp 2004). Past research on co-operatives by Birchall and Simmons (2004) had incorporated mutual incentive theory (MIT) in the study of members' participation. MIT stressed on the two social-psychological theories of motivation, namely individualistic and collectivistic values. A member's decision whether to participate or not in the co-operatives is influenced and motivated by considering both the positive (benefits and habits) incentives and the negative aspects (costs and satiation). An interaction between rewards (positive) and risks (costs), depending on the stronger (positive or negative) influence, would determine the member's final decision. Similarly, a member's participation in the co-operatives is driven by (collectivistic values) three variables: shared goals, shared values and sense of community. Birchall and Simmons (2004) conducted the study after a failed attempt in 1997 to demutualize the Co-operatives Wholesale Societies (CWS). Instead, it has led to the merger of the CWS and the Co-operatives Retail Services that formed the CWS Ltd in 2002 and currently is the biggest co-operatives with food retailing, department stores, banking, insurance, automotive sales and building services in Britain. Hence, co-operatives differ from other enterprises in their concept, organizational structure, governance and equity management (Frederick 1997; Zeuli and Cropp 2004).

There are more than 800 million people who are members of co-operatives around the world (International Co-operative Alliance 2010), thus indicating that co-operatives are relevant to the economic and social development of many countries. Various studies on the role of co-operatives in promoting community development and eradicating poverty confirm the importance of co-operatives (Birchall 2003, 2004; Birchall and Ketilson 2009; Birchall and Simmons 2008; Frederick 1997; Zeuli and Cropp 2004). Birchall highlighted the enormous potential of co-operatives in assisting the poor, especially in developed countries, but points out that successes in the developing countries were less evident with the exception of countries that had promoted the co-operative movement intensively.

Opinions regarding supportive public policies, efficiency and performance of co-operatives, however, have been mixed. Porter and Scully (1987) discuss the inefficiencies arising from public resources allocated to co-operatives in the USA. They noted that dairy co-operatives incurred costs (as an economic agent) and created control problems resulting in efficiency losses. Weak property rights structure was observed to be the cause of inefficiencies in co-operatives compared to non-co-operative firms. Cain, Toensmeyer,

and Ramsey (1989), however, held the view that farmers' co-operatives were more beneficial in providing services than ordinary firms. Sexton and Iskow (1993), on the other hand, established that there is no conclusive evidence to fully support the notion that co-operatives are better organizations than investor-owned firms. However, they were convinced that as voluntary organizations, co-operatives played an important role in the development of the agricultural sector in the USA.

Efficiency measurement of firms based on production frontier with a non-parametric framework could be traced to the work of Farrell in 1957. Since then, data envelopment analysis (DEA) has been utilized successfully to appraise the performances of profit as well as non-profit organizations (Ramanathan 2003). Numerous studies apply DEA to examine the technical, cost and profit efficiency of financial institutions (Berger and Humphrey 1997; Emrouznejad, Parker, and Tavares 2008). Although there are studies on co-operatives, comparatively these are scarce. Lang and Welzel (1996), in conducting the analysis of 757 German co-operative banks from 1989–1992 data, discovered that smaller banks enjoy higher total factor productivity (TFP) growth in relation to bigger banks. Mergers of small inefficient banks were proposed to reap economies of scale and eliminate inefficiencies. However, their research on bigger German banks does not indicate any evidence of economies of scale. It was the external factors that influenced significantly the cost differences between high- and low-cost banks. It was noted that smaller banks were more responsive to input prices (Lang and Welzel 1998).

Two other investigations into efficiency of co-operatives that employed DEA were conducted by Fukuyama, Guerra, and Weber (1999) and Pasiouras, Sifodaskalakis, and Zopounidis (2007). Fukuyama's (1996) analysis of the Japanese Shinkin banks indicates that overall technical inefficiency was due to pure technical inefficiency and it improved as asset size of credit co-operatives increased. Fukuyama, Guerra, and Weber (1999) studied efficiency and productivity growth of Japan credit co-operatives from 1992 to 1996 with respect to types of ownership. The work by Pasiouras, Sifodaskalakis, and Zopounidis (2007) analysed the cost efficiency of the Greek co-operative banks by applying the two-stage DEA. It concluded that cost inefficiency was due to allocative and not technical inefficiency. Factors such as gross domestic product (GDP) per capita, unemployment rate and disposal income influenced the efficiency of banks. They noticed that the TFP experienced a small decrease and the relationship between size differences and productivity was not statistically significant (Pasiouras and Sifodaskalakis 2007).

Most of the DEA research on co-operatives has been conducted in the Western developed countries which have benefited the co-operative movement in developed and developing countries as lessons were drawn and good practices were replicated in different national settings. Malaysian researchers and academics are not attracted towards research on co-operatives. Although considerable amount of studies were done on other enterprises, organizations, financial institutions and banking industry in Malaysia, the interest in co-operatives is still lacking. Research on the Malaysian banks by Katib (1999), Dogan and Fausten (2003), Krishnasamy, Ridzwa, and Perumal (2003), Sufian (2004, 2006, 2007), Sufian and Ibrahim (2005) and Sufian and Abdul Majid (2007) highlighted the challenges faced by the banks but their analysis excluded co-operative banks and credit co-operatives. However, there were two other studies that included co-operative banks in their studies. One is by Othman (2010), which examined co-operative and conventional banks, using Malmquist productivity index, DEA. The study noted that the TFP of the co-operative bank (*Bank Kerjasama Rakyat* [Bank Rakyat]) improved by 28.2%. *Bank Rakyat* led in terms of improvement in productivity among all the 10 banks within the tenure of study. *Bank Rakyat* was able to utilize and capitalize on the improvements in technology.

The other study was by Islam (2012) who studied *Bank Rakyat* and National Savings Bank by employing financial ratios to compare the performance of both the banks in relation to the achievement of socio-economic development objectives of the country. The findings indicate that *Bank Rakyat* was more effective and efficient in the management of expenses and assets, and in generating income.

However, other studies on Malaysian co-operatives highlighted the challenges faced by co-operatives in Malaysia. First, most agricultural co-operatives in Malaysia do not work on their own co-operative farms but rely solely on government land development agencies such as the Federal Land Development Authority (FELDA) and the Federal Land Consolidation and Rehabilitation Authority (FELCRA) for contract work (such as harvesting, transporting harvest, irrigation and others) to generate income (Idris and Abdullah 2011). The work contracted out by FELDA involves large tracks of land which formed part of the land development scheme introduced by the government to address the plight of landless farmers. It provided a steady stream of income for the co-operatives as it involved the government. However, this study noted that co-operative sales were affected by insufficient supply of labour due to lack of interest among the younger generation in the agricultural co-operatives. The younger generation seems to be less interested in the community-type of work and prefer to be employed or pursue individual-oriented ventures (Idris and Abdullah 2011).

Another challenge is the lack of managerial capacity. A study by Ismail and Mohd Sarif (2010) discovered that there was knowledge gap with regard to global competition and suggested that co-operative managers be equipped with global managerial skills to face international challenges successfully. A study by Kaur et al. (2005) on co-operatives' workforce in Malaysia found that 61% of co-operatives do not have executive staff. Over 80% of these workers do not receive any co-operative training and lagged behind the employees of other organizations in career planning and development. Din (2006) analysed the efficiency of the Fishermen's Associations in Malaysia by applying DEA and concluded that co-operatives are beneficial as they provided both economic and social benefits to their members.

3. Co-operative development in Malaysia

Malaysian law defines co-operative as an organization consisting of individual persons with the objective of promoting the economic interest of its members in accordance with co-operative principles (Laws of Malaysia 2008).

The co-operative movement was introduced by the British colonial administration into Malaysia to address credit and indebtedness in the rural areas (Fredericks 1986). While employed as a tool to overcome the problem of indebtedness especially to middlemen, the co-operative movement was also viewed as self-help and became part of an integrated rural development by the indigenous government. Hence, co-operatives were encouraged among the peasants, farmers and fishermen. Similarly, in the urban areas, it started with the lower-level government servants and later among consumer societies. The direction of local co-operative movement appears to be in parallel with other international co-operatives' focus, which is the revitalization of the communitarian tradition (Borgaza and Spear 2004).

However, co-operatives have often been viewed as weak due to indebtedness and inefficient due to lack of managerial capacity as participation was voluntary. It was the Fourth Development Plan, 1981–1985, that recognized the co-operative movement as a vehicle for development. The launch of the National Co-operative Policy (NCP) in 2002

provided the movement a further boost. Among others, the policy includes the tightening of the co-operative's legislation to ensure better governance and management.

Co-operatives were given financial and non-financial support (related to management, audit and education) to enhance their development (Othman and Kari 2008). The government allocated RM 114.2 million[3] (2.23%) for co-operative development out of its total development expenditure of RM 51.3 billion in 2010 (MCSC 2010). In fact, Malaysia's favourable public policy towards co-operatives resembled the accommodative public policy in the USA and Western European countries (Sexton and Iskow 1993). The types of assistance provided by the government are as follows:

(1) Basic support (maximum RM 30,000.00) which includes:
    (i) Physical sub-assistance: This assistance involves the provision of basic infrastructure to the shop/business premises of co-operatives; and
    (ii) New co-operative sub-assistance: This assistance is provided to start business activities.
(2) Strengthening/stabilization assistance (maximum RM 300,000.00):
    (i) Co-operatives were given this assistance in the form of matching grant for the purpose of providing basic infrastructure, facilities and/or capital contributions in order to enhance or expand the existing activities.
    (ii) This assistance includes business premise renovations, purchase of business equipment, machinery and other facilities in line with the activities conducted according to respective sectors.
(3) Marketing assistance (maximum RM 300,000.00):
    (i) Co-operatives are given assistance to promote or advertise co-operative products or goods, collection and marketing of products in a systematic manner through branding, packaging, halal certification and also image building to enable co-operatives to penetrate a wider market.
(4) Research and development aid (maximum RM 300,000.00):
    (i) Co-operatives were given this assistance to conduct research and development activities on their products and services as recommended by Malaysian Agricultural Research and Development Institute and universities act as consultants.
(5) Strengthening the knowledge and skills of human capital among co-operative members. Co-operative's members and leaders undergo training and courses to learn co-operative principles, concepts and management.
(6) Promotion of co-operatives' activities and business through expos, exhibitions and carnivals.
(7) All grants or soft loans are charged at a low interest of 1–6% per annum depending on the activities and size of the loan.

Figures 1–4 show the development over the last two decades. There has been a continuous increase in the establishment of co-operatives in Malaysia. When the nation experienced economic growth in the 1990s, the co-operative movement grew at 3.5% a year, while membership, share capital and asset growth expanded at 3.2%, 9.93% and 11.42%, respectively. The movement was adversely affected by the 1997 AFC that hit Malaysia and other countries in the region. This was indicated by the decrease in growth rate compared to the previous period in terms of number of co-operatives, membership, share capital and assets. The total asset value fell by more than 4% to a mere 7% as compared to 11.42% in the earlier period. Co-operatives with investments in shares were also affected by the unanticipated financial bubble burst and were left financially

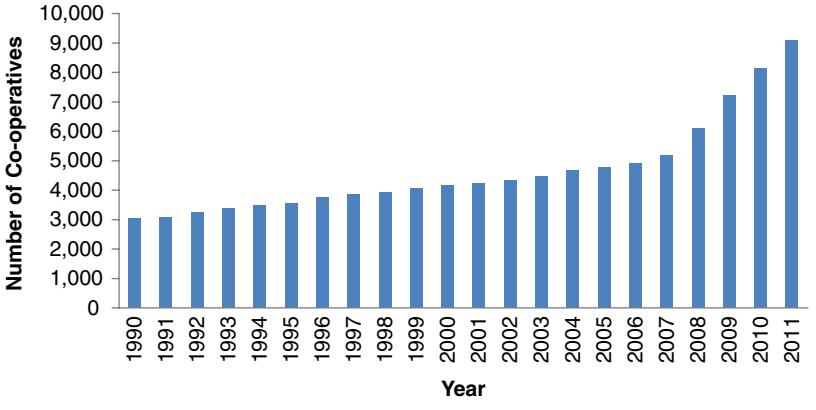

Figure 1. Number of co-operatives. *Source*: Monitoring Division, Malaysia Co-operative Societies Commission (MCSC), various years.

vulnerable with liquidity problems (Md. Salleh et al. 2008). Co-operatives that invested in shares and trust funds especially with borrowings from the private financial institutions suffered severely from the crisis. They faced liquidity problems but received assistance from the government to ease their financial problems. However, the improvements in the economy and the capital market have led to the recovery of the co-operatives.

The recovery years of the Malaysian economy from the AFC had witnessed growth in the movement. The movement started to record positive growth in terms of numbers, membership, shares and assets. The NCP (2002–2010) focused on co-operatives playing a bigger role in the economy especially towards poverty eradication, employment creation and business expansion. The development of co-operatives was further strengthened when the Department of Co-operative Development was upgraded into a commission, MCSC, in 2008. The second NCP (2011–2020) was launched and it focused on increasing co-operatives' participation in the wealth creation by strengthening co-operatives' capacity and capabilities, especially the managerial capabilities. The second NCP is in line with the new direction in Malaysia's development as envisaged in the New Economic Model,

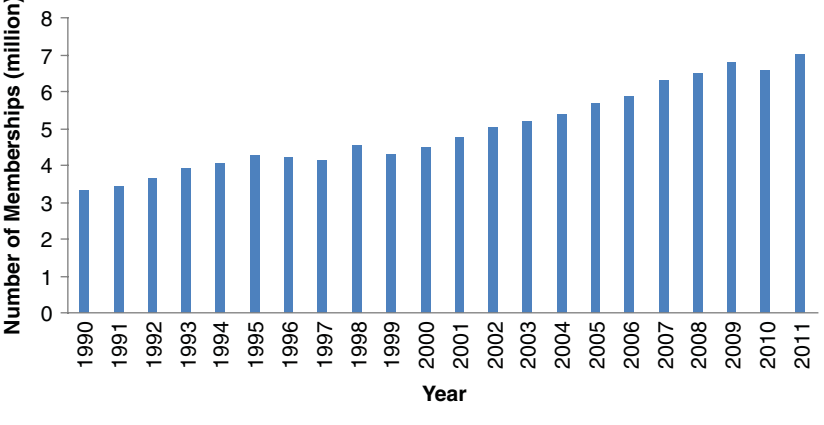

Figure 2. Number of memberships. *Source*: Monitoring Division, Malaysia Co-operative Societies Commission (MCSC), various years.

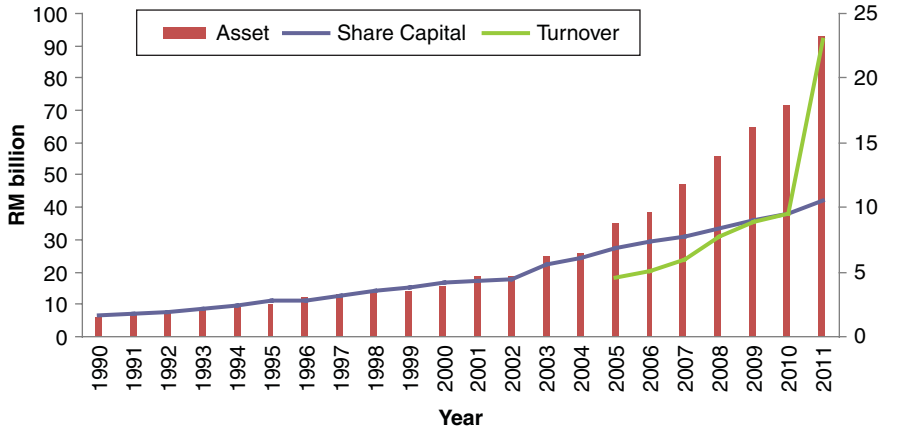

Figure 3. Share capital, asset and turnover. *Source*: Monitoring Division, Malaysia Co-operative Societies Commission (MCSC), various years. Note: Turnover data are not available before 2005.

introduced in 2010, which outlined specific strategic reform initiatives for Malaysia to progress to the next level of development as a high-income nation from its current middle-income status (National Economic Advisory Council 2010; Rodrigo and Mansor 2013). Although the NCP had been important in spurring rapid co-operative development, its effectiveness was limited, as despite the increase in number of co-operatives, the growth of membership, share capital and assets had decreased. Figure 1 indicates that in 2011 there were 9074 registered co-operatives. The movement had 7.04 million members, about 26% of the population, share capital amounting to RM 10.49 billion, total assets worth about RM 92.8 billion, turnover of RM 23.09 billion and profits of RM 2.62 billion (MCSC 2012).

Although Figure 4 shows that growth of co-operative turnover had decreased from 18% (2005–2009) to 11% (2009–2010) due to the global economic downturn but the rapid increase in 2011 was due to the change in the computation of the movement's assets

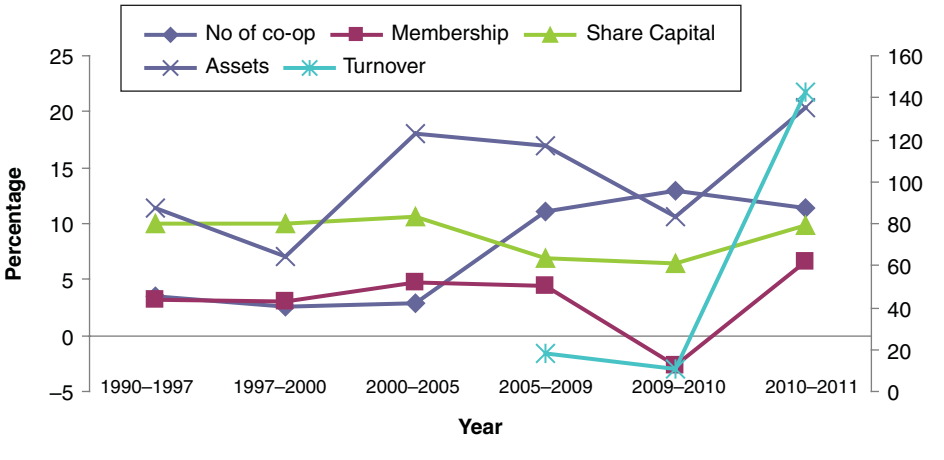

Figure 4. Growth trend of the co-operative movement in percentage. *Source*: Monitoring Division, Malaysia Co-operative Societies Commission (MCSC), various years. Note: Growth percentages calculated by author. Turnover data are not available before 2005.

and turnover as these assets and turnover included that of co-operatives' subsidiaries. Prior to 2011, subsidiaries were excluded from the statistics, hence resulting in the big percentage increase in assets and turnover for the period 2010–2011.

The number of co-operatives dispersed across the 14 states in Malaysia is shown in Figure 5. This figure shows that Selangor, Perak and Johor have the three highest numbers of registered co-operatives. Taking turnover as an indicator of financial performance as a measure of success of co-operatives, the co-operatives with the highest percentage turnover are: *Bank Rakyat*, the National Co-operative Organization of Malaysia (ANGKASA), Pahang, Wilayah Persekutuan, Johor and Terengganu. In general, all the states portrayed positive co-operative performances as more than 60% of the co-operatives were generating profits from their business activities. Co-operatives in Negeri Sembilan registered the highest percentage in terms of profit turnover. With regard to the performance, both *Bank Rakyat* and ANGKASA achieved turnover of above RM 800,000. These two entities played a significant role in the performance and development of the movement.

Generally, the co-operative movement could be categorized into urban and rural segments. Rural category includes various types of agro-based co-operatives, fishermen's co-operatives and co-operatives under the Farmers' Organization Authority (*Lembaga Pertubuhan Peladang*), Malaysia Fishery Development Authority *(Lembaga Kemajuan Ikan Malaysia, LKIM)* and government land development agencies such as FELDA, FELCRA and Rubber Industry Smallholders Development Authority (RISDA). Credit and banking co-operatives formed the backbone of the co-operative movement in the urban areas, and these two types of co-operative contributed the highest percentage of turnover to the movement. In 2010, the credit and banking percentage of share capital in the movement was 72%, while assets of the banking co-operatives alone were 90.3% (MCSC 2010). Other primary societies include consumer, housing societies, land development and school co-operatives.

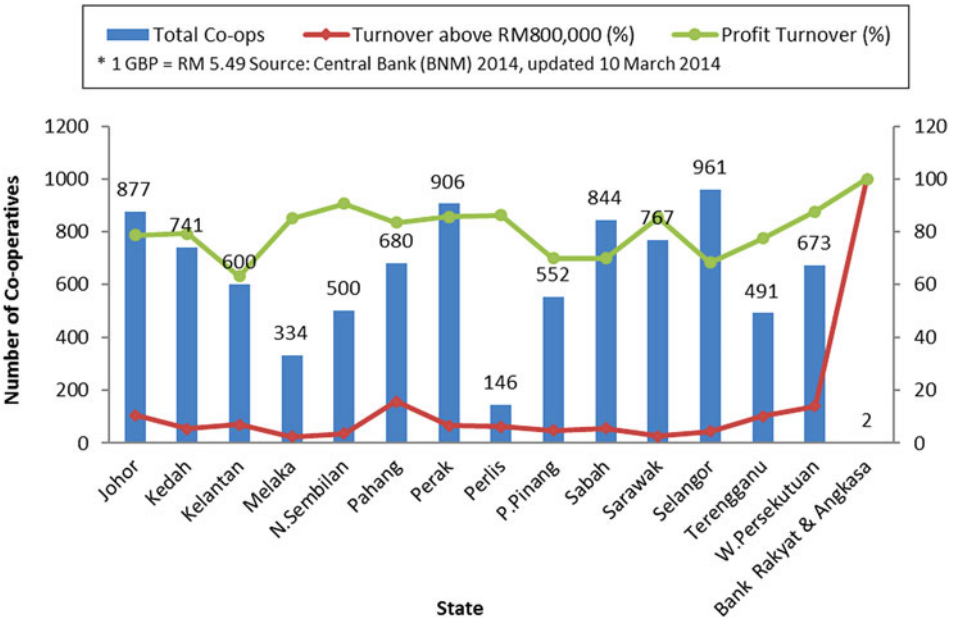

Figure 5. The analysis of co-operatives' performance by turnover and states in 2011. *Source*: Monitoring Division, Malaysia Co-operative Societies Commission (MCSC), 2011.

It has been widely acknowledged that co-operatives played an important role in providing services to the rural community. Among their main functions are contractual work, transport services (lorries, buses and tankers), retail stores and mini-markets, the supply of electrical appliances, motorcycles and furniture. In the land development schemes, co-operatives are important as they became agents for their members to cater to the needs of settlers, thus ensuring the provision of quality goods at reasonable prices and at the same time undertake collective marketing of their produce including fruits, vegetables, chickens, goats and others.

The data show that 92.8% of co-operatives (6695 co-ops) are in the small (with annual sales between RM 200,000 and less than RM 1 million) and micro-clusters (with annual sales less than RM 200,000) and contributed only 4.5% and 3.4%, respectivel,y to the movement's turnover in 2009 (MCSC 2009). In contrast, the big cluster co-operatives (only 2.2% with annual sales above RM 5 million) were responsible for 83.1% of total co-operative movement's turnover. These comprise the banking and credit co-operatives. The medium-size cluster co-operatives (with annual sales of above RM 1 million but less than RM 5 million) contributed 9% of the movement's turnover. Therefore, the success, strength and performance of co-operatives are skewed towards the biggest cluster which is dominated by the banking and credit co-operatives.

Evidently, co-operatives by membership target groups show that the adoption co-operatives are present in various occupations among Malaysians. Co-operatives data in 2011 were further categorized by MCSC into 70 various sub-target membership groups. The groups are based on members' occupation, land development scheme, special needs criteria, educational institutions and activities performed. The special needs criteria group is related to single mothers, the disabled, the poor, pensioners and indigenous people. Co-operative memberships are also from various types of occupations such as government agencies, private sector, sports, banking, youth, land development schemes, doctors, teachers, small industries, insurance, lawyers, imam, factory and estate workers. To encourage a multi-ethnic co-operation, the government has launched 1 Malaysia. In line with the concept, the MCSC launched the 1 Community 1 Co-operative in 2010 (MCSC 2010). In 2011, there were 25 co-operatives among the estates workers with 9660 members. These co-operatives have an asset worth RM 14,575,744 and share capital of RM 4,579,913. On average, however, share holdings of an individual member in co-operatives amounts to only RM 474 per member.

The National Land Finance Co-operative Society Ltd (NLFCS) is a co-operative established in 1960 to solve the problems among retrenched and homeless estates workers arising from sale and resale of European-owned rubber estates. This co-operative was established by Tun Dr. V.T. Sambanthan, a prominent Malaysian Indian Congress leader, with the objective of creating opportunities for estate workers to own land (NLFCS 2012). The co-operative also looks after the welfare of members' children and their education, promotes house ownerships, creates small-scale entrepreneurship opportunities and provides financial aid to members.

Co-operatives among the poor fishermen have also been encouraged. However, the progress of fishermen co-operatives is relatively slower compared to others in the agriculture sector. Fishermen co-operatives were formerly under the surveillance of LKIM in accordance with the 1971 Fisheries Development Authority Act (Law of Malaysia 2006). However, with the new mandate of the MCSC in 2008, the fisheries co-operatives are currently managed by themselves to function within the fishing community to support the fishing industry. However, only 53% of these co-operatives are active, while 26% have been identified as potential to be effective (MCSC 2008). Another 26% which are deemed

to have some possibilities would be revived. Their activities include marketing, transportation of fish, ice production and supply, leasing of licenses of boats and sale of diesel. MCSC is also entrusted with the responsibility to empower fishermen (upgrading the traditional coastal/inshore fishermen to become deep-sea fisherman) by providing technical training to the fishermen to enhance their skills and transforming the fishing industry into a commercialized business.

Some of the co-operatives such as the fishermen's and farmer's co-operatives are steered by government entities to achieve development measures as mentioned earlier. In some cases, co-operatives become a focal point for political mobilization at the local level especially at the state level. Hence, the reason for the escalation in the number of co-operatives, albeit, small and micro in size.

4. Research methodology

DEA was employed to estimate the relative efficiencies of co-operatives based on membership target groups (groups are made by MCSC). Data provided by MCSC are for the year 2011. Out of the 70 groups, only 56 profitable groups were selected for analysis as the DEA model is non-negative. The 56 profitable groups comprise 8944 co-operatives or 98.6% of the total registered co-operatives. DEA method was chosen for its ability to overcome problems of evaluating firm with multiple inputs and outputs and complex performance (Cooper, Seiford, and Zhu 2004; Zhu 2003). DEA could be performed even when conventional cost and profit functions (that depend on optimizing reactions to prices) could not be justified. Furthermore, DEA was developed by Charnes, Cooper, and Rhodes (1978) for applications in the public sector and not-for-profit organizations where typical economic behavioural objectives, such as cost minimization and profit maximization, may not be relevant.

The decision-making units (DMUs) in this study comprise 56 membership target groups. Following Coelli et al. (2005), variable returns to scale (VRS) input-oriented approach model was employed to measure technical efficiency of these groups as VRS calculates technical efficiency without being confounded by scale efficiency. Furthermore, constant returns to scale (CRS) assumption is only appropriate when all firms are operating at optimal scale and with perfect competition without constraints or influence from government or other factors. VRS model was chosen as it would indicate whether the DMUs are operating at constant, increasing or decreasing returns to scale. Input-oriented approach would measure how much of the inputs could be proportionally reduced without changing the outputs.

Table 1 shows the details of membership target group such as turnover, profit, members, assets and share equity. The choice of outputs in this analysis follows the study

Table 1. Descriptive statistics of output and inputs in the DEA membership groups analysis 2011.

Variables	Minimum	Maximum	Mean	SD
Outputs				
Turnover (RM)	43,452.00	13,690,540,598.00	328,606,602.61	1,825,328,291.85
Profit (RM)	11,219.00	153,6724,691.00	46,774,041.7679	213,565,107.77
Inputs				
Members (person)	317.00	2,087,254.00	125,077.78	341,625.78
Asset (RM)	119,192.00	73,389,316,753.00	1,656,712,859.46	9,801,047,084.73
Equity (RM)	38,723.00	2,599,264,172.00	187,145,985.392,9	502,383,391.975,13

done on the performance of Fortune 500 companies by Zhu (2003). Zhu studied the performance of the top 20 companies by considering revenue and profit as outputs, while assets, employees, equity, market value, earnings per share and return to equity were regarded as inputs.

In this case, turnover and profits constitute one of the three criteria, besides average ratio and non-financial aspects that are considered by the MCSC in ranking the performance to determine the best 100 co-operatives (MCSC 2012). It is imperative for co-operatives to be profitable to achieve their socio-economic goals. Members are considered as inputs because in co-operatives, besides being users of goods and services, they are also the owners of the co-operative enterprise. They have a very important role in management decision-making and they are required to contribute in terms of manpower, support and collective financial contributions towards their co-operative activities.

The discussion on DEA follows consideration of a set of n observations on the DMUs. Each observation, DMU_j ($j = 1, \ldots, n$), uses m inputs x_{ij} ($i = 1, 2, \ldots, m$) to produce s outputs y_{rj} ($r = 1, 2, \ldots, s$). The efficient frontier is determined by these n observations as in Equation (1) (Zhu 2003). θ^* represents the input-oriented efficiency score of DMU_j under evaluation. If $\theta^* = 1$, this indicate that DMU_j is on the efficient frontier:

$$\theta^* = \min \theta,$$

subject to

$$\begin{gathered}\sum_{j=1}^{n} \lambda_j x_{ij} \leq \theta x_{io}, \quad i = 1, 2, \ldots, m; \\ \sum_{j=1}^{n} \lambda_i y_{rj} \geq y_{ro}, \quad r = 1, 2, \ldots, s; \\ \sum_{j=1}^{n} \lambda = 1, \\ \lambda_j \geq 0, \quad j = 1, 2, \ldots, n.\end{gathered} \tag{1}$$

The DEA process involves the following model:

$$\min \ \theta - \varepsilon \left(\sum_{i=1}^{m} s_i^- + \sum_{r=1}^{s} s_r^+ \right),$$

subject to

$$\begin{gathered}\sum_{j=1}^{n} \lambda_j x_{ij} + s_i^- = \theta x_{io}, \quad i = 1, 2, \ldots, m; \\ \sum_{j=1}^{n} \lambda_j y_{rj} - s_r^+ = y_{ro}, \quad r = 1, 2, \ldots, s; \\ \sum_{j=1}^{n} \lambda_j = 1, \\ \lambda_j \geq 0, \quad j = 1, 2, \ldots, n.\end{gathered} \tag{2}$$

The frontier determined by Equation (2) (Zhu 2003) exhibits VRS, and the model is input-oriented VRS envelopment model. $\lambda_j = 1$ is the convexity constraint to account for VRS model. The VRS envelopment model identifies the VRS frontier with DMUs exhibiting increasing return to scale (IRS), CRS and decreasing return to scale (DRS) (Zhu 2003). Scale efficiency measures could be obtained for each DMU by conducting both CRS and VRS DEA, and then decomposing the technical efficiency (TE) scores obtained from the CRS DEA into two components, one due to scale inefficiency and one due to 'pure' technical inefficiency (i.e. VRS TE). The appearance of difference in the CRS and VRS TE scores for DMU is an indication that the DMU has scale inefficiency.

This research employs a two-stage method where the efficiency scores in the first stage are regressed upon the environmental variables (Coelli et al. 2005). This analysis would determine which of the inputs have significant influence on efficiency scores. Work by Simar and Wilson (2011) was considered as cross-sectional data were used, which means that homoscedasticity assumption would be violated. The use of ordinary least squares as proposed by Banker and Natarajan (2008; cited in Simar and Wilson 2011) is with the assumption that bounded noise at constant would be violated as well. Therefore, the DEA efficiency estimates from first-stage analysis are regressed on co-operative variables (turnover, member, equity) using non-linear Tobit regression.

The standard Tobit model is as follows for observation (co-operative group) i:

$$\begin{aligned} y_i^* &= \beta x_i + \varepsilon_i, \\ y_i &= y_i^* \quad \text{if } y_i^* \geq 0, \\ \text{and} \quad y_i &= 0, \quad \text{otherwise}, \end{aligned} \tag{3}$$

where $\varepsilon_i \sim N(0, \sigma^2)$, x_i and β are vectors of explanatory variables and unknown parameters, respectively, while y_i^* is a latent variable and y_i is the DEA score. Tobit regression was run using Gretl software version 1.1. Tobit regression equations are as follows:

$$\theta_i = \alpha_0 + \beta_1 * \text{Tover} + \beta_2 * \text{Pro} + \beta_3 * \text{Equity} + \beta_4 * \text{member} + \varepsilon_i, \tag{4}$$

where dependent variables are

θ_i: technical efficiency score (TE); scale efficiency (SE) and pure technical efficiency score at time t extracted from the DEA first stage.

The independent variables are as follows:

Tover: membership groups' turnover;
Pro: membership groups' profit;
Equity: membership groups' equity;
Member: membership groups' members;
ε is the random error term.

5. Empirical findings

5.1. DEA first-stage analysis findings

Sensitivity checking was conducted to ensure that there were no errors in measurement that would affect results. A test was run by omitting one output while repeating the DEA analysis (Ramanathan 2003). Results from several runs showed no significant change in

the efficiency pattern. Analysis of peer result also confirm the result's robustness as all the efficient DMUs are similar in all the analysis and have formed peers of inefficient DMUs. The groups that have been found to be most efficient by DEA are with the efficiency measure of 1. Table 2 shows the efficiency scores from the analysis. The efficient groups are operating at the most productive scale size. The results reveal that based on CRS, only 10.7% of the co-operatives groups are efficient, while with VRS 19.6% are efficient. The difference between the percentages of efficient groups between CRS and VRS is quite significant. However, as discussed by Ramanathan (2003), this is because the assumption of CRS is relaxed as VRS variables are assumed. The percentage is higher under the VRS method as some groups which are not efficient under the CRS model had become efficient when the assumption of CRS (convexity constraint) is relaxed. The top 11 most efficient groups are banking, doctors, FELDA, affiliated co-operative (secondary co-operatives), single mothers, surveyors, welfare (co-operatives performing welfare activities), South Kelantan Development Authority (KESEDAR), Matriculation College, village development and schools.

Referring to Table 2, the mean score of CRS technical efficiency is 0.438. This score implies that the co-operatives on the whole should reduce their consumption of all inputs by 56.2% to be efficient. As for VRS (mean score 0.527), the co-operatives' consumption of all inputs should be reduced to 47.3% to become efficient. Following the study done by Bader et al. (2008), this finding could also be interpreted to consider the inefficiency of co-operatives. The results suggest that co-operatives have slacks where the resources are not utilized efficiently to produce the same outputs. Taking the mean score of VRS, this implies that co-operatives on the whole are having inefficiency level of 89.8% in producing their outputs.

Table 3 presents the distribution of efficiency results according to four categories. The results are ranked according to four different categories from highest, upper and lower intermediate to the least efficient. Only 11 membership target groups have the most efficient score (DMU 2, 5, 7, 8, 10, 13, 16, 20, 23, 27 and 50), while 10 groups are moderately efficient (DMU 6, 11, 22, 25, 26, 29, 47, 48, 52 and 55) and 21 groups are in lower efficiency group (DMU 12, 14, 17, 21, 24, 30, 31, 32, 33, 34, 36, 38, 39, 41, 42, 44, 45, 49, 51, 53 and 54). The least efficient groups are DMU 1, 3, 4, 9, 15, 18, 19, 28, 35, 37, 40, 43, 46 and 56.

The scale of efficiency of the DMU is computed as the ratio of CRS efficiency (technical [TE] and scale efficiency [SE]) to its VRS efficiency (pure technical efficiency [PTE]). As in many studies, the TE from CRS DEA is decomposed to one due to scale inefficiency and pure technical inefficiency. The results show 86% of the groups are with scale inefficiency.

This investigation found that 46.4% (26 groups) of the co-operative operating at the IRS. This means that they are currently operating at a lower scale sizes by operating under IRS, utilization of resources whereby they can achieve greater economies of scale if the level of operations are increased. Results indicate that 32.1% of the co-operatives (18 groups) are operating at DRS that is at a higher scale size than it should be.

5.2. Second-stage Tobit regression findings

The second-stage analysis attempts to investigate if any of the co-operative group characteristics (turnover, profits, members' equity and membership) have any influence on the efficiency scores. The goodness of fit of the models was assessed based on the test for normality of residuals. The results had indicated that all models had a good fit as all the

Table 2. Efficiencies of co-operatives by membership target group.

DMUs (membership groups)	TE	PTE	SE	RTS
1. Gov. agencies	0.180	0.181	0.999	–
2. Banks	0.227	1.000	0.227	DRS
3. Youth land scheme	0.131	0.132	0.996	DRS
4. Fire brigade	0.014	0.112	0.121	IRS
5. Doctors	1.000	1.000	1.000	–
6. FELCRA settlers	0.621	0.709	0.876	DRS
7. FELDA settlers	1.000	1.000	1.000	–
8. Affiliated co-operative (secondary co-ops)	1.000	1.000	1.000	–
9. Teachers	0.159	0.246	0.647	DRS
10. Single mothers	0.527	1.000	0.527	IRS
11. Imam/bilal (mosque staff)	0.839	0.897	0.935	IRS
12. KIK (village industry co-ops)	0.075	0.347	0.216	IRS
13. Surveyors	0.183	1.000	0.183	IRS
14. Mosque members	0.477	0.493	0.969	IRS
15. Customs	0.039	0.131	0.301	IRS
16. Welfare activities	1.000	1.000	1.000	–
17. Family	0.530	0.532	0.997	DRS
18. KEMAS community development	0.067	0.070	0.953	IRS
19. Association	0.135	0.138	0.977	IRS
20. KESEDAR	1.000	1.000	1.000	–
21. KOBERA (co-operatives of the poor)	0.296	0.311	0.954	IRS
22. Community college	0.777	0.795	0.977	IRS
23. Matriculation college	1.000	1.000	1.000	–
24. Private college	0.553	0.5564	0.980	IRS
25. Landownership	0.632	0.637	0.993	IRS
26. KPK/KEDA (village development)	0.811	0.812	0.999	–
27. Rural development	0.412	1.000	0.412	IRS
28. Uniformed personnel	0.059	0.096	0.613	DRS
29. Teachers college	0.758	0.769	0.985	IRS
30. Fishermen	0.444	0.445	0.997	DRS
31. OKU (co-ops of the disabled)	0.394	0.440	0.897	IRS
32. General public	0.204	0.598	0.341	DRS
33. Government servants	0.202	0.352	0.575	DRS
34. Statutory agency workers	0.220	0.305	0.723	DRS
35. Factory workers	0.273	0.287	0.952	DRS
36. Estate workers	0.374	0.375	0.996	IRS
37. Stevedoring	0.203	0.205	0.989	IRS
38. Private co. workers	0.211	0.308	0.685	DRS
39. KPP (worker's investment co-ops)	0.387	0.390	0.992	IRS
40. Drivers	0.152	0.157	0.968	IRS
41. KPD (district development co-ops)	0.358	0.370	0.968	DRS
42. District officers	0.129	0.344	0.376	IRS
43. Small business	0.066	0.067	0.984	DRS
44. Pensioners	0.505	0.507	0.996	IRS
45. Farmers	0.315	0.315	0.999	–
46. Police	0.180	0.181	0.997	IRS
47. Technical workers	0.671	0.672	0.999	DRS
48. MARA Training Institute (IKM)	0.728	0.738	0.986	IRS
49. RISDA	0.318	0.470	0.676	DRS
50. Schools	1.000	1.000	1.000	–
51. Graduates	0.332	0.451	0.737	IRS
52. Housing estate	0.655	0.836	0.782	DRS
53. IPT (higher learning institute)	0.348	0.348	1.000	–

(*Continued*)

Table 2 – *continued*

DMUs (membership groups)	TE	PTE	SE	RTS
54. IPTS (private higher learning institute)	0.504	0.508	0.992	IRS
55. Entrepreneurs	0.699	0.699	0.999	DRS
56. Women	0.173	0.173	0.997	DRS
Mean	0.438	0.527	0.826	

Note: TE = technical efficiency based on CRS; PTE = pure technical efficiency based on VRS; SE = scale efficiency = CRS TE/VRS TE. *E* is efficiency. To calculate Inefficiency (IE), IE = (1 − E)/E. E.g. when $E = 0.527$, $(1 - 0.527)/0.527 = 0.898$ or 89.8% inefficiency.

errors exhibited were normally distributed with very small *p*-value. Table 4 portrays the co-operative group's Tobit regression results.

Tobit regression's results in Table 4 reveal that turnover, profit and equity are statistically significant at 1% alpha in influencing TE. Profits, members and share equity are statistically significant in influencing PTE of the groups, while only turnover and equity are statistically significant in influencing SE. Equity and members are found to be negatively correlated to TE and PTE. However, turnover and profits are positively correlated.

Co-operative turnover, profit and equity are representative of co-operative size; thus, it could be stated that the group size is statistically significant in influencing and determining the efficiency of the membership groups. This finding is consistent with the study by Jaforullah and Devlin (1996) on New Zealand's dairy industry that confirmed that co-operative farm size had an influence on the industry's efficiency. The findings demonstrate that the bigger the co-operatives' turnover and profit, the higher the co-operative efficiency scores.

Membership as an independent variable, however, is found to be statistically significant in explaining PTE but not statistically significant in explaining SE and TE. As reported by Fulton and Giannakas (2001), co-operative membership size has a negative impact on co-operative success; therefore, this result is also consistent with their findings as increased membership has an impact of decreasing both TE and PTE of co-operatives.

6. Discussion

The annual increase in the number of co-operatives indicates the relevance of co-operative movement in the Malaysian economy. The NCP and the creation of the Commission have further spurred the growth. The financial and management support by the government has enabled the co-operatives to sustain their activities. The spillover effect of the country's buoyant economic growth has also contributed to the co-operatives' moderate but steady growth for the past 90 years. These two factors are very important as they have ensured the

Table 3. Efficiencies scores of membership target group by various range.

Efficiency scores (VRS)	No. of co-operative (%)
1 (highest)	11 (19.6)
0.61–0.99 (upper intermediate)	10 (17.9)
0.3–0.6 (lower intermediate)	21 (37.5)
<0.3 (least efficient)	14 (25)
Total	56 (100)

Table 4. Co-operative groups Tobit regression results.

Variables	TE	PTE	SE
Constant	0.653708	0.76286	0.741822
LNTurnover	0.0717038	0.030437	0.0782241
	(0.00272)**	(0.29159)	(0.00944)**
LNProfit	0.119534	0.149293	0.026824
	(<0.00001)**	(<0.00001)**	(0.38131)
LNMembers	− 0.023376	− 0.0505148	0.00694829
	(0.22555)	(0.02999)*	(0.77496)
LNEquity	− 0.179797	− 0.149251	− 0.1.3356
	(<0.00001)**	(<0.00001)**	(−0.00001)**

Note: Results obtained from data analysed using Gretl Version 1.1.
**Significant at 1%; **significant at 5%.

survival of the co-operatives. Apart from the 'big' co-operatives (which is only slightly over 2% of the total co-operatives), over 90% of co-operatives (micro and small) grew, developed and survived as mentioned earlier with very heavy government financial and management support.

Although, in general co-operatives have been perceived as important and beneficial to the country's development, DEA results indicate that the performances of co-operatives membership target groups are not satisfactory. This estimation by VRS revealed only 19.6% of the groups performed efficiently, while 55.4% of the groups are between upper and intermediate efficiency, and although they are underperforming, they still may be able to survive as profits are being made (not optimal) which could help sustain their operations. About 25% of the groups are with very low efficiency scores and should be considered as vulnerable groups which may face the risk of making losses if situation does not improve. The weak groups are predominantly among the government agency workers, youth land development scheme, small business, KEMAS (workers in department of community development), *Koperasi Bela Rakyat* (KOBERA) (co-operative of the very poor), the general public, factory workers, fire brigade, uniform personnel, teachers, customs, drivers and women. Equally relevant is the fact that 46.4% of the groups are operating at a lower scale size and 32.1% operating at a much higher scale size resulting in unattainable economies of scale.

Tobit regression had demonstrated that turnover, profit, equity and members are important variables that influence efficiency scores of the membership groups under study. Turnover, profit and equity are pertinent and statistically significant in influencing the technical efficiency. Scale efficiency scores are influenced only by equity and turnover. Turnover is positively correlated to all three scores which postulate that the higher the turnover of co-operative groups, the greater the efficiency scores. The negative relationship between equity and members with the efficiency scores, however, became a challenge to co-operative performance because as equity and members increased, all three efficiency scores decrease. This outcome suggested that co-operatives are less efficient when membership size and equity gets bigger. The result further reinforced the perception that co-operatives are facing members' apathy and free rider problem (Department of Co-operative Development 2003). As memberships became larger and equity increased, the co-operatives could encounter problems in retaining members' loyalty and support towards their co-operatives. It appears that co-operative members are not active members but they became members just to cash on the dividends distributed by their co-operative and subsequently not motivated to participate in the

co-operatives any longer. This finding seems to concur with the MIT. As evident from other research mentioned earlier, poor management skills among the co-operatives have been identified as one of the main challenges. The issues include financial mismanagement and fraud as highlighted in cases such as the Deposit Taking Co-operatives in 1986, Co-operative Central Bank (CCB) 1986 and ANGKASA in 2008 (Consumers Association of Penang 2013).

7. Theoretical and policy implications

7.1. Theoretical implications

As pointed out earlier, co-operatives are voluntary in concept and user-based in nature, and hence, the members' loyalty and active participation in the activities of their co-operatives are crucial for success. They have a role to play to ensure that their co-operatives' are efficiently managed. The findings of this study conclude that there is a relationship between members' active participation and efficient performance of co-operatives.

The other theoretical implication of this study is on the methodology. The advantage of this method is on its objectivity. DEA efficiency rating is based on the numerical data and not on the subjective opinions of respondents. Building upon the strength of this method, future analysis would have to consider the performances of co-operatives by their functions such as credit and finance, consumer, housing and services as this information is critical to benchmark co-operatives against their competitors in the market.

7.2. Policy implications

The co-operative movement's sustainability and progress are dependent on the improvement of co-operatives' performance. The high percentage of inefficient co-operatives should be monitored closely and addressed effectively to ensure the success and achievement of the National Co-operative Plan. Public perception on the role of co-operatives in the nation's economic and social development should be improved. Improvement of the movement's efficiency will directly enhance public perception of co-operatives.

Also, the government should review its policy to establish co-operatives in every community in Malaysia. It is not the number of co-operatives that matters but the quality of these co-operatives. Efforts have to be geared towards driving the existing co-operatives to be efficient and profitable. As the current co-operatives have not achieved their full potentials, inefficiencies could be costly not only to the relevant co-operatives but also for the government.

7.3. Governance and managerial implications

Only with efficient management will there be a strong co-operative movement which is truly a self-help and independent business enterprise. Members that fail to uphold their responsibilities to their co-operatives will destroy the organization. As evident from the analysis, it is critical for the members to participate to ensure a vibrant co-operative. Members need to be educated to perform their role and understand the governance structure of co-operatives.

Although the co-operative movement was an option to assist the government to accomplish national development goals, the co-operative movement needs to be re-examined, especially with regard to its membership, governance and management. Serious

consideration has to go into improving the governance and management of co-operatives. Strict enforcement of co-operative law to ensure co-operative compliance towards co-operative principles and law could further improve co-operative businesses, increase sustainability and enhance the possibility of success and achievement of any government plan for the development of co-operatives.

This study found that that there is a relationship between professional managers and profitable co-operatives. The successful co-operatives are big co-operatives and these co-operatives are managed by professional managers. Hence, the remuneration for the management personnel of co-operatives has to be reviewed and upgraded to a performance-based compensation and attractive promotion packages.

7.4. Limitations

Determining the relevant inputs and outputs to be considered in the analysis was a challenge as data were limited. Despite the limitations, this study provides empirical evidence on co-operatives. Social output data, number of co-operative workers, wages and operating costs are important considerations but, unfortunately, were unavailable at the point of research. Due to this limitation, results on efficiency ratings should be interpreted with caution. Such information would further enhance the development of co-operative movement. Further analysis on the efficiencies would also include the external factors such as the GDP per capita, inflation rate and unemployment rate.

8. Conclusion

Overall assessment of the co-operative performance indicated positive growth in the number of co-operatives, memberships, share capital, assets and turnover within the Malaysian co-operative movement. This achievement was possible due to the strong financial and non-financial support by the federal government and the perceived significant role that co-operatives played in the country's development. DEA evaluation on the efficiencies of 56 co-operative groups in the movement, however, had revealed an unsatisfactory performance. Only 19.6% of the groups achieved the highest efficiency scores. These results thus revealed that the co-operative groups are not operating at their most productive scale or optimal scale.

The management capacity of co-operatives is a key factor in determining their performances. Building strong managerial and executive team is paramount and this could be achieved by enhancing the understanding of the members, board of directors and management on the principles and concept of co-operatives through effective communications, education and training which would improve members' motivation to participate and support their own co-operative business. Groups that are efficient are likely to be groups with active membership and effective leadership.

The high percentage of inefficient groups in this study indicates wasted resources in co-operatives' operations which could be the result of poor governance or management problems. The problem is more acute among the poor and rural dwellers' (e.g. farmers and fishermen) co-operatives. As a result of the inefficiencies, it became a disincentive among the existing members which led to apathy towards their co-operatives. Tobit regression results further confirmed that group size is important in influencing the efficiency of co-operative groups and reinforced the issue of members' apathy and free rider problem in the movement. The results endorse the general perception that co-operatives in Malaysia are facing challenges which require immediate attention.

Notes

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3. GBP = RM 5.49. Source: Central Bank (BNM) 2014, updated 10 March 2014.

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