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Cost Structure and Efficiency of the Credit Departments
of the Farmers' Associations in Taiwan

1. Introduction

The Credit Departments of Farmers' Associations (CDFAs) are the most important financial institutions in rural Taiwan. Farmers' Associations (FAs) were established to protect farmers' welfare, improve their agricultural techniques and help them increase revenues. As a federated system of farmers' cooperatives, FAs are permitted to provide banking services to their members through their credit departments. Most members of FAs are farmers but the membership also includes local township residents who can enjoy all benefits of membership except voting rights.

Under the Farmers' Association Law, the expansion of service and investments of CDFAs is tightly regulated. Idle funds held by CDFAs can be deposited only in three national banks, namely the Farmers' Bank of China, the Land Bank of Taiwan and the Cooperative Bank of Taiwan. Each township FA is operated by a general manager appointed by a board of directors and supervisors, elected by its voting members. Accordingly, local politics strongly influences the credit business. Furthermore, lack of financial expertise of the general manager often hinders credit screening and loan monitoring, leading to a large value of non-performing loans.

Fraudulent practices and loose internal controls have led to several cash-runs in recent years. The potential for a financial crisis has brought concerns about the soundness of CDFAs. The government in Taiwan tried to close some CDFAs but failed because it caused great protests and political turmoil. In order to improve the performance of CDFAs, their cost structure and operational efficiency should be investigated so that proper actions can be taken. This study tries to examine the cost structure and operational efficiency of CDFAs using various approaches that consider the effect of non-performing loans, and further to elucidate the relationship between the determinants and measures of efficiency including efficiency change after 1997 Asian financial crisis. As there are similar institutions in other countries facing the same challenges, the results of this study can provide further understanding about the related issues., Therefore, our findings are not only important to the managers, the depositors and the borrowers of the CDFAs, but also to the policy-makers in the government and the similar financial institutions.

Regardless of its importance or potential crisis, the system of CDFAs is not well understood in its operating performance, possibly due to lack of sufficient data, A large body of work has sought to evaluate banking performance, but little has focused on rural financial institutions. Chang and Hsieh (1998) used a nonparametric programming approach to evaluate the efficiency of CDFAs. They found that most CDFAs are highly scale efficient, but underperformed in terms of technical and allocative efficiencies. A significant association between financial performance ratios and efficiency measures was identified, although the effect of uncertainty of environmental factors was neglected. Huang et al. (1999) employed stochastic shadow cost frontier analysis to evaluate the cost efficiency of CDFAs. They used quality-adjusted loan output to account for non-performing loans. Their empirical results suggest an agency problem in CDFAs. Small and rural CDFAs suffer more serious allocative distortion than large and urban CDFAs. Furthermore, large CDFAs are on average more cost efficient than small CDFAs. Chang (1999) used a nonparametric approach to incorporate risk into the measurement of the technical efficiency of rural financial institutions in Taiwan. Their empirical work used three risk indicators - non-performing loans, allowance for loan losses and risky assets. The results show that regulations to control risky assets and loan loss reserves are more effective than those to control the quality of loans.

2. Methodology

Studies of the efficiencies of financial institutions have involved parametric and nonparametric approaches. This work applies both the stochastic cost frontier model and the DEA model to investigate the cost structure and the operational performance of CDFAs in Taiwan. As stated by Kohers et al. (2000), the true efficient frontier is unknown. Using both approaches reduces potential bias associated with assumptions about the data set and helps to verify empirical results.

This study first examines the cost structure of CDFAs with the stochastic cost frontier model. The effect of non-performing loans is taken into account. Data envelopment analysis (DEA) is then used to estimate efficiency measures of CDFAs. Finally, the relationship between efficiency measures and relevant factors is investigated.

3. Empirical results

The sample in this study consists of 279 CDFAs. Data are obtained from the

Farmers' Association Yearbook, the Financial Statistics Abstract published by the Ministry of Finance, and the Analysis of Operations of the CDFAs reported by the Cooperative Bank of Taiwan.   Data from alternate years between 1994 and 1998 are used to reflect possible changes in efficiency structure.

All except two estimates of the parameters of the cost model and the share equations differ significantly from zero and the adjusted R^2 is 0.9573.   In particular, the costs of urban CDFAs exceed those of rural CDFAs by 2.9495%.   Other things being equal, a new branch increases costs by 2.2% and non-interest revenues from services and asset size positively affect costs. Finally, the costs of CDFAs increase over time but at a decreasing rate.

The cost distortion of CDFAs can be calculated from the stochastic frontier model.   It is around 17.6%, and higher after the 1997 Asian financial crisis, regardless of urbanization type.   Furthermore, the rural CDFAs suffer more from the cost distortion of non-performing loans after 1997.   The cost efficiencies range from 0.388 to 0.994.   In particular, the cost efficiency decreased after 1997 Asian financial crisis and the impact are more serious on urban CDFAs.

Increasing returns to scale exist for both types of CDFAs (SC > 1), and that returns to scale influence rural CDFAs most strongly.   Furthermore, rural CDFAs benefit more from economies of scale than from economies of scope.   Actually economies of scope do not exist for both types of CDFAs. Joint production may not result in cost complements for CDFAs because the procedures for approving agricultural loans different from those for approving non-agricultural loans.   Under the Farmers' Association Law, the services of CDFAs are limited and are fewer than those provided by commercial banks.   Some deregulation that allows more joint production may be required.   Besides, the effect of economies of scope was decreased after 1997 financial crisis while the effect of economies of scale had the opposite results.

The efficiency measures from the DEA model include technical efficiency (TE), pure technical efficiency (PTE), scale efficiency (SE), allocative efficiency (AE) and cost efficiency (CE).   The cost efficiency is low and seems to follow mostly from poor technical efficiency.   Additionally, the technical efficiency is dominated by pure technical efficiency, instead of scale efficiency, implying that the inefficiency of CDFAs is primarily related to bad operational management and internal control.

Efficiencies are much lower in 1998 than in the other two years examined, implying the potential influence of 1997 financial crisis on efficiencies.

Moreover, on average, 18.64% of CDFAs exhibit constant return to scale, while 59.14% exhibit an increasing return to scale. Hence, increasing outputs increases cost efficiency, which finding is consistent with the preceding discussion on economies of scale.

The inefficiency of CDFAs may come from various sources. A two-stage regression is conducted to determine the impact of the affecting factors on efficiency. Table 8 presents the results.

Given the nature of non-performing loans, that they negatively influence all efficiency measures is unsurprising. The ratio of loans to deposits, as expected, has a positive impact. A low ratio of loans to deposits corresponds to large idle funds, which must be deposited in three designated banks with low interest. CDFAs can make more loans to improve efficiency following appropriate credit screening and loan monitoring procedures.

The quality of personnel affects only technical efficiency, pure technical efficiency and cost efficiency. Hiring people with better educational backgrounds seems to be able to enhance managerial efficiency. Rural CDFAs are more efficient than urban ones. The results also indicate that the asset size is related to efficiency measures, and large CDFAs are efficient in all aspects.

Furthermore, regression analysis suggests that the number of branches is negatively related to the efficiencies except scale efficiency. Performance can be improved by increasing the asset size but not by increasing the number of branches. Lastly, the efficiency measures after 1997 financial crisis were significantly worsened than those before 1997. The bad management, inadequate credit screening and loan monitoring together with the influence of 1997 financial crisis contributed to the decreases of efficiencies. The regression results of cost efficiency (CE1) from stochastic cost frontier model are included for verification.

4. Conclusion

Both the stochastic cost frontier model and the DEA model were used to estimate the cost structure and efficiency of CDFAs in Taiwan from 1994 to 1998. The factors that affect efficiency were further explored including the influence of

1997 financial crisis. In particular, loan outputs were adjusted to account for problems of loan quality encountered by CDFAs. Economies of scale do exist, and influenced by the urbanization type of CDFAs. However, economies of scope do not exist for both types of CDFAs. The increase in costs associated with non-performing loans is 17.6% and is greater for rural CDFAs after 1997 financial crisis. The ratio of loans to deposits positively affects efficiency. The quality of personnel positively affects technical efficiency, pure technical efficiency and cost efficiency. However, the number of branches negatively influences efficiency since the related increase in operating costs seems to exceed the increase in revenue. Moreover, the non-performing loan ratio and 1997 Asian financial crisis significantly and negatively affect efficiencies. With the other variables fixed, a negative relationship is found to hold between the non-performing loan ratio and the efficiency measures.

The government of Taiwan has recently been considering some new legislation to manage CDFAs or even to reorganize Farmers' Associations so that the CDFAs' problem loans will not cause cash runs that could jeopardize the entire financial system. This study suggests that different approaches may have to be taken for different types of CDFAs that face different problems. For example, the efficiencies of rural CDFAs, with higher proportions of agricultural loans than urban CDFAs, are influenced by agricultural production. The government can support these financial institutions to promote agricultural development. The operations and the structures of the loans provided by urban CDFAs are more like those of commercial banks. The government can encourage mergers and acquisitions among these CDFAs to improve efficiency.

The quality of personnel positively affects technical efficiency, pure technical efficiency and cost efficiency, so hiring employees with better educational backgrounds should improve managerial efficiency. On-the-job training should be effective in improving the quality of personnel. Also, the government can specify the qualifications of general manager or members of the board, by requiring some financial expertise or a college degree. Relevant changes would have to be made to the Farmers' Association Law.