Super-efficiency DEA Model for Evaluating Technology Transfer Performance of U.S. University

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Abstract—American research universities have been allowed to receive license income from licensing patent rights to private sectors for further development and commercialization after the passage of University and Small Business Patent Procedures Act (Bayh-Dole Act) in 1980. The Act made huge fundamental and policy change in encouraging universities to rapidly increase their patenting and licensing activities. In the age of fundamental change, technology management especially technology transfer performance (TTP) has become an important issue among the entire American research universities. Nowadays, due to the complexity of patenting and licensing activities, a direct and precisely TTP evaluation and comparison is usually important but difficult. Unfortunately, few studies have devoted to proposing an objective and quantitative mechanism or technique for precisely evaluating TTP so far. Therefore, this study employs and compares two alternative data envelopment analysis (DEA) models—Charnes-Cooper-Rhodes (CCR) and super-efficiency slack-based measure (SBM) to determine relative efficiencies and to measure the slack values among universities on the basis of AUTM licensing survey data whereby TTP is transformed into monetary value. Our research results will be able to sort the performance and provide managerial suggestions for each university to improve their TTP.

I. INTRODUCTION

American research universities have been allowed to receive license income from licensing patent rights to private sectors for further development and commercialization after the passage of University and Small Business Patent Procedures Act (Bayh-Dole Act) in 1980. The Act made huge fundamental and policy change in encouraging universities to rapidly increase their patenting and licensing activities. In the age of fundamental change, technology management especially technology transfer performance (TTP) has become an important issue among the entire American research universities. Nowadays, due to the complexity of patenting and licensing activities, a direct and precisely TTP evaluation and comparison is usually important but difficult. Here we will focus on the measurement of TTP in U.S. universities. We take use of AUTM license survey data to be our sources. Following, we will sort and compare TTP between U.S. universities. Efficiency ratings should be considered as a key element for achieving greater performance and better position. The technology of data envelopment analysis (DEA) is employed to determine a multi-factor TTP model. This study also presents an extension to the DEA, by incorporating the Charnes-Cooper-Rhodes (CCR) and super-efficiency slack-based measure (SBM) to determine relative efficiencies and to measure the slack values among universities on the basis of the AUTM licensing survey data whereby TTP is transformed into monetary value.

II. CONCEPTS OF TECHNOLOGY TRANSFER PERFORMANCE

A. Factors affect technology transfer performance

The literatures referring factors of TTP, Pakes and Griliches [15] analyzed 121 large firms in the U.S.A between 1968 and 1975, they found R&D expenditures have significant relationship with the amount of patent. Foltz and Jeremy [10] used the number of patent applications and total university patents and [16] used invention disclosures, patent applications, start-ups to measure TTP. Thursby and Thursby [23] investigated 62 supervisors of university technology transfer office by questionnaire survey. They found that the most of important goal for technology transfer are royalties and fee. Contrary, the number of licenses signed, the amount of sponsored research, patents awarded is not important. Thursby and Kemp [25] used DEA to analyzed 112 American universities between 1991-1996, and they chose licenses executed, amount of royalties, amount of patents, citation analysis, patent applications and invention disclosures as the indicators to measure TTP. Publication is a popular way for university professors to share new knowledge or ideas with other people and for knowledge itself to evolve. Research outcomes, in terms of publications, will increase the opportunity of technology transfer. Publications with potential commercial applications, publicized by research professors, would be identified much easier than others for technology transfer [24], it is obvious that any increase for publications, always encouraged by university, would facilitate technology transfer. In the firm size, compare to research expenditure, it is a common variable to measure organizational performance. Schumpeter [19] has improved firm size has positive relationship with research expenditures. Acs and Audretsch [1] find that firms with different size have different innovative level. Accordingly, firm size will be an important factor for organizational performance. Therefore, we will explore the impact of school size for university TTP. Although there are many possible indicators is able to measure the TTP, this study use license income as our major indicator for evaluating TTP according to the suggestion of AUTM (2006). This research concerns research expenditures