Chapter 15
Scale Economies in Indian Commercial Banking Sector:
Evidence from DEA and Translog Estimates

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ABSTRACT

Two alternative estimation models, i.e., a translog cost function and data envelopment analysis (DEA) based on a cost model are compared and contrasted in revealing scale economies in the Indian commercial banking sector. The empirical results indicate that while the translog cost model exhibits increasing returns to scale for all the ownership groups, the DEA model reveals economies of scale only for foreign banks, diseconomies of scale for nationalized banks, and both economies and diseconomies of scale for private banks. The divergence of the results obtained from these two estimation models should concern model builders. From an empirical perspective the definition of scale economies through a constant input mix is very restrictive. The DEA cost model is much more flexible in this respect: It neither requires the restrictive assumptions that the unit factor prices are always available with certainty, nor that these prices are exogenous to the firms. However, the very volatile nature of the banking industry might question the validity of the empirical estimates in this deterministic setting. Therefore, further research is required to examine the bank performance behavior using both SFA and chance constrained DEA for the comparison in a stochastic setting.

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INTRODUCTION

There is a widely held general belief that competition, a driving force behind numerous important policy changes, exerts downward pressure on costs, reduces slacks, provides incentives for the efficient organization of production, and even drives innovation forward. To analyze the performance of firms, the concept of *productivity growth* has been widely used in the literature, and the sources of this growth are largely due to contributions from either *scale economies (returns to scale)*[1] or *technical change* or both[2].

The returns to scale (RTS) property of a production function is regularly used to describe the relationship between scale and efficiency. As for terminology: Constant RTS are said to prevail at a point on the production frontier if an increase of all inputs by 1% leads to an increase of all outputs by 1%. Decreasing RTS are present if outputs increase by less than 1%, while increasing RTS exist if they increase by more than 1%.

An appropriate estimation strategy for the underlying production (technology) structure is essential in understanding RTS characteristics of firms. We find in the literature (Färe et al., 1988) that there are two approaches to the estimation of RTS: the neoclassical approach and the axiomatic approach. The former (usually estimated with some parametric econometric technique) gives one a *quantitative* measure of RTS, whereas the latter approach (to be estimated in a nonparametric fashion via data envelopment analysis (DEA))[3] yields both *qualitative* and *quantitative* information about RTS. The latter is been researched in many studies (Førsund, 1996; Banker et al., 1996; Sueyoshi, 1997; Fukuyama, 2000, 2001, 2003; Førsund & Hjalmarsson, 2004; Tone & Sahoo, 2004, 2005, 2006; Hadjicostas & Soteriou, 2006; Førsund et al., 2007; Sueyoshi & Sekitani, 2007a, 2007b; Podinovski et al., 2008)[4]. However, both methods have become important analytical tools in the empirical evaluation of RTS.

Note that all standard methods of determining RTS proceed by examining tangential planes to the frontier that can be drawn through a given point. This is done either by looking at the constant term (the variable u_0 originally introduced in the literature by Banker et al., 1984) that represents the intercept of that plane with the plane in which all inputs are set to zero or, by observing the weights of the corner points of the facet of the frontier associated with that plane. This determination, however, may be difficult because the plane need not be unique. In this study we will, therefore, deal with both the lower and upper bounds of RTS.

However, the difference between the econometric and DEA approaches lies in the construction of the efficiency frontier and the calculation of a measure for scale economies along the frontier. The advantage of the econometric approach is that it allows for a formal statistical testing of hypotheses and construction of confidence intervals (Hjalmarsson et al., 1996). However, the problem with this approach is that it is parametric and can confound the effects of *misspecification* of functional form with scale economies; and further, *flexible* functional forms are susceptible to multicollinearity, and theoretical restrictions may be violated (Reinhard et al., 2000). DEA, however, has the advantage of both, being nonparametric in nature which means *less* susceptible to specification error; and being able to accommodate multiple inputs and multiple outputs. We will be critically analyzing in this paper the nature of scale economies properties from both *nonparametric* cost DEA and a *parametric* translog cost function on the common premise that they are both *deterministic* in nature.

For empirical illustration, we will be analyzing in this paper the RTS characteristics of banking in India, looking particularly at the impact of competition on scale performance of banks with respect to ownership[5]. For a growing economy like India, the faster growth of any sector hinges