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## Evaluating Efficiencies of Chinese Commercial Banks in the Context of Stochastic Multistage Technologies

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### Abstract

This paper proposes a stochastic network model under the framework of the stochastic frontier approach, which allows firms to produce outputs through multistage processes so that we can characterize the underlying technologies and assess technical efficiency in each subsector of a firm. Our model explicitly considers the links among subsectors and overcomes the failure of network DEA that fails to estimate the fractions of shared inputs employed by subsectors, when only aggregate data are available. We compile data from the Chinese banking industry over the period 2002-2015 to exemplify our approach with the help of copula methods. Under the assumption of two production stages - i.e., deposit-gathering and loan-expansion stages - we find that banks allocate roughly 59% and 61% of labor and capital, respectively, to collect deposits in the first stage and that the average technical efficiency scores in both production stages are respectively 68% and 84%. Our study supports the previous findings that joint-stock banks are the most technically efficient, while larger commercial banks, including the big four state-owned banks, are the least technically efficient.

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