

# Convergence of Operational Efficiency in China's Provincial Power Sectors

Vishal Chandr Jaunky

Department of Business Administration, Technology and Social Sciences, Luleå University of  
Technology, SE-971 87, Luleå, Sweden

Lin Zhang

Corresponding author. Center of Economic Research at ETH Zurich, Zurichbergstrasse 18, 8092  
Zurich, Switzerland

China has recently been experiencing unrelenting power market growth, which has prompted the government to invest massively in power generation facilities. The country is now the world's second largest electricity consumer behind the US. Improvements in electricity efficiency or productivity across provinces are essential to tackle the problems of electricity demand and supply. Is the cross-provincial electricity efficiency declining (convergence) or is the gap between leading and backward provinces increasing (divergence)? From an energy policy point of view, the issue of convergence or divergence is of utmost interest. In case of efficiency convergence, this would point to the existence of spontaneous dynamic forces which will eventually result in similar efficiency level across provinces. If on the other hand, there is efficiency divergence, then there could be a need for active energy policy measures (at national

and provincial levels) to boost the catching-up process. Generally speaking, the electricity efficiency convergence analysis addresses questions about the effectiveness and impact of domestic institutions and policies on long-term performances of the Chinese power sector.

The paper therefore focuses on the convergence of efficiency and productivity of electricity across 29 Chinese provinces over the period 1996-2008. To estimate the efficiency and productivity scores we apply the data envelopment analysis (DEA) methods. In general, the ranking of provinces as per their efficiency and productivity scores tends to corroborate. We next analyze whether efficiency and productivity convergence patterns prevail among the provinces using parametric and non-parametric convergence models. Parametric models make specific assumptions about the population distribution, while for non-parametric models, no assumption is made with respect to the population distribution and the data are left to speak for themselves. The neoclassical models reveal that a convergence process has taken place. The Chinese provinces are found to converge faster to their own operational efficiency long-run growth path than to a common one. The models also reveal a positive effect of household size, the industrial and service sectors while a negative effect of government intervention is uncovered on convergence. On the other hand, energy price is found to have no significant impact. In addition, mixed results are obtained from non-parametric techniques especially with regards to efficiency. Inefficient provinces are staying at their initial positions while efficient ones tend to experience a fall in efficiency over time.

Since the common operational efficiency convergence speed is relatively lower than the provincial one, there is still room for public policies and interventions. Furthermore, misalignments between local and central government have been occurring due to especially local protectionisms and individual interests. Hence the central government ought to enact laws to

restrict the influence of local governments. The positive effect of household size implies that increased urbanization can eventually enhance efficiency. Along the same line, the government should also ensure a sustained growth in the industrial and service sectors which also could lead to efficiency improvements. Since energy price does not affect convergence, this raises need for the Chinese government to change its electricity pricing system and introduce more competition to stimulate market forces. Current government interventions based on financial expenditures have a negative impact on convergence. As such, it could be more coherent for the government to explicitly enact policies to consolidate their green technologies. Finally, with a view to improving the future performance of inefficient provinces, benchmarking best practices could be a viable option. It is therefore vital for those provinces to keep track of their operational efficiency performance and the access to data in both quality and volume should be facilitated.