

# Club Convergence in the Energy Intensity of China

## Non-technical Executive Summary

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### Motivations underlying the research;

Energy intensity (EI) is used as an increasingly popular measure to evaluate the energy performance of an economy. What EI measures is the amount of energy being consumed relative to every unit of output generated.

Its increased popularity has seen it become a key performance indicator in many areas. In China for example, during 2005 the national government set targets to reduce EI by 20% between 2006-2010. More recently EI targets were included into 'Twelfth Five-Year Plan', giving it renewed importance in China.

There are existing studies that have tried to understand the nature of EI across the provinces of China, however these largely simplify the possible regional differences and/or commonalities that may exist.

A central theme of our work is to establish sub-groups of regions that share similar EI characteristics. Evidence of any such groups will have important implications for policy discussion and design.

### Research Overview

Our empirical work involves two stages of analysis, the first being to identify the groups, and the second being to understand the determinants of EI across these groups.

To define groups of provinces we use the club-convergence method of Phillips and Sul (*Econometrica*, 2007). This approach ultimately uses the observed trends in EI to define groups of provinces.

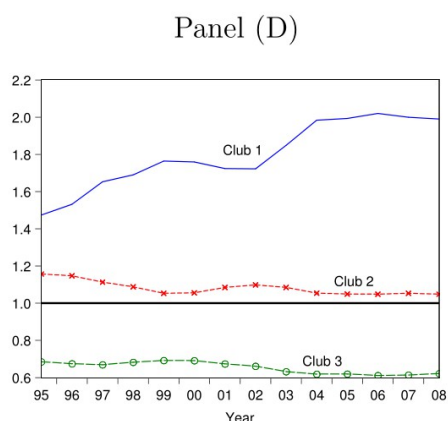
Given the identified clubs, in order to offer useful insights and policy implications, regression methods are used to establish the determinants of EI and if/how they differ across each club.

### Main conclusions

Our analysis reveals three convergence clubs relating to low, medium and high levels of EI (see graph opposite).

Regression results for the determinants of EI (which include variables relating to GDP and Economic Structure, Technology and Capital, Foreign Trade and Investment, Energy and the Environment, Transport and wider Demographic Characteristics), reveal significant club specific differences.

Not all determinants are common across the three clubs, and where they are common, they can differ both in magnitude and sign, reflecting their fundamental differences.



We further question if the identified clubs are likely to converge towards a single group in the coming decade, using simple forecasting methods. We find no evidence that such convergence will occur, thereby reinforcing the value of identifying and understanding club specific features.

**Potential applications and policy implications of the work.**

Our results offer a new perspective that complements existing studies on China. Unlike in previous studies, our club groupings do not strictly adhere to common geographic separations e.g. east, west and central divisions.

From these results we are able to point towards a number of policy implications. Factors which are more important for policy makers to understand include:

- Larger firms are able to realize scale economies and reduce EI, therefore where possible larger firms should be encouraged, however in this regard it is important to maintain a competitive market balance;
- Reducing the secondary industry's share of output in club 1 (high EI club) would help. Maintaining growth of the tertiary sector though constraints on resources (more to the point the abundance of natural resources) must be kept in mind;
- Energy price changes do not directly result in EI changes. Thus considering price as an instrument to change EI would not seem the a justifiable course of action;
- Maintaining fiscal expenditure trends will help to sustain improvements in EI levels, particular in clubs 1 and 3; and
- Foreign Direct Investment (FDI) has particular benefits for reducing EI in club 1. Accordingly placing a greater emphasis on FDI among club 1 provinces is encouraged.