National Innovative Capacity in East Asia: Determinants and Evidence from Five Countries, and Particularly from Taiwan

By

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Certification

This thesis is submitted in fulfilment of the requirements of the degree of PhD, in the Graduate School of Management, Macquarie University. This represents the original work and contribution of the author, except as acknowledged by general and specific references.

I hereby certify that this has not been submitted for a higher degree to any other university or institution.

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Abstract

The innovative capacity of a country is the basic driving force behind its economic performance. In 2002, Furman, Porter & Stern (FP&S) developed a methodology for assessing innovative capacity in terms of the national factors that influence the rate of patenting by the country in the United States Patent and Trademark Office (USPTO). They are the first to provide an integrated framework for the measurement of national innovative capacity, which they apply to a panel of 17 OECD countries over the 25 years from 1973 to 1996. My study extends the FP&S approach by applying it to five "latecomer" countries from East Asia, none of which was included in the FP&S study. In this way, this study weights the distinctive contribution of each driver on innovative activity and provides a basis for comparing innovative capacity of the OECD countries with the mechanism of innovation in the East Asian countries (particularly the *Tiger* countries).

First, this study adopts the FP&S methodology in relation to the five East Asian countries, by gathering comparable data over a comparable time period. The results here replicate those of FP&S, with some important differences: it is found that fewer national factors influence the rate of patenting in countries that have become innovative only recently, and that their patenting performance is diverging (as opposed to the convergence demonstrated by FP&S).

Second, this study extends the framework to encompass variables not considered by FP&S, in particular the impact of public sector Research & Development (R&D); the results show that this variable has exerted a significant effect on patenting rates, which reinforces its claim to be considered as part of the innovative capacity of a latecomer country.

Third, this study provides some empirical and case study evidence of current patenting trends in one of the five countries, namely Taiwan, to illustrate the depth of strategising involved in raising the level of the country's innovative performance and the indispensable role played by the public sector. In these ways, this study sheds light on the process through which a latecomer country is able to close the gap with the more developed countries, by channelling resources towards the raising of its innovative capacity.

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List of Abbreviations

APEC	Asia Pacific Economic Cooperation
APIPA	Asia Pacific Intellectual Property Association
CAFC	Court of Appeals for the Federal Circuit
CD-R	Compact Disk-Read Only Memory
CII	Current Impact Index
CPU	Central Processing Unit
DVD	Digital Video Disk
ED SHARE	Share of GDP spent on higher education
E-G	Ellison-Glaeser specialisation formulation in mechanical, chemical, and electrical classes
EPO	European Patent Office
ESOP	Employee Stock Option Program
EU	European Union
FDI	Foreign Direct Investment
FP&S	Furman, Porter and Stern
FTE S&T	Full-time Equivalent Scientists and Engineers
IC	Integrated Circuit
IDT	Integrated Device Technology
III	Institute for Information Industry
IMD	International Institute for Management Development
IP	Intellectual Property
IPRs	Intellectual Property Rights
IT	Information Technology
ITRI	Industrial Technology Research Institute
JPO	Japan Patent Office
LC	Legal Centre
LED	Light Emitting Diode
LICs	Late Industrialising Countries
MNCs	Multinational Corporations
MOEA	Ministry of Economic Affairs
MOS	Metal-Oxide Silicon
NBER	National Bureau of Economic Research

NI	National Semiconductor Incorporated
NICs	Newly Industrialised Countries
NSC	National Science Council
NSEL	National Systems of Economic Learning
ODM	Original Design Manufacturing
OEM	Original Equipment Manufacturing
PC	Personal Computer
POP	Population
PPP	Purchasing Power Parity
PWT	Penn World Table
R&D	Research and Development
RTA	Relative Technological Advantage
S.D.	Standard Deviation
S&E	Scientists and Engineers
SIA	Semiconductor Industry Association
SMEs	Small-Medium Size Enterprises
SOC	Systems-On-a-Chip
S&T	Science and Technology
STLC	Science and Technology Law Centre
TFT-LCD	Thin Film Transistor - Liquid Crystal Display
TDP	Technology Diffusion Project
TI	Texas Instrument Incorporated
TIPO	Taiwan Intellectual Property Office
TSMC	Taiwan Semiconductor Manufacturing Corporation
TTLA	Taiwan's TFT-LCD Association
TTSC	Technology Transfer and Service Centre
TWTM	Taiwan's Technology Marketplace
UMC	United Microelectronics Corporation
UNIDO	United Nations Industrial Development Organisation
USPTO	United State Patent and Trademark Office
USTR	United State Trade Representative
VC	Venture Capital
VISC	Vanguard International Semiconductor Corporation
WIPO	World Intellectual Property Organisation