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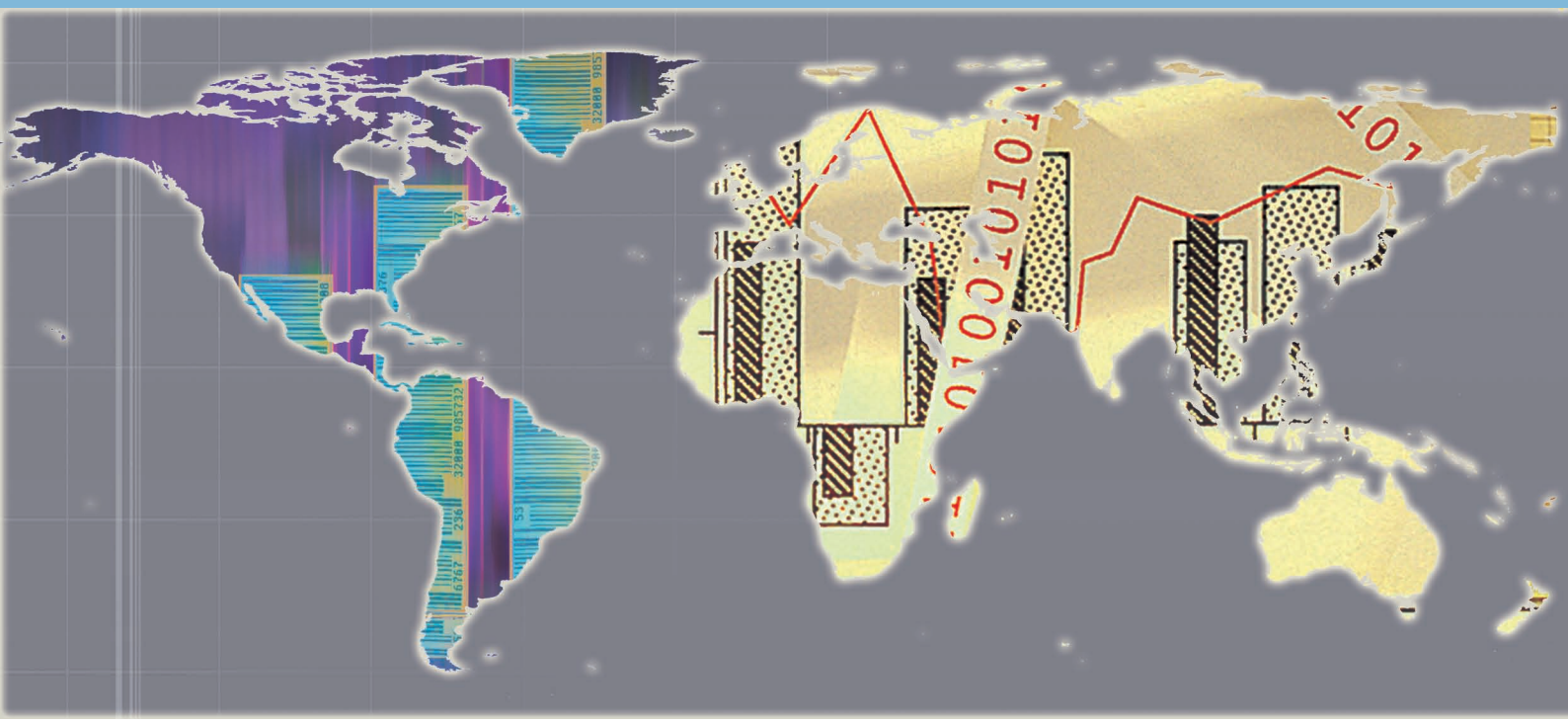

Changing Patterns in Industrial Performance

A UNIDO Competitive Industrial Performance Perspective

Implications for Industrial Development

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Implications for Industrial Development

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
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List of abbreviations

ALDCs	African least developed countries
BITs	bilateral investment treaties
B-o-P	balance-of-payments
CIPI	Competitive Industrial Performance Index
DARPA	Defense Advanced Research Projects Agency
DCs	developing countries
DTTs	double taxation treaties
EIS	European Innovation Scoreboard
EU	European Union
FDI	foreign direct investment
GDP	gross domestic product
GNI	Gross national income
HIEs	high-income economies
ICs	industrialised countries
ICT	information and communication technology
IDR	Industrial Development Report
IInt	industrialisation intensity
IMD	International Institute for Management Development
LDCs	least developed countries
LIEs	low-income economies
LMIEs	lower-middle-income economies
MHT	medium- and high-technology
MHVAsh	share of medium- and high-tech in manufacturing value added
MHXsh	share of medium- and high-tech exports in manufactured exports
MNEs	multinational enterprises
MVA	manufacturing value added
MVApc	manufacturing value added per capita
MVAsh	share of manufacturing value added in GDP
MXsh	share of manufactured exports in total merchandised exports
MXpc	manufactured exports per capita
MXq	manufacturing export quality

NAFTA	North American Free Trade Agreement
NSI	National Systems of Innovation
OECD	Organization of Economic Co-operation and Development
R&D	research and development
RIS	Regional Innovation System
RTAs	Regional Trade Agreements
S&T	Science & Technology
SMEs	small- and medium-sized enterprises
SSA	sub-Saharan Africa
SWOT	strengths, weaknesses, opportunities, threats
TAC	transactional capacity
TFC	transformational capability
UK	United Kingdom
UMIEs	upper-middle-income economies
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
WEF	World Economic Forum
WTO	World Trade Organization

Abstract

Industrial performance, and its varietal dimensions, factors and variables, is associated with socio-economic development. In this paper, we attempt to portray a limited indication of changes in industrial performance across developing, and industrialised, countries according to income groups and in terms of transactional and transformational dimensions of the economy. We are viewing these two dimensions through the industrial performance lens with bi-focality of intermediation on the one hand, and value-addition on the other. Data used for analysis has been extracted from UNIDO's Scoreboard, which depicts full, and core, samples of 120, and 99, countries respectively over the period 1993 to 2003, with benchmark comparator years 1993, 1998 and 2003. The unit of analysis is the national economy. The six variables of the UNIDO Competitive Industrial Performance Index (CIPI) are dichotomised into transactional capacity (TAC) and transformational capability (TFC). Results are presented in constructed graphs.

1. Introduction

Industrial performance, and its varietal dimensions, factors and variables, is associated with socio-economic development [Bartels (2007a)]. However, capturing parsimoniously the crucial dimensions, factors and variables is a continuing and serious challenge [Durlauf and Quah (1998)]. We attempt to portray a limited indication of changes in industrial performance across developing, and industrialised, countries according to income groups and in terms of transactional and transformational dimensions of the economy[1]. We are viewing these two dimensions through the industrial performance lens with bi-focality of intermediation on the one hand, and value-addition on the other hand [Dunning (2003, fig. 1, p.109)][2].

It is therefore crucial to indicate, from the outset, the scope and delimitations of this paper. This paper takes departure from the depiction of industrial performance as a dynamic pattern of manifest capabilities and capacities which are nested from the level of the firm to that of the national economy. The unit of analysis is the national economy. However, the empirical and theoretical foundations are visible at the level of the firm and when aggregated, are manifest nationally. After all, it is the collective but coherent-contentious, (in the sense of Brownian Motion) activity of individual economic agents - be it defined in computable general equilibrium terms [Bandara (1991); Carlstrom and Fuerst (1997)], industry sectors, or industry-market dynamics of competition [Porter (1980, 1990)] - that results in economic behaviour as output growth (or lack of it) and development as increasing wealth[3].

The paper therefore examines the patterns of competitive industrial performance when the indications of such performance are recast in terms of transformational capability variables and transactional capacity variables [Dunning (2003)]. It does so using the UNIDO

[1] A literature search of Proquest and Science Direct shows few references that refer directly to these two dimensions, or perspectives, of a national economy. When these two dimensions emerge in socio-economic literature, they are usually associated with information technology [Gregor et al. (2006); Fitzgerald and Harper (2008)]; business-to-business organisational modalities [Kaefer and Bendoly (2004)]; Human Resource Management in terms of leadership and organisational dynamics [Pawar and Eastman (1997); Gilley, Maycunich and Quatro (2002); Mccarthy et al. (2008); Jandaghi, Matin and Farjami (2009)]; and institutional dynamics [Ellis (2004); Jacobides and Winter (2005)].

[2] This paper recognises the potential future effects of the Great Recession of 2008, but does not address it directly as it is a 'rear-view mirror' take on industrial performance.

[3] Normative positions are avoided herein notwithstanding the fact that patterns of economic change involve inherently choices and selection among competing incentives, values and returns on 'alternative' investments. It needs recalling that the economic exchange of 'goods' is mirrored by that of 'bads'.

Scoreboard[4] which depicts full, and core, samples of 120, and 99, countries respectively over the period 1993 to 2003, with benchmark comparator years 1993, 1998 and 2003. This represents a period of notable global economic stability with growth [Oliver and Sichel (2000); Rodriguez and Rodrik (2000)] with the exception of the year 2000[5].

More specifically, we examine patterns of industrial performance over time in two-dimensional space - along transactional capacity (x-axis) and transformational capability (y-axis) - which are indexed, with values between zero and one, for countries individually as well as for countries grouped according to income groupings[6].

As the paper examines variably competitive industrial performance of countries, in time and space, it looks definitionally at performance measured at points in time. These are assumed to represent the dynamics of performance that emerge from choice variables which, in two dimensional combination, depict parsimoniously industrial change.

Clearly, from the literature, there are numerous performance benchmarks[7]. This paper does not provide directly explanations of why various patterns of industrial performance should exist. The vast literature on economic development and growth more than adequately deals with the explanatory variables responsible for the differentiated economic performance of national economies [Sala-i-Martin (2002a, 2002b); Bartels (2007a, 2007b); Cerra and Saxena (2008)]. Instead, this paper portrays visually the broad patterns of changing capacity to transact and capability to transform which is within the managerial, organisational and policy remit of national economies as they compete geo-economically and geo-strategically [Krugman (1986)].

It attempts to bring to the fore the persistent nature of economic performance [Bartels (2007a)] in terms of a dynamic that is remarkably stable over time. In other words, economies change

[4] UNIDO Industrial Development Scoreboard 2007 Update.
[5] The year of the 'dot.com' crash [Thornton and Marche (2003)] when the Silicon Valley driven 'high-tech' boom was temporarily halted by sharp falls in the equity prices of internet-based entrepreneurs and enterprises.
[6] Economies are divided according to 2007 GNI per capita, calculated using the World Bank Atlas method. http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20420458~menuPK:64133156~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html
[7] See A.T. Kearney, 2005, *FDI Confidence Index*; A.T. Kearney, 2009 Global Retail Development Index; A.T. Kearney, 2004, A.T. Kearney's 2004 Offshore Location Attractiveness Index: Making Offshore Decisions; Gwartney and Lawson (2008), Economic Freedom of the World - 2008 Annual Report, Fraser Institute; Heritage Foundation, 2009, 2009 Index of Economic Freedom; IMD, 2009, The World Competitiveness Yearbook 2009.

slowly and the path dependency trajectories of economies tend to be highly stable even when subjected to exogenous shocks [Rodrik (2004a); Cerra and Saxena (2008); Barro and Ursúa (2008, 2009)]. In addressing the issues, the paper is oriented more to formalised and institutional systems rather than informal ones.

The rest of this paper is organised as follows: Part 1 -- Literature Review -- examines, describes and reviews the pertinent literature related to the subject matter. Part 2 -- Description of Data -- describes the six Competitive Industrial Performance Indices (CIPI) as the variables of industrial development. The CIPI is condensed from six indicators to form two indices, which depict respectively the transformational capability (TFC) and transactional capacity (TAC) of national economies. Part 3 -- Methodology – describes the construction of the two indices of transformational capability and transactional capacity of countries and also presents the two dimensions in constructed graphs (Figure 2-13). Part 4 -- Results -- draws together the results of examining the graphs and portrays dynamic changes. Part 5 -- Analysis and Discussion -- presents and discusses analytically the results with the perspective of changing economic structure. Part 6 -- Policy Implications -- based on the analysis, presents and looks into some of the policy implications of changing patterns of the TFC and TAC. Part 7 -- Concluding Remarks -- draws together the threads of implications for industry, and trade and development, and draws attention to issues for further research. Part 8 -- Appendix -- contains technical references and graphs.

2. Literature review

Long-term economic dynamism [Maddison (2001)] is founded on the deep fundamentals of growth [Rodrik, Subramanian and Trebbi (2002); Rodrik and Subramanian (2003)] that are accentuated by the economic capacity to 'buy' and 'sell' things and capability to 'make' things which become aggregated because of the social setting of homo economicus [Persky (1995); Gintis (2000); Henrich et al. (2001)]. Central to these two functions is the enabler of innovation. Dynamic technological capabilities and innovation[8] are crucial for economic

[8] The lexicon of innovation, according to various sources, covers concepts such as, a new idea, method, or device. The Department of Trade and Industry, UK, defines innovation as, 'the successful exploitation of new ideas'. Innovation is classified into product innovation, process innovation, position innovation and paradigm [Tidd, Bessant & Pavitt (2005)]. Schumpeter differentiates between innovation and invention. According to Schumpeter, an invention is theoretical, whereas, an innovation is a practical usage of an invention. We apply the usage of the term innovation according to the four types as provided by Tidd, Bessant & Pavitt (2005) and earlier stated by Lundvall (1998).

development, competitive economic performance and growth [Lundvall (1998); Archibugi and Coco (2004)]. In general, countries have increasingly realised the significance of innovations as enablers of performance and are formulating policies, or at least trying to create favourable entrepreneurial environments, which are conducive to innovation[9]. Specifically, the Industrialised Countries, either individually or in concert as unions or members of Regional Trade Agreements (RTAs), are devoting enhanced policy space and resources (in particular incentives and fiscal policy instruments) to expand the capacity and capability of those actors responsible for driving innovation at the national level [Atkinson and Correa (2007); Johansson et al. (2007); Block and Keller (2008); Atkinson and Andes (2009)] in order to increase TAC and TFC [Bartels et al. (2008) under review].

Nevertheless, a significant number of countries lag far behind the leading economies on the industrial performance spectrum, and, from a policy perspective, may, or may not, have fully realised the significance of (policy supported) innovation for their further growth and economic development. For example, according to Myant (2007), the Czech Republic fulfilled the criteria to join the EU, but lags far behind in international comparisons of technological competitiveness; one of the main reasons of this being minimal levels of institutional capability for innovation.

Ultimately, it is up to the policy community and regulatory authorities of a nation-state to provide well-articulated and appropriately configured incentives to industry and other economic agents, and to create favourable environments conducive to enhancing capacity for exchange and capability for innovation. In a recent interview with Theil (2007), Edmund Phelps, the Nobel laureate, reinstated the importance of innovation (in particular for Europe). This was framed by reference to enhancing institutions that support innovation. The UNIDO Industrial Development Report (IDR) 2002/03 [UNIDO (2002)] also emphasizes that development is influenced significantly by the innovative activities of firms which lead to technological change, not only at the level of the firm, but also, through nested aggregation,

[9] However, a certain level of technological capacity is a prerequisite to absorb new knowledge and the benefits of Science & Technology (S&T) spillovers from Industrialised Countries (ICs) to Developing Countries (DCs) [Skolnikoff (1993)].

at the level of the sector, industry and the macro-economy with obvious spatial effects and externalities (localised, regionalised and cross-border)[10].

According to Mitchell (1999), technological innovation has resulted in long-term high growth in many countries over the 50 years after the 2nd World War. On the other hand, current discussion notes that, notwithstanding the vast resources available (national budgets and technical personnel), the pace of technological advance could be nearing technology limits, and to develop further existing technology is increasingly costly and extremely difficult. Haavind (2006) indicates that technology manipulation for innovation is increasingly becoming more difficult and gives as an example semiconductor processing, which is gradually reaching its physical limits[11].

Economic paradigm shifts (aggregated to the level of general purpose technologies) occur because of three inter-related factors or reasons [White and Ramsey (2007)]: through different and better performance (the capacity argument); recognition and allowance of transformation (the value added or capability argument); and education (the skills, training, adoption, adaptation argument). Together, these factors reflect innovative behaviour, acceptance of innovation and knowledge. White and Ramsey (2007) underline this paradigm shift with examples of countries such as, *inter alia*, Chile, China, India, Ireland[12], that recognise the significance of knowledge workers and innovation for their economic growth [Drucker (1967)].

These inter-related factors are manifest ultimately as economic capacities and capabilities which are measured (across different scales) on a variety of variables of socio-economic

[10] From an economic perspective not all spatial effects and externalities can be positive. Reality imposes the possibility of negative externalities and hence, the burden of policymakers to craft policies to maximise the positive while minimising the negative.

[11] It is however interesting to note that this limitation is being overcome by an innovation paradigm shift in computing which addresses the Hamiltonian path problem by using bio-informatics engineering. This illustrates the absence of barriers in that, when it comes to knowledge, it is not possible to prejudge limits [Baumgardner et al. (2009)]. See also DARPA for a perspective on innovations thinking [http://www.darpa.mil/#tech]; and Brett Giroir (2007), Ideas Begin Here, DARPAtech, DARPA 25th Systems and Technology Symposium, 7/August/2007, Anaheim, Cal., US.

[12] Ireland today is one of the fastest-growing economies in the EU. The transformation of Ireland from an agricultural economy to a MHT manufacturing and trading-services economy took place during the last 15 years. Policies leading to this development have focussed on the enhancement of trade, FDI, skills, secondary education, technology and innovation activities.

development and competitive performance[13]. From a policy perspective, these variables are available selectively to industrial policy makers to choose those which are the most pertinent to the stage of industrial development[14] and economic development ambitions and goals of the country in question. These variables, from the economic growth literature, have different coefficients or elasticities. Choice - under circumstances of economic as well as policy constraints - revolves around issues of which variables(s) are resourced [15] in space (geographically sector-wise, technology-wise) and time (the switching of resources as incentives to action by economic agents).

The increasing tendency of countries to measure themselves against their previous performance and one another in a variety of 'league tables' of competitiveness, economic performance, investment climates, the ability to do business, etc., points to the importance accorded to the factors that either enable national economic performance to advance up the league tables or disable countries and so subject them to the disadvantages of marginalisation from the global economy and decreasing access to technology [WEF (2008); IMD (2009)].

It goes without saying that the national ability to change gear in economic performance in response to either exogenous shocks or constructed advantages is neither easy nor necessarily pre-ordained by initial conditions framed by geographical position, institutional qualities, trade integration intensities, and geo-strategic considerations. [North (1990); Sachs (2001); Rodrik and Subramanian (2003)]. The dynamics of such national ability are comprehensively described by Porter (1990) in his empirical portrayal of the sources of the competitive advantages of nations and are re-cast, in bargaining terms, in the business language of the marketing of nations [Kotler, Jatusripitak and Maesincee (1997)].

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[13] See A.T. Kearney, 2005, *FDI Confidence Index*; A.T. Kearney, 2009 Global Retail Development Index; A.T. Kearney, 2004, A.T. Kearney's 2004 Offshore Location Attractiveness Index: Making Offshore Decisions; Fraser Institute, Economic Freedom of the World; 2008 Annual Report; Heritage Foundation, 2009, 2009 Index of Economic Freedom; IMD, 2009, The World Competitiveness Yearbook 2009; Transparency International, 2008 Corruption Perceptions Index; UNDP, 2007, Human Development Report 2007/2008; UNIDO, 2009b, Industrial Development Report 2009: Breaking in and moving up: New industrial challenges for the bottom billion and the middle-income countries; WEF, 2008 Global Competitiveness Report 2008-2009 Geneva; World Bank, 2008, Doing Business in 2009.
See also Countryrisk.com for various country analysis reports which use a variety of indices to compare and contrast countries across dimensions from export to sovereign risk for example.

[14] See Jeffrey Sachs, Stages of Economic Development, Speech at the Chinese Academy of Arts and Sciences, Beijing, 19/June/2004.

[15] In order to change the output side of a development variable, the input side must be subject to resources (fiscal, monetary, policy, regulatory, legal, human and physical capital).

Each country, therefore, to greater or lesser extent, is aware of its basic needs. Basic prerequisites for national economic development, *inter alia*, – capital, especially in the form of Foreign Direct Investment (FDI) which contributes more to growth than domestic investment [Borensztein, De Gregorio and Lee (1998)] and investment in infrastructure, knowledge creation and human capital – are crucial for innovative performance. Furthermore, though a country might have to rely on, or deal with exogenous factors such as the advantages of FDI, international aid and/or collaboration, in order to improve its performance, it has to start its own innovative work either in parallel or at some stage [Oukil (2009)] in order to solve local problems. Either way, innovative activities should be carried out. In this context, it should be recognised that this paper looks at formal approaches that lead to national economic development rather than the informal innovation which exists in all countries at all levels but which is driven solely by the imperatives of managerial and personal utility.

According to Sachs (2000), technology, not ideology is the main dividing, and hence differentiating, factor in the world today. For the continued enhancement of industrial performance, it is crucial for all economic agents in a country to be innovative for progress in knowledge and the ability to trade at higher levels of products and services differentiation. This in turn entitles the national economy, in international exchange, to appropriate higher prices and rents and hence generate surpluses for welfare and public goods choices. For DCs, this would be conducive to development; nonetheless, for ICs – the European member states all belong to this category[16] – it is equally necessary for them to keep up their innovativeness, should they want to maintain their advanced industrial status.

On the other side, in comparative terms, the vast majority of DCs have not benefited from either globalisation or international trade [Archibugi and Coco (2004)]. This is to say that, although a certain amount of growth has occurred, both its pace and distribution across space in most DCs have been truncated and subjected to endogenous and exogenous shocks with which DCs have not coped well [Rodrik (2004a)]. The ability of an economy to deal with, and adapt to, changing circumstances is correlated with its transactional and transformational profiles [Dunning (2003)].

[16] According to UNIDO International Yearbook of Industrial Statistics 2009.

The policy advice that prevails in relation to growth, while emphasizing the macro-economic factors and variables of stability (inflation, exchange rates, etc.) [Fischer (1993)], focuses ultimately on the enabling factors of learning [Bartels (2007a)]. These lead to improved TAC (intermediation in international trade) and TFC which reflects the dynamic of Schumpeterian entrepreneurship through the operations of firms (Small- and Medium-sized Enterprises (SMEs)) as well as Multinational Enterprises' (MNEs) management of their spatially distributed systems [Bartels, Giao and Ohlenburg (2006)]. Those DCs which have benefited from globalisation have tended to realise, earlier than most, the significance of productivity, *inter alia*, which is reinforced particularly by technological innovation. In this context, the availability of cross-country and longitudinal comparative variables translated into benchmark indices (scoreboards) are increasingly used to measure a country's performance, to market a country, to compete against 'the near abroad' and for policy craft.

According to Spenley (2002), who defines benchmarking as "… a management technique that is concerned with establishing performance measures for an organisation, so that it can analyse its efficiency and compare itself to other, usually competing, businesses -..." (p. 295), the process, and outcomes, of benchmarking are crucial tools to build and sustain successful business, where it is necessary to be better than others. This can only be achieved by, firstly, constantly observing competitors [Porter (1980)] and secondly, by constantly improving the own business. This approach, which is a common practice for businesses, is adapted in the context of national competitiveness.

Rodrik (2004b) also emphasizes the significance of benchmarking global performance in exports, as it provides a good indicator of a country's own position with respect to other competitors. As it is firms, within sectors and industries, which engage in innovative functions (in a framework of government configured incentives) and also compete with each other at different levels of aggregation (global, regional, national, local), it is crucial to check and assess their performance. That is, to carry out benchmarking, in order to capture a comparative perspective on national economic performance at the aggregate level[17].

[17] This is one of the reasons that there has been recent proliferation of benchmarking and benchmarks or scoreboards. See countryrisk.com and nationmaster.com for the extensive range of such comparator indices and statistical comparison of countries and their performance.

Benchmarking of macro-economic factors and variables provides useful information which forms the basis for policy recommendation and thus, presents a robust tool for policy makers [Önsel et al. (2008)]. Archibugi, Denni and Filippetti (2009) reinstate the need for policymakers to benchmark their countries internationally as being crucial in order to recognise the strong as well as weak points of economic performance. This enables policy makers to craft incentives and policy instruments, as well as their configuration in time and space, to take advantage of emerging opportunities, and assess policies.

However, in the specific context of industrial policy, there is some controversy over the utility of benchmarking at the national level. For example, Grupp and Mogee (2004) are critical of benchmarking and the resulting scoreboard practices and question their validity. Furthermore, they state that the figures can be manipulated with regards to the weighting of each indicator or variable[18]. At the same time, they also mention that scoreboards fulfil the function of displaying a good comparison of the 'leaders' and 'laggards'. The critique is understandable, as scoreboards are invariably constrained, in terms of the number of variables, and do not look necessarily into the various dimensions and aspects of the reasons behind the results, for example, political unrest during a time period when production was reduced. In addition, from the perspective of the deep determinants of socio-economic growth [Rodrik and Subramanian (2003)] it is difficult to capture, or measure unambiguously, the 'soft' socio-cultural indicators and transient variables that either affect, or determine, economic performance purportively manifest in the benchmark or scoreboard.

Nonetheless, countries, both the 'leaders' and, more importantly, the 'laggards', have the possibility to recognise their relative positions, and in which areas (dimensions, factors and variables), they are advancing or regressing, and can then formulate appropriate policies to enhance their competitiveness and growth prospects. The proliferation of benchmarks and scoreboards should not be confused with the context of such comparators. Economic modeling, and the requirements of parsimony to express the model, requires elegance in that the fewer (and the better) the variables selected to describe phenomenal performance, the better to appreciate and comprehend the benchmark. It also enables policy makers to operate without problems of auto correlation among the indicators and variables. Examples of such

[18] The issue of weighting - which weight is given to which indicator has long been a statistical and empirical difficulty with resolution based ultimately on theoretical underpinnings and 'best' practice choice of the authors of the particular benchmark.

parsimony are the Human Development Index [UNDP (2007)], FDI potential and FDI performance [UNCTAD (2008)], UNIDO Competitive Industrial Performance Index (CIPI) [UNIDO (2009a)][19].

As mentioned previously, there is an increasing trend in benchmarking of the technological capabilities of countries[20]. According to Archibugi and Coco (2004)[21], a single indicator, taken alone, cannot illustrate adequately the similarities or differences between countries. However, a parsimonious number of indicators taken together can form a good basis for comparisons between countries, though each indicator has its own limitation[22]. They add that technological capabilities need to be "conceptualised and quantified" (p. 29) to better understand their function in economic growth. Furthermore, the utility of benchmarks and scoreboards increases when the parsimonious set of indicators depict, or can be innovatively combined to illustrate, 'dimensionality'[23].

Notwithstanding the limitations inherent in defining fully and capturing completely the dynamic nature of industrial classification, Lall, Weiss and Zhang (2005) indicate that industrial activity and manufacturing, as medium- and high technology, might involve low technology and vice versa[24]. Though this might apply in some cases, for the scoreboards, as MHT is calculated in the same manner across all countries, it is assumed to be a good indicator of industrial development. At the same time, while describing export 'sophistication', they also emphasize the role of advanced technology as being crucial for competitiveness in high-income economies. Furthermore, inspite of their critique, they

[19] It should also be recognised that there are important methodological consequences arising from whether the benchmark or scoreboard is arrived through managerial perceptual categorisations or quantitative measures of the results of economic activity on output. In the former, the face, construct and discriminant validation thresholds need to be more exacting. In the latter, data collection, fidelity and reliability need to be exacting.

[20] See in this context, *inter alia*, Wagner et al. (2001) "The Science and Technology Capacity Index" in Science and Technology Collaboration: Building Capacity in Developing Countries? RAND Corporation.

[21] In their paper, they introduce a new indicator for technological capabilities for developed and developing countries - ArCo - which encompasses three dimensions of technological capabilities, namely, technology creation, technological infrastructure and development of human skills (p. 10).

[22] Nevertheless, indicator comparisons are used throughout economic development literature as shorthand to portray comparative performance. Hence, for example, the unending quest to capture effects with total factor productivity measurement.

[23] By this we mean that the indicators show either complementary or contrasting dimensions of what the benchmark or scoreboard proposes to measure. For example, see Carpinetti and De Melo (2002), Balk (2003), Arrowsmith, Sisson and Marginson (2004), and Aterido, Hallward-Driemeier and Iarossi (2007).

[24] However, due to the dis-integration inherent in spatially distributed global production systems - especially in MNEs, increasingly referred to as the global factory [Flamm and Grundwald (1985); Buckley (2003); Bartels (2005)] - the stages of production argument [Ando (2006)] helps in differentiating low- from medium- and high-technology activity.

consider industrial benchmarking across countries to be invaluable for policy craft. Similarly, Grupp and Mogee (2004) find that a benchmarking scoreboard can be valuable depending on, *inter alia*, the type of indicator(s) and the construction of the scoreboard itself. Crucially, they add that scoreboards also "… need a clear and transparent structure and recognised steps." (p. 1378).

Firstly, this aspect of clarity regarding the provenance of the variables, the empirical and theoretical literature, the seminal authorship and explanatory technical notes for benchmarking and scoreboards is often relegated to secondary importance in efforts to get to the benefits of comparison. Secondly, the longitudinal aspect of inter-temporal consistency[25] in the selected variables and methodology over time, in order to enable long-term policy-oriented comparisons, is sometimes abrogated in mistaken favour of modernizing the benchmark or scoreboard. It is crucial to observe that the stability of statistical data is critical to the accuracy, validity, reliability and hence credibility of benchmarking and scoreboards[26].

Archibugi and Coco (2005) review some main measures of technological capabilities and their methodologies[27] and mention that to gain an understanding of the reasons behind the differences in countries, it is necessary to look at indicators of technological capabilities which are usually proxied by value-oriented variables. This also provides an understanding of existing high innovativeness of innovating countries, as well as a means to discern their strengths and weaknesses. They also recognise and support the development of measures of technology by combining different indicators.

In the IDR 2002/03, UNIDO introduced the Competitive Industrial Performance Index (CIPI). The CIPI measures respectively, the capability, and capacity, of countries to produce and export competitively, and helps assess national industrial performance in the global economy. It considers the four main dimensions of industrial competitiveness, namely: industrial capacity, manufactured export capacity, industrialisation intensity and export quality to explore industrial depth, complexity and competitiveness, in order to establish a means of

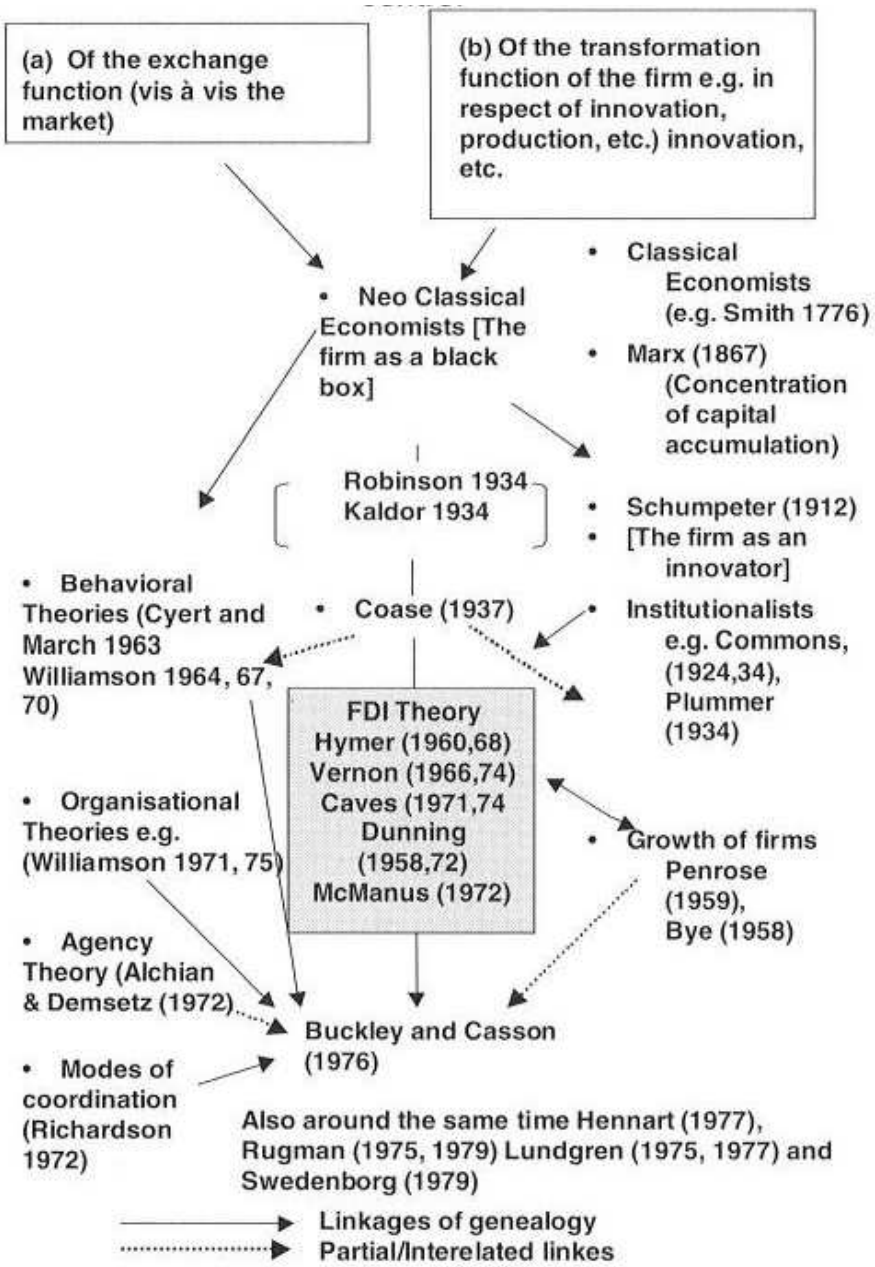
[25] In the sense of activities related to the Scoreboard are consistent in time as well as with the time frames of benchmark years.
[26] The latest (i.e. current) statistics are generally not as accurate as data of two or three years vintage regarding structural dimensions of an economy [Upadhyaya and Todorov (2008)].
[27] Namely, the Technology Index of World Economic Forum (WEF), Technology Achievement Index of United Nations Development Programme (UNDP), UNIDO's Industrial Development Scoreboard, the Science and Technology Capacity Index developed by the RAND Corporation and their own ArCo Index.

benchmarking [UNIDO (2002)]. Many other benchmarking tools exist[28]. They, however, tend to rely on qualitative measures of executive perceptions. The CIPI, on the other hand, in measuring quantitative variables that concentrate on the manufacturing sector, covers country-level indicators of intermediation and innovative performance that affect the exports of the country as well as the value-adding dimension of manufacturing, at progressively higher levels of technology. In other words, the CIPI benchmarks the scale and scope functions of competing economies.

Industry and firms are, therefore, involved in not only sales, or exchange of goods, but also in functions involving value adding [Dunning, 2003] [29]. The value-adding (transformational) and transactional functions carried out by firms, lead ultimately in terms of agglomeration, to national performance. The exchange of goods therefore, can take place as intra-industry trade and/or trade between different countries. With increasing global trade[30], it is crucial to look at the pattern of goods exported in relation to value-adding functions which require, and augment, innovation capability. It is thus necessary for a firm, and hence an economy or country, to carry out both exchange and value-adding activities, in order to maximise their profit and also enhance their growth. Referring to the figure 1 - the firm as a coordinating unit of control, one part of the figure shows the provenance of empirics and theory of the exchange of goods, whereas the other part depicts that for the value-adding function of the firm. Aggregated to the level of the economy, this approach constitutes the basis for dichotomizing the six indices of the CIPI into two sets: one representing the transactional capacity; the other the transformational capability of the economy. The two dimensional pattern of respective economic performance across countries can be plotted for comparison and correlation with other factors of development.

[28] For example, *inter alia*, World Economic Forum's growth and competitiveness indices; and IMD's World Competitiveness Yearbook.
[29] In this context, the organising function of the firm as an economic agent is essentially that of a coordinating unit of control of particular transactions functions and value added activities.
[30] This is long term since 1945 notwithstanding periodic recessions and 'the great recession' of 2008 which has generated as much as a 13% fall in world trade in 2009 according to the OECD [Patrick Love and Ralph Lattimore, 2009, International Trade: Free, Fair and Open? Paris, OECD].

Figure 1. Some antecedents of internalization theory. The firm as coordinating unit of control



Source: Dunning (2003), p.109, fig. 1

3. Description of data

The CIPI includes the following six crucial variables of industrial development[31]:

Manufacturing Value Added (MVA) per capita (MVApc)

This is the basic indicator of a country's relative level of industrialisation, in terms of value as opposed to volume, and is deflated by population to adjust for the size of the country. However, notwithstanding the necessity for parsimony, MVA alone does not capture sufficiently all the dimensions in the competitiveness of manufacturing activity and, its role in the national economy or the intensity of its technological structure. These are accounted for elsewhere in the index. Competitiveness is critical for sustainable industrial development. The technological structure of production matters insofar as industrial growth and maturity invariably entail a shift of the production structure from relatively simple to higher order activities and complex technologies. Moreover, technologically complex activities offer other benefits or externalities namely: they tend to grow more rapidly in terms of the variety in production and trade; they have greater scope economies, learning potential and beneficial spillovers; and they help make countries more responsive to new technological demands [Mayer, Butkevicius and Kadri (2002)].

Manufactured Exports per capita (MXpc)

Exports indicate the relative capacity of countries to intermediate competitively with the global economy and, implicitly, to keep abreast of changing technologies. Again, notwithstanding the need for parsimony, export values cannot, by definition, capture the extent of local value added.

Share of MVA in GDP (MVAsh)

This captures the relative role of transformational capability in manufacturing in the country in question. It points to the macro-level effectiveness of 'knowledge at work', the extent of

[31] These are assumed to be 'driven' by six other variables namely: inward FDI, skills, infrastructure, capital imports, intellectual property in the form of license and royalty fees, and research and development expenditures especially by business. However, these lie beyond the scope of this paper. They are dealt with in terms of regression in a forthcoming working paper.

innovativeness at the level of the economy and signals the extent to which economies of scope could be exploited.

Share of Medium- and High-tech (MHT) Value Added in total Manufacturing Value Added (MHVAsh)

This variable captures relatively the technological complexity of the transformational capability in manufacturing within the economy. It gives relevance to complex activities, on the grounds that these are desirable for long-term competitive performance and growth prospects. A more technologically complex structure denotes both industrial latency and maturity[32], flexibility and the ability to move to faster-growing and even more complex activities on the platform of accumulated know-how and know-why. The measure captures shifts across activities (but not necessarily upgrading within them). It is an aggregate measure and may not necessarily capture the fine technological differences within broadly defined categories (for instance, because of increasingly sophisticated technological advances, vertical specialisation, and vertically integrated intra-industry trade, low-technology activities may include some high-technology products and vice versa). In capturing performance however, these aspects do not compromise overall findings which appear generally sound and plausible.

Share of Manufactured Exports in total Merchandised Exports (MXsh)

The share of manufactures in total exports captures the role of manufacturing in export activity. To some extent, it reflects the ability to export, through intermediation, the value generated by the economy.

Share of Medium- and High-tech Exports in manufactured exports (MHXsh)

This variable captures technological complexity, the ability to organise for making more advanced products and hence to move - through scale (and scope) economies - into more dynamic areas of export growth. Again, there are some qualifications to the measure. Apart from challenges inherent in classifying products by technology levels, there is the problem,

[32] In the sense that economies of scope in MHT, based on fundamental research and development, enable exploratory and entrepreneurial behaviours, *ceteris paribus*, with respect to the product life cycle and to the political economy of technology [Sachs (2004)] as well as the concurrent exploitation of many highly differentiated goods and services.

noted above, about the extent of local value added in export activity (for example, an exporter who simply assembles high-technology products may appear as sophisticated as one who designs and produces similar products with local components if both report the same export values).

4. Methodology

The CIPI data used in this paper covers 99 core countries which represented in 2003, 96.4% of global GDP, 92.5% of global exports, and 85.5% of global population[33].

The share of MVA in GDP (*MVAsh*) and share of Medium- and High-tech Value Added in total Manufacturing Value Added (*MHVAsh*) together represent the Industrialisation Intensity (*IInt*) - i.e. the 'intensity' of industrialisation. This is measured by the *simple average* of the Share of MVA in gross domestic product (GDP) and the Share of medium and high-technology (MHT) activities in MVA. The share of Manufactured Exports in total Merchandised Exports (*MXsh*) and Share of Medium- and High-tech Exports in manufactured exports (*MHXsh*) together represent the Manufacturing Export Quality (*MXq*).

The *Industrialisation Intensity* (*IInt*) is calculated using the arithmetic mean of the base CIP indicators (*MVAsh*) and (*MHVAsh*):

$$IInt_{i,j} = \frac{MVAsh_{i,j} + MHVAsh_{i,j}}{2}, \quad \text{for the i th country and j = 1993, 1998 and 2003}$$

The *Manufacturing Export Quality* (*MXq*) is calculated by using the arithmetic mean of the base CIP indicators (*MXsh*) and (*MHXsh*):

$$MXq_{i,j} = \frac{MXsh_{i,j} + MHXsh_{i,j}}{2}, \quad \text{for the } i^{\text{th}} \text{ country and j = 1993, 1998 and 2003}$$

The *k* individual four indices of the above CIP indicators for the i^{th} country and $I^k_{i,j}$ the j^{th} period are standardised in the range of [0, 1] according to the formula:

$$I^k_{i,j} = \frac{X^k_{i,j} - \min_i(X^k_{i,j})}{\max_i(X^k_{i,j}) - \min_i(X^k_{i,j})}$$

[33] See technical notes, Industrial Development Scoreboard 2007 Update, www.unido.org/index.php?id=5058

$X^k_{i,j}$ whereas is the i^{th} country value for the period j of the k^{th} performance variable. Therefore the highest country value is mapped to the value of 1 and the lowest value is mapped to 0.

The exports and the manufacturing export quality display the competence of a country to interact – or transact in terms of globalisation – with other countries[34]. Hence, the TAC of a country is shown by the manufactured exports per capita (*MXpc*) and manufacturing export quality (*MXq*).

$$TAC_{i,j} = \frac{MXpc_{i,j} + MXq_{i,j}}{2}$$, for the ith country and j = 1993, 1998, 2003

On the other hand, MVA per capita (*MVApc*) and Industrialisation Intensity (*IInt*) represent the capability of a country to innovate, that is, to transform (in complex terms) raw materials, other commodities and intermediate goods into medium- and high-tech products. Hence, together they represent the TFC of a country.

$$TFC_{i,j} = \frac{MVApc_{i,j} + IInt_{i,j}}{2}$$, for the ith country and j = 1993, 1998, 2003

The six variables of the UNIDO CIPI, once dichotomised into transactional capacity - i.e. the capacity to intermediate effectively within globalisation - and transformational capability - i.e. the capability to add value - depict parsimoniously industrial performance in two dimensions with which to visualise patterns in time and space.

Policies need time to show their effect in changing structures. To establish temporal comparison of countries, we consider TAC and TFC indices for the years 1993, 1998 and 2003. There exist several possibilities to compare and group 'similar' countries, for example, by geography, political-economy, income, etc. We select to group the countries according to their incomes, in low-income, middle-income and high-income terms according to the World

[34] This does not so much reflect the classic Ricardian comparative advantage [Deardorff (2005); Stibora and De Vaal (2007); Costinot (2009)] but rather its intermediation functions that emerge from 'created' advantages (competitive) due to export-oriented FDI [Cheng, Qiu and Tan (2005)] and its inherent product and production specialisation effects [Ricci (1999)].

Bank income grouping of countries[35], as it differentiates the middle-income countries further into lower-middle and upper-middle income countries. The appendix indicates the countries in their income group.

It is not in the scope of this paper to address each country individually[36]. Rather, we study the income groups respectively as a whole as described above, and in some cases, where necessary, study and analyse some individual countries.

Taking the previously described indices for transactional capacity (TAC) and transformational capability (TFC), we plot graphs with TAC on the x-axis and TFC on the y-axis. As mentioned earlier, both the indices are between the lowest value 0 and highest value 1. The median (0.5) is plotted for both TAC and TFC. Furthermore, the arithmetic mean of both indices respectively for each income group is also plotted. This illustrates the position of the country with respect to the median as well as to the group average - whether it is faring much better than the group average or lagging far behind - and represents a significant point of reference for policy makers.

The median (0.5) for both TAC and TFC respectively divides the graphs into four quadrants: Quadrant I - countries in this quadrant have low levels of both TAC and TFC. Quadrant II - countries in this quadrant possess high transactional, intermediation or exporting capacity and low transformational or value-adding capability. Quadrant III - countries have high TFC, but low TAC. Quadrant IV - countries possess high innovativeness which is manifest as transformational value-adding capability as well as high intermediating capacity.

We term the quadrants I, II, III and IV respectively as:
Q-I - 'Laggards'; Q-II - 'Intermediators'; Q-III - 'Innovators'; Q-IV - 'Innovating Intermediators'. These represent comparatively the TAC and TFC orientation of the economies of the countries as singularities and together as an income group. This nomenclature is adopted for statistical comparison and analytical convenience and it needs to

[35] Income group: Economies are divided according to 2007 GNI per capita, calculated using the World Bank Atlas method. The groups are: low income, $935 or less; lower middle income, $936 - $3,705; upper middle income, $3,706 - $11,455; and high income, $11,456 or more.
http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20420458~menuPK:64133156~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html Accessed on 25.05.2009.
[36] A forthcoming paper will attempt to address countries individually with respect to industrial performance in the two dimensions mapped onto the incidence of political-economy instability.

be borne in mind that, because of the arithmetic means of the group for TAC and TFC indices, for each income group of countries there are Laggards, Innovators, Intermediators and Innovating Intermediators.

Furthermore, the movement in two dimensional space over the long-term from Quadrant I to IV can be path dependent with respect to whether an economy is biased generally towards economies of scope functions (through innovative value-adding performance) [Panzar and Willig (1981)] or economies of scale functions (through trade performance) [Panzar and Willig (1977)].

5. Results and analysis

The countries, and their economic systems, in this dichotomous spatial depiction are highly differentiated in terms of geography, integration with the world economy, institutions, political-economy and the incidence of geo-strategic considerations as well as reactions to economic cycles. Nevertheless, their industrial orientations fall along the spectrum of social market capitalism (economy) [Esping-Andersen (1990); Phelps (2007)], from the developmental state [Woo-Cumings (1999); Kohli (2004); Lazonick (2008); Jäntti and Vartiainen (2009)] to neo-liberal capitalism [Atasoy (2008)].

Two-dimensional graphs are drawn for low-income, lower-middle-income, upper-middle-income and higher-income economies for the benchmark years 1993, 1998 and 2003. A number of general observations is evident from the temporal-spatial patterns of the relative position of each country within each income group and regarding the income group as a whole.

Firstly, in general as groups, as well as in time, low-income economies (LIEs), lower-middle-income economies (LMIEs) and upper-middle-income economies (UMIEs), over time, occupy Q-I and are laggardly in terms of TAC and TFC compared with the high-income economies (HIEs) which are distributed across all quadrants, but with most countries either in Q-I or Q-IV and clustered around the arithmetic mean and the median. This is not unexpected given the transition from global uni-modal income distribution pre-1960 to the bi-modal

distribution[37] evident today [Jones (1997); Durlauf and Quah (1998); Beaudry and Collard (2006); Sala-i-Martin (2006); Epstein, Howlett and Schulze (2007)] and as TAC and TFC manifest themselves ultimately in the national accounts, and balance of payments (B-o-P), of an economy. Also, the income group TAC and TFC means approach the median as we move from LIEs to HIEs.

Secondly, over time, without exception, all income group arithmetic means of TAC move towards the median. However, for HIEs, both TAC and TFC means move towards the respective medians. The largest shift is for HIEs and the smallest is for LIEs. In other words, there appears to be a rate dynamic to the patterns and, comparatively, LIEs are in danger of becoming less able in both TAC and TFC terms as, from 1993 to 2003, the distribution in two-dimensions is more concentrated in the laggards quadrant. Further, for LIEs and UMIEs the pattern shows greater dispersal about the TAC and TFC means, whereas for HIEs the dispersal appears less pronounced [Hillebrand (2008)][38].

Thirdly, despite differences mentioned above, the patterns for all income groups tend to be persistent. This indicates that aggregate level growth patterns of economic change (structural, developmental, business, technological, etc.), despite the generally perceived or assumed rapidity of globalisation, are quite stable in their dynamics within the short- to medium-term[39]. This bears witness to the generational characteristics of economic development.

Fourthly, from the path dependency perspective of economies of either scope or scale, the increasing dispersion about the means for LMIEs and UMIEs tends to be in the dimension TAC rather than TFC. In these income categories, the means shift respectively as a decrease in the TFC dimension and an increase in the TAC dimension. This reflects, to some extent, the adoption of the export oriented development 'model' as well as increasing globalisation (especially in terms of vertically integrated cross-border intra-industry trade). It is noticeable that the countries that have shifted the most in the LMIEs are East Asia (China, Philippines,

[37] Interestingly, the bi-modal distribution (i.e. rich countries remaining rich and poor countries remaining poor) has a noticeably narrower form for poor-LIEs than for rich countries respectively.
[38] Interestingly, global inequality rose from Gini coefficient 0.62 (1988) to 0.65 (1993) and decreased to 0.64 (1998) [See Branko Milanovic (2005), Worlds Apart: Measuring International and Global Inequality. Princeton University Press, Princeton].
[39] As a function of the business cycles of short-term (Jugler-fixed investment) of about 10 years, and medium-term (Kuznets-infrastructure investment) of about 15-25 years. This means that while volatility increases in variables, factors and dimensions as the unit of analysis changes, through the nested levels from macro- to micro- and, to that of the firm, at the level of the aggregate economy, things are remarkably stable.

Thailand) while their counterparts in the UMIEs are Malaysia, Mexico and Poland. These are all emerging markets[40] which have tended to pursue export oriented development[41] [Hummels, Ishi and Yi (2001); Burstein, Kurz and Tesar (2008); Amador and Cabral (2009); Bartels (2009)].

Fifthly, regarding HIEs the dispersal about the means has been in both the TAC and TFC dimensions, only more so in the former.

Sixthly, in all income categories excepting HIEs, the TFC mean has decreased over the 1993-2003 period. This reflects to a certain extent the focus on generating knowledge in industrial policy in HIEs [See for example Laffont (1996); Sakakibara and Cho (2002); Kiyota and Okazaki (2005); Breznitz (2007); Hodler (2009)][42].

Seventhly, membership of a particular income group does not necessarily imply that TAC and TFC for a particular economy will be superior to those of an economy in a lower income group. For example, the HIE Oman performs less well in the two dimensions than LIE Senegal. And the HIE Australia does not out perform LIE Senegal in the TAC dimension (although it does so in the TFC dimension). Relative to their income groups HIE Australia and Oman are laggardly whilst Senegal is an innovating intermediary (albeit with diminished performance over 1993-2003). UMIE Gabon does not outperform over time LMIE Honduras in either of the two dimensions even though both countries are respectively in Q-I – Laggards – within their own income groups. UMIE Brazil does not outperform LMIE China even though both economies are respectively in Q-IV – Innovating Intermediaries – within their income groups.

These general observations point to the serious challenges facing policy makers in crafting policies in order to alter the path dependent trajectories of TAC and TFC for example with respect to FDI [Bartels and de Crombrugghe (2009)]. Without anticipating the policy implications in section 6, the seven general observations suggest that shifting up the mean

[40] See IIF, 2009, Capital Flows to Emerging Market Economies, 11/June/2009.
[41] Note that NAFTA (17/Dec/1992) has been key to Mexico's exports and hence its shift in the TAC dimension.
[42] The industrial policy key word search in Science Direct data base yields 140,921 articles over the period 2005-2009.

performance either along the TAC or the TFC dimensions requires applying different policies to different 'drivers' of industrial performance [Montobbio (2002); Peneder (2003)][43].

We now address the TAC and TFC dynamics of each income group in order to bring into relief salient features of competitive industrial performance.

5.1. Low-income economies

Although with respect to other income groups, the LIEs are laggardly, and over time dispersal is concentrated around decreasing means, within their group, the Q-IV - Innovating Intermediaries - increase their number adding Nigeria, Zambia and Zimbabwe to Bangladesh, Pakistan and Senegal.

The majority of the countries in this group are African Least Developed Countries (ALDCs) with a small minority being South Asian countries. Considering the three graphs - 1993, 1998 and 2003 - for the LIEs, the change in mean of this group's TAC index over the time period of ten years is marginal; whereas the mean of the group's TFC index improves marginally in 1998 and then deteriorates in 2003 to a value below that in the year 1993. This shows that despite the Innovating Intermediaries, neither the group, nor its individual members, have been able to improve their performance with respect to TAC and TFC which is alarming for future prospects. As previously noted, the group has concentrated its industrial performance in the two dimensions around means which have hardly shifted (and if at all, have decreased over time).

In general, the concentration around low performance is marked for these particular economies. However, the performance is nuanced by those economies in Q-IV – Innovating Intermediaries. Côte d'Ivoire, Niger, Malawi show greater movements towards lower TAC and TFC performance; Senegal shows movement lowering its TAC but increasing its TFC. Nigeria shows improvement in both dimensions moving from below to above group means. Côte d'Ivoire improves its transactional capacity, but at the penalizing cost of its transformational capability and, as shown by its TFC falling below the group average, this

[43] In a forthcoming paper [Bartels et al. (2009)] an attempt at modelling the relation between 'drivers' of industrial performance, and TAC and TFC performance is presented. The regression results suggest tentatively that TAC is driven significantly by investments in communicational infrastructure; and that TFC is driven significantly by royalties, licensing and patents inward transfers, as well as research and development expenditures (especially by business enterprises).

deterioration is substantial. Niger improves its TFC to a small extent from below to above group average; however, at the cost of its TAC deteriorating considerably (close to zero). Malawi improves its TAC marginally but at a serious cost to its TFC.

During the years 1993 and 1998, Senegal represents the positive outlier in this group. Its TAC is well above average. However by 2003, its TAC falls sharply, though it remains the highest amongst countries in this group. Senegal is in contrast to Côte d'Ivoire in that it improves its value-adding capabilities at the cost of its intermediating capacities. A debilitated case is presented by Ethiopia, which shows TAC-TFC values almost equal to zero throughout the period of observation.

The missing dynamism in the LIEs due to poor sub-Saharan African economic performance is a significant and perturbing observation [Collier and Gunning (1999); Bosker and Garretsen (2008); Collier (2009)]. In tentative terms of identifying economies of scope and/or scale path dependent trends within LIEs, Nigeria, Zambia and Zimbabwe have moved to Q-IV, from Q-I, Q-II and Q-III respectively[44]. Senegal, while remaining in Q-IV appears to be moving up the economies of scope, whereas Côte d'Ivoire is on the economies of scale path (although its path trajectory seems to be losing value in terms of transformational capability[45]).

Countries which lie above the group average for either TAC or TFC respectively, or both, have potential to improve their innovating intermediary oriented (TAC or TFC) performance. As mentioned previously, the value-adding function, which is greatly influenced by technology and innovation, is crucial for economic growth and development [Foray (1997); Andersen (1998); Olsen and Engen (2007); Cassia, Colombelli and Peleari (2009)].

5.2. Lower-middle-income economies

These economies show increasing dispersal, which separates the group into three clusters, about the TAC and TFC means which decrease respectively in the former dimension and

[44] Nigeria shows the largest shift from laggardly to innovating intermediator performance most probably fueled by developments in its oil and gas industry as well as its related and supporting industry. See Ghazvinian (2007); Shaxson (2007) for indications on the dynamics of the petroleum industry in SSA.
[45] The Ivorian Civil War lasted 2002 till 2004.

increases in the later dimension over time[46]. Notably, none of the laggardly performers in Q-I in LMIEs are able to reposition their performance. Q-II Intermediators shrink their number from five to three. Algeria shifts down in its TAC and TFC performance from Q-III to Q-I[47]. China, Philippines and Thailand become outliers in their TAC-TFC performance as Q-IV Innovating Intermediators with the greatest TAC shift registered by Philippines[48]. This is due largely to the rapid rise in tradable services[49] gross value added which changed up from 20% (1993-94) to just under 60% (1997-98) and just under 80% (2001-02), with a dip to a low of 10% (1999-2000). In contrast, manufacturing gross value added growth rates decline from 5% (1993-94) to 3% (2001-02). The share of services in GDP grew from 46.4% (1995) to 53.5% (2002)[50] [Bautista (2003)].

The economic export performance of China and Thailand is well recorded in the literature and is illustrated by the correlation between export growth rates (i.e. the TAC dimension) and GDP growth rates on the one hand, and on the other hand, between economic openness (imports plus exports as ratio of GDP) and FDI stock as ratio of GDP [Yue (1999); Yao and Zhang (2003)]. Similar to LIEs, LMIEs display a tendency away from the Q II - Innovators orientation.

Most members of LMIEs cluster about the means in the TAC and TFC dimensions over time with the exceptions above and of Algeria and Cameroon which are outliers near the 'zero' TAC and TFC.

Path dependency trends are tentatively visible for Philippines shift along the TAC dimension; China's and Thailand's shift along both TAC and TFC dimensions; and Egypt shifts up the TFC dimension, at a cost to its TAC, into Q-III Innovators. Mongolia is noticeable for loosing its TFC to shift along the TAC dimension[51].

[46] The shift in the TAC mean is due to three countries – China, Philippines and Thailand – which shift their TAC (and TFC) indices close to the respective medians with the Philippines TAC beyond the TAC median.
[47] The Algerian civil war lasted from 1992 to 2000 (See www.onwar.com/aced/chrono/c1990s/yr90/falgeria92.htm).
[48] This is despite increase in capital flight rising from about US$ 5 Billion (1995 constant prices) in 1993 to US$ 14 Billion (1995 constant prices) in 2003. However, the year 1995 saw surges of capital inflows equivalent to 2.5% of GDP (1995 constant prices) [Beja (2006)]
[49] There is evidence of underreporting in export performance by Philippine firms [Bautista (2003)].
[50] Current price GDP (1970-2002) [Bautista (2003)].
[51] The collapse of the Soviet Union and subsequent privatisation of state enterprises which did not improve either productivity or capacity, or competitiveness along with inflation rates at 325% (1993) and declining real

5.3. Upper-middle-income economies

As with the LMIEs, UMIEs show increased dispersal over time about the respective TAC and TFC means and the divergence leads the economies to cluster into three sets along the 45 degree diagonal of the TAC-TFC means. However, it is noticeable that TFC mean decreases while the group TAC mean increases over time. The greatest shifts occur for Malaysia and Mexico which become the leading Q-IV – Innovating Intermediaries[52]. Gabon continues in a cluster of its own as a Laggard, until joined by Panama and Venezuela which looses considerably its TFC as well as its TAC[53]. Also noticeable is the downwards downwards and backwards shifts in the Russian Federation TFC and TAC respectively and almost becomes another solitary outlier[54]. Also notable is the case of Brazil which shifts its performance towards the TAC and TFC means of the group[55].

What is particularly interesting about the UMIEs, as their TAC and TFC means shrink and the 45 degree diagonal rotates towards the horizontal, is that of all income groups, they have the highest rate of change of trade openness. This rose from around 38% of GDP (1993) to around 63% of GDP (2003)[56] [Jaumotte, Lall and Papageorgiou (2008)]. In other words, UMIEs have selected the trade off TAC against TFC. As a consequence, they have the lowest rate of change in technological development among all income groups.

GDP growth explains this collapse of TFC capability. Aggravating factors lead to real GDP fall of 9.5% (1992) [Dumbaugh and Morrision (2009)].

[52] Inward FDI to Malaysia grew rapidly from US$ 5.7 billion (1993) to US$ 7.3 billion (1997) before falling back to US$ 2.5 billion (2003) as a result of the South-East Asian Crisis which started in 1997. The inward FDI stock rose from US$ 20.6 billion (1993) to US$ 41.2 billion (2003). FDI inflows as a share of gross fixed capital formation has an average of 17.7% (1991-1997) with a peak of 25.3% (1992) [Fan and Dickie (2000)]. With respect to Mexico, the inauguration of NAFTA in 1994, bi-lateral trade with the US produced by 2002 a trade surplus of US$ 37 billion. The NAFTA has enabled 20% of GDP to be based on trade within NAFTA provisions [See David Williams Mexico's NAFTA Experience, AgExporter, Jan 2004, pp. 14-15]. Inward FDI grew from just below US$ 5 billion (1993) to above US$ 25 billion (2002) [Mollick, Ramos-Duran and Silva-Ochoa (2006)] mostly to the northern border states (with maquilladora sites).

[53] Gabon and Venezuela, as significant oil exporters, and Panama reliant on services (Panama Canal, offshore banking) arguably all suffered from "Dutch Disease" when appreciation of the real exchange rate renders manufacturing industry increasingly uncompetitive in the absence of adjustment to cost structures and productivity [Corden (1984)]. Average annual growth rates in GDP for Venezuela in manufacturing were -5.1% (1998-2003) [Di John, 2004, The Political Economy of Industrial Policy in Venezuela, Mimeo, University of London] on the back of falling investment per worker [Puente and Gómez (2008)].

[54] The collapse of the Soviet Union and subsequent lack of investment in the drivers of competitive industrial performance accounts for these shifts, when, for example, total investment in fixed capital fell by about 27% (1993-2002) and value added as a share of GDP fell from 42.5% (1992) to 37.3% (2001) [Dabrowski et al. (2004)].

[55] Brazil's output share of manufacturing decreased from 27.9% (1990) to 26.3% (2000) [Grilli (2005)].

[56] Corresponding figures for other groups are: LIEs 22% to 29% GDP (1993 to 2003); LMIEs 34% to 48% (1993 to 2003); and HIEs 35% to 42% (1993 to 2003).

UMIEs ICT capital as a share of capital stock rose from 0.25% (1993) to 0.8% (2003)[57] [Jaumotte, Lall and Papageorgiou (2008)].

5.4. High-income economies

As previously mentioned, HIEs show the greatest dispersal and the TAC and TFC means move closer to the median across time. What is immediately notable about the group is the relatively large number of Q-IV – Innovating Intermediaries, and clustering into three sub-groups. The Laggards Kuwait and Oman are joined by Qatar over time. The leading Innovating Intermediaries Hong Kong SAR, Japan, Singapore and Switzerland, are joined by Belgium and Ireland over time. These HIEs display a bias towards TFC with the exception of Hong Kong SAR which is the archetype Intermediator. The vast majority of HIEs cluster about the TAC and TFC means along the 45 degree diagonal which does not change its orientation either way (unlike the pattern with UMIEs).

The 'traditional' leaders in HIEs are well known for their policy stances (ranging from the autonomous intermediation of Hong Kong SAR and Singapore [Buckley and Mirza (1988); Arrighi (2002)]. The industrial development literature covers amply the contexts and settings common to Japan, and Singapore in particular [Stein (1995); Ozawa (2004); Furuoka (2005)][58].

Over time, the traditional leaders are joined by Belgium and Ireland. That these two relatively small economies[59] should move significantly away from the majority to join the Q-IV – Innovating Intermediaries outliers is instructive regarding the effectiveness of industrial policy on the key variables which are taken to matter to the success of the political economy and strategic management of public policy for industrialisation.

Belgium is notable for being at the political centre of the EU with advantages of the single European Market (1992) being exploited well. With respect to Ireland, one of the fastest-growing economies in the EU, the economy was transformed in the past 15 years from a

[57] In contrast, the respective increases for other income groups were: LIEs 0.3% (1993) to 2.1% (2003); LMIEs 0.25% (1993) to 2.4% (2003); and HIEs 1.4% (1993) to 4.4% (2003).
[58] In this respect, neither the political economy of industrialisation nor the path dependency which develops (as a result of the political economy) can be ignored [Boschini (2006)].
[59] The trade openness of Belgium and Ireland are respectively 172% of GDP (2005) and 151% of GDP in 2004 [nationmaster.com].

traditionally agricultural economy into one with high-technology and internationally-traded services. Policies for the development of the Irish economy have centred on attracting FDI, and increasing trade, by implementing a policy of free trade and encouraging FDI by MNEs, particularly in MHT [Ruane and Buckley (2006)]. The laggards in the HIEs are resource (oil/gas) exporting dependent countries which, like their UMIEs counterparts, have suffered from the 'Dutch Disease'[60].

6. Policy implications

In looking at the UNIDO CIPI through the lens that focuses on the dichotomous dimensions of TAC and TFC of economies, policymakers are enabled, to a certain extent, and under resource constraints, to select among competing paths to increased competitiveness. This paper addresses policymakers, think tanks and policy organisations, interest groups, policy units of governments, decision-making managerial staff in industries and within the academic community. The main purpose is to present crucial issues of industrial performance at national aggregate economy level. This has been done with the help of graphical representation, which presents an informative international benchmarking perspective. At the aggregate level, the results of the six indicators of industrial performance in the two dimensions previously delineated, encapsulate factors and variables, which subject to policy instruments and incentives, are conducive to growth [Bartels (2007a)]. However, the dynamics of the political economy of industrial performance [Boschini (2006)], as well as institutional changes, that permit skilled choices to be made [Amsden (1997); Skott (1999); Ahlerup, Olsson and Yanagizawa (2009)] and the policy dynamics of competing interests [Lee and Kim (2009); Rock et al. (2009)] that make those skilled choices difficult to make are beyond the present scope of this paper. Nevertheless, policy making, changing incentives (in time and space) and plans of action are necessary in order to move in the two dimensional space bounded by TAC and TFC.

The paper, in presenting graphically the benchmarking of the competitive industrial performance in terms of value-adding and intermediating activities of national economies, is limited in its scope of explanations as far as the reasons behind the presented results. There are various underlying historical (the deep past as well as the more recent), political, cultural

[60] See Kunibert Raffer (2007), Macro-economic evolutions of Arab economies: A foundation for structural reforms.

or other reasons for the results. Nevertheless the two-dimensional benchmarking provides policymakers a chance, firstly, to recognise their respective countries' positions with respect to other competing countries, immaterial of whether they are similar[61] to their own country or very different. The graphs present informatively an international scoreboard of transformational, or value-adding, capability and transactional, or intermediating, capacity, both of which are very important for economic growth and development. Secondly, the international comparisons provide an opportunity to ask questions and examine variables that assist to formulate policies to move up the ladder, with respect to both TAC and TFC.

Especially since the financial or global crisis - the so-called Great Recession of 2008[62] [Wolf (2008)], it is clear that governmental intervention[63] is necessary for the good functioning of open markets[64] and this is tantamount to industrial policy [Udell (2009)]. Government has a crucial role to play in the structural shift in the economic circumstances of a country [Rodrik (2004b)]. Leaving industries to grow in an uncoordinated manner may not always be conducive to development [Hausmann and Rodrik (2003)]. Some main points for consideration in formulating policies are mentioned below without exhausting the short-, medium- and long-term characteristics necessarily associated with policy.

It has been widely discussed that innovation and technological advances are positively correlated with economic growth. Innovative activities and technological capabilities are projected in the country's TFC index. Hence, astute policy formulation which articulates and configures TFC variables with national strategy for industrialisation is necessary to direct and

[61] Rodrik (2004b) states that though countries might be similar with respect to their existing resources and factor supply, they might still produce and/or specialise in different products. According to this, it would not make any difference to compare similar or different countries. However, normally, it does make a difference whether similar countries (in terms of income, geography, factor endowments) or different countries are compared; for example, a comparison of Nigeria and Switzerland is not really meaningful. Yet, it would still be useful for Nigeria to see its position on an industrial scoreboard with respect to Switzerland.

[62] See John Kay, "What a carve up", Financial Times, 1-2/August/2009, Life&Arts, p. 12; and Barry Eichengreen and Kevin O'Rourke, "A Tale of Two Depressions", http://www.voxeu.org/index.php?q=node/3421 Accessed on August 4, 2009.

[63] Hausmann and Rodrik (2003, p. 629) differentiate between two types of government intervention; one type makes up for the loss of innovators if they fail; the second being to reward them highly if they succeed. However, both these types also have certain drawbacks. The former carries the risk of leading to moral hazard; the latter not being helpful to those who require financial support in the early stages of innovation.

[64] See Lall (2004) for discussion on neoliberal and structuralist views on policy issues; some relevant points are extracted and mentioned here. The structuralist view sees effective government intervention as a necessary instrument, as markets are not perfect. It does not leave the government out of a responsibility for policy issues, and argues for government intervention for a good functioning of the market, the need for it being higher in this age of globalisation. There exist constraints to the possibility of government intervention (industrial policymaking); however, constraints from the WTO are trade related; and constraints can also have a positive effect, in so far as that they help avoid inefficiencies.

support manufacturing to include continuously innovative activities and to create an environment which is conducive to innovation[65].

In this context, it is worth mentioning the benefits of National Systems of Innovation (NSI). Should such policy implementation not seem feasible at national level, it can initially be established in different regions as Regional Innovation System (RIS). The European Union (EU) in its European Innovation Scoreboard (EIS)[66] also benchmarks local regions; this benchmarking is contained in the Regional Innovation Scoreboard which compares different regions of the EU countries. There are some good examples of regions within the EU which have managed the transformation from being low-growth region to high-growth and high-innovation region[67] [Bartels, Lederer and Tandon (2007)]. A RIS has the possibility to focus on regional potentials and needs to develop the region.

In addition to innovativeness, higher secondary education is another factor which policymakers should focus on. This helps the economy in general, and it is certainly a crucial factor for economic growth and development. There are two important aspects with regards to the skills accrued from higher secondary education. Firstly, it is a pre-requisite for R&D and innovation. Secondly, while formulating policies for developing higher secondary study programs, in order to generate solutions to local problems, congruence or conformity with existing and future industrial requirements should not be overlooked. Obviously, the strategy for secondary and tertiary education should go hand-in-hand with industry's strategic needs for technical and managerial skills.

Private businesses have two main goals, first, to ensure their continued existence, and second, to maximise their utility (profit). And more often than not, because their decisions may be focused on short-term benefits or profit, rather than long-term wider considerations for sustainable growth, government induced incentives have a very important role to play. Given the right (monetary and non-monetary) incentives[68], private businesses would be willing to

[65] These are invariably associated with increasing the stock of knowledge available within an economy in terms of research, development and deployment of ideas, and access to the ideas outside the economy in terms of intellectual property.
[66] www.proinno-europe.eu/doc/EIS2006_final.pdf
[67] For example, Almeria in Spain and Usimaa in Finland. See EIS 2006.
[68] Rodrik (2004b) mentions the significance of 'carrot-and-stick' principle when putting the instrument of subsidies to use. In the case of incentives, the same principle should be put to practise for misapplication of incentives.

include innovation-related practical R&D in their business strategies. Though a firm might already be a leader in its own country, investment as well as cross-border international joint ventures in innovative activities would help maintain its position in its own country, but more importantly, enhance the firm's competitiveness internationally. The nested effects aggregate manifestly at the national level when increasing numbers of firms improve their competitiveness.

Hausmann, Hwang and Rodrik (2005) analyse the importance of the mix of products a country produces for its economic growth. They state that the economic performance of a country is influenced by the products it produces and exports; i.e. specialisation in one or other product category would have a significant influence on its performance. According to the model which they introduce, countries with certain type of goods do tend to perform better. This is due inherently to the advantages which accrue from the underlying factors of economies of scope in particular, and economies of scale in general at the level of industrial sectors that become aggregated with synergies at the level of the local, regional, and national economy.

Hence, policy that is configured in incentives and instruments to achieve (industrial) scope and scale economies, has a crucial role to play in order to influence and, if necessary, proactively shift the production patterns and export structures. It needs to be seriously considered here that the requisite policy craft to attain such effects need to be architectured and applied in space and time over the very long term, by successive governments. This is in order to build up levels of 'stock' (human capital, social capital, physical capital, co-ordination and transaction cost reducing institutional capital) that cannot be easily 'eroded' by exogenous shocks. The relatively higher levels of stock also enable the unavoidable interstices in socio-economic dynamics to be minimised. This is because the 'thickness' or 'depth' of intermediation in internal markets [Greenspan (1999)] is relatively greater in economies with relatively higher levels of stocks of capital (in its socio-economic-physical manifestations) [Barrett (1997)]. However, the autocratic-democratic nexus of power and the incentives therein which encourage leadership to invest in such capital is beyond the immediate scope of this paper.

Obviously, existing potential with regard to raw material and/or semi-processed products and domestic skills and manufacturing capacity should be taken into consideration while looking

at local requirements[69]. From among the relative higher industrial performance economies in each income group, policymakers have examples for further comparative analysis regarding lessons for the future. The fact that income group membership does not necessarily guarantee higher TAC and/or TFC positions should provide competitive encouragement as to what is attainable with policy that is finely tuned to the needs and strategy of the economy in question.

The Q-IV - Innovating Intermediaries in each income group therefore act as examples of 'best practice'. As a 'set of good performers', as well as exploring possibilities, the deliberate policy analysis of leading countries - in either of the two dimensions - can lead to tractable lessons of industrial policy which can be applied[70]. Countries which are in the low-income group as well as those with lower values of TAC and TFC, can learn from countries like Ireland, China and India. However, the learned lessons should be focused through the lens of local conditions in order to formulate adequate and appropriate industrial policies for manufacturing industry [Chang (2002)].

A highly policy-oriented sophisticated approach to SWOT[71] analysis is a prevalent practice in the corporate world of business and management. Transferring aspects of this method to policy craft and analysis of national industries is a crucial step in increasing DC competitiveness. A key principle which companies follow strategically is that not only must profit be generated at faster rates than costs but also the costs involved in strengthening weaker points are far higher than the costs involved in further strengthening existing strengths. Similarly, policymakers should formulate strategies that focus on further strengthening competitively existing relatively 'strong' industries. At the same time, other sectors and/or manufacturing of other products should be gradually built up dynamically as a function of available resources and competitor analysis. A good example of recognizing a country's strengths and building upon them is that of Almeria in Spain, which recognised the

[69] In this context, see also Rodrik (2004b). Within the context of 'discovering' products, Rodrik (2004b) states that the meaning of 'discovering' in this context is not the same as discovering via R&D. Rather it is significant for a country to discover certain products, which are well established globally, which can be produced locally for lesser costs. This might involve adapting existing technology to local conditions.
[70] Without falling victim to actionable sanctions within the WTO framework of the permissible in an increasingly rules-based system.
[71] Strengths, Weaknesses, Opportunities, Threats

potential of 'greenhouse farming' and developed it with dedicated resource allocation[72]. This had what is assessed to be a positive and sustainable influence on economic development of that region [Bartels, Lederer and Tandon (2007)].

As TFC is significantly influenced by investments in creating knowledge (manifest as R&D and intellectual property) so too TAC is significantly contoured by investments in communications-oriented infrastructure [Bartels et al. (2009) forthcoming)][73]. This implies that for an economy to move along the TAC dominated trajectory, it must invest significantly over the long-term in infrastructure suited to efficient transactions[74]. In contrast, to move along the TFC trajectory requires serious investment, again over the long-term, in knowledge generating factors (R&D, accessing intellectual property through paying patent, royalty and license fees for strategically valuable know-how). In this regard, the significance of industrial clustering is crucial because of reduced co-ordination and transaction costs of data, information, statistics and knowledge exchange [Porter (1990); Krugman (1991a, 1991b); Fujita and Thisse (2002, 2009)]. Industrial clusters are conducive to economic growth, and have a noticeable influence on the shift in manufacturing in countries, when well incentivised in policy terms. Due to the effects of clustering, policymakers should consider industrial clustering as a serious policy option for long-term economic development.

The negative influence of climate change and diminishing ozone layer would effect all countries equally, immaterial of their economic or income status. To enhance production, which is essential for the development of DCs, and at the same time, maintain and reduce the impact of enhanced industrial production on the environment is a big challenge. Hence, it is of utmost importance that the challenges on the path to recovery are taken up with a proactive approach towards including "green packages".

[72] This is not to address the thorny issues of labour and migration in this competitive development of greenhouse farming. See Transnational Newsletter, 7th issue, July 2009; and Callejón-Ferre et al. (2009) for analysis of poor working environments in this competitive development.

[73] Among the many regression models of economic performance (aka output, growth, income, etc.) [Durlauf and Quah (1998)] various proxies for infrastructure (example, telephone lines per capita) are positively correlated with performance. The regression of the 'drivers' of industrial performance on competitive industrial performance indices (TAC and TFC) indicates that infrastructure positively influences TAC capacities.

[74] See Bartels (2007b) for indication of the long-term frame, over 40-60 years, for the electrification of the advanced industrialised countries.

Unlike the positioning, or rankings, that emerge from the TAC and TFC patterns for income groups, it is not meaningful to rank the policy instruments mentioned above because different countries face different constraints. Rather, it is up to sovereign policymakers to take the various instruments as points of consideration and reference for formulating policies and plans of action that are attuned to the stage of development of the country in question. Besides having an impact on the production, export and innovative structure of the country, the above-mentioned points of consideration would lead to, most importantly, long-term and long-lasting social and welfare benefits in the context of stable institutional development.

7. Concluding remarks and issues for further consideration

In general as groups, in two dimensional space as well as in time, LIEs, LMIEs and UMIEs occupy Q-I and are laggardly in terms of TAC and TFC compared with the HIEs which are distributed across all quadrants, but with most countries either in Q-I or Q-IV and clustered around the arithmetic mean and median. Over time, all group arithmetic TAC (but not TFC) means move towards the respective medians with the arguable exception of the LIEs. However, for HIEs, both TAC and TFC means move towards the respective means.

The improvement of LIEs with respect to the mean of their TAC index is marginal. The mean of the group's TFC index improves slightly from 1993 to 1998 and then declines in 2003. The LIEs present a disquieting case, as neither the group as a whole, nor the individual countries have made any considerable improvement in their TAC and TFC indices over the relevant time period of 10 years. Senegal presents the only positive outlier during the years 1993 and 1998. However, its TAC index for the year 2003 falls sharply, though remaining the highest in the group. Ethiopia demonstrates the most alarming case in this group, as its TAC and TFC indices remain at almost zero throughout the period of observation[75].

The group of LMIEs, over time, are clearly separated in three clusters; China, Philippines and Thailand being not only the positive outlier cluster, but also the best performers in this income group. Cameroon and Algeria present the alarming cases in this income group; Cameroon's TAC and TFC indices hardly shift over the observation time period of 10 years,

[75] Notably, the Ethiopia-Eritrea border war occurred over the period 1998-2000 and cost US$ 200 million. See international crisis group and Adejumobi (2006, p. 137).

and Algeria's TFC index declines sharply from the quadrant Q-III - Innovators of the income group to the lowest TFC index compared to other countries in the income group[76].

For the UMIEs, it is apparent that the group mean of TFC index diminishes over the observed time period. At the same time, the group mean of TAC index moves towards the median. Not only do Malaysia and Mexico prove to have the highest TAC and TFC indices compared to other countries in the group, they improve further and move closer to the TAC median, with Malaysia achieving the same value as the TAC median and being very close to the TFC median. Gabon shows a TAC index close to zero in the year 1993; however, though remaining a laggard in this income group, it improves its TAC index substantially till 2003.

Both the TAC and TFC means of HIEs move closer to their respective medians over time and are closest to them as compared to other income groups. In this income group, it is striking that Kuwait, Oman and Qatar have TAC and TFC indices equal to, or lower than, the TAC and TFC values of certain LIEs. Australia's TFC index diminishes over time. Belgium improves its TFC index over time, as well as its TAC index substantially. Also remarkable is the giant leap of Ireland with respect to both its TAC and TFC indices, its TFC index overtaking that of Singapore and Japan. Notably, Hong Kong SAR, while maintaining a high TAC index, does not improve its TFC index over time. Singapore, on the other hand, maintains its high TFC index and its 'winner' position with respect to its TAC index.

There is ample literature discussing the benefits of FDI, trade, as well as emphasizing the significance of technology and innovation, for economic growth and development. Hence, in conclusion, the policy community in DCs can use the two-dimensional rankings in the presented graphs - as a benchmarking scoreboard, and UNIDO's technical assistance, together with the points of consideration mentioned in 'Policy Implications' to formulate appropriate policies which would be conducive to the enhancement of their TAC and TFC indices.

The country groupings can be recast in terms of geography and membership of RTAs. The latter would be useful in the context of the rapid increase in the number of BITs, DTTs and RTAs [UNCTAD (2003); Bartels (2009)] over the 1993-2003 period. It should be possible to

[76] Notably, Algeria's civil war from 1992 to 1997 is partly responsible for the near collapse in this industrial performance. See Armed Conflict Events Data <http://www.onwar.com>

map RTAs performance and membership with shifts along the TAC dimension regarding the economies.

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Appendix

List of countries in income groups

Economies are divided according to 2007 GNI per capita, calculated using the World Bank Atlas method. The groups are: low income, $935 or less; lower middle income, $936 - $3,705; upper middle income, $3,706 - $11,455; and high income, $11,456 or more. http://web.worldbank.org/WBSITE/EXTERNAL/DATACSTACTISTICS/0,,contentMDK:20420458~menuPK:64133156~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html [Accessed on 25.05.2009].

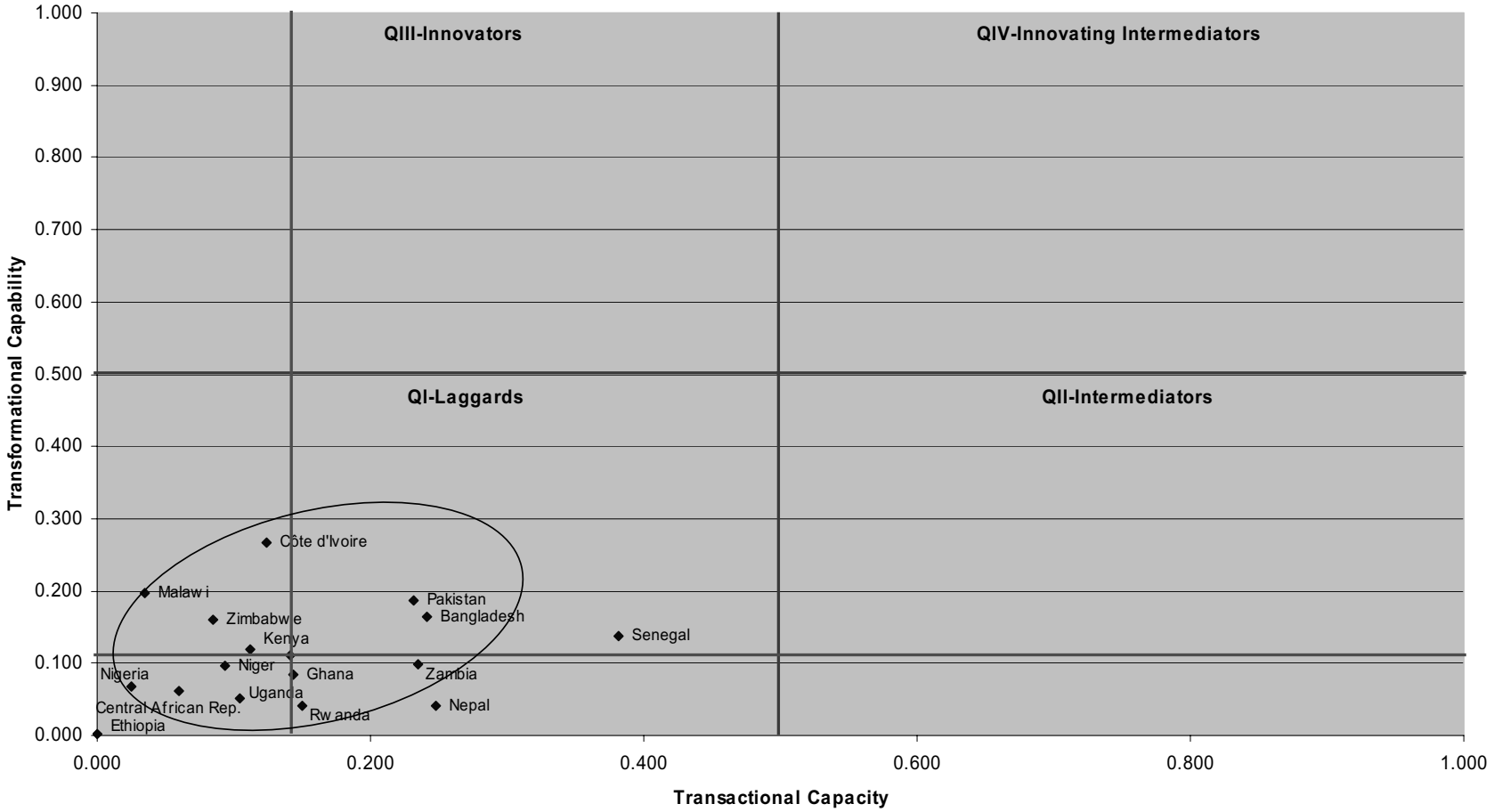
Low-income economies (LIEs)
Bangladesh, Central African Rep., Côte d'Ivoire, Ethiopia, Ghana, Kenya, Malawi, Nepal, Niger, Nigeria, Pakistan, Rwanda, Senegal, Uganda, Zambia, Zimbabwe

Lower-middle-income economies (LMIEs)
Albania, Algeria, Bolivia, Cameroon, China, P.R., Colombia, Ecuador, Egypt, Arab Rep., El Salvador, Honduras, India, Indonesia, Jordan, Macedonia, FYR, Mongolia, Morocco, Paraguay, Peru, Philippines, Sri Lanka, Thailand, Tunisia

Upper-middle-income economies (UMIEs)
Argentina, Brazil, Bulgaria, Chile, Costa Rica, Fiji, Gabon, Jamaica, Latvia, Malaysia, Mauritius, Mexico, Panama, Poland, Romania, Russian Federation, Serbia and Montenegro, St. Lucia, Turkey, Uruguay, Venezuela, RB

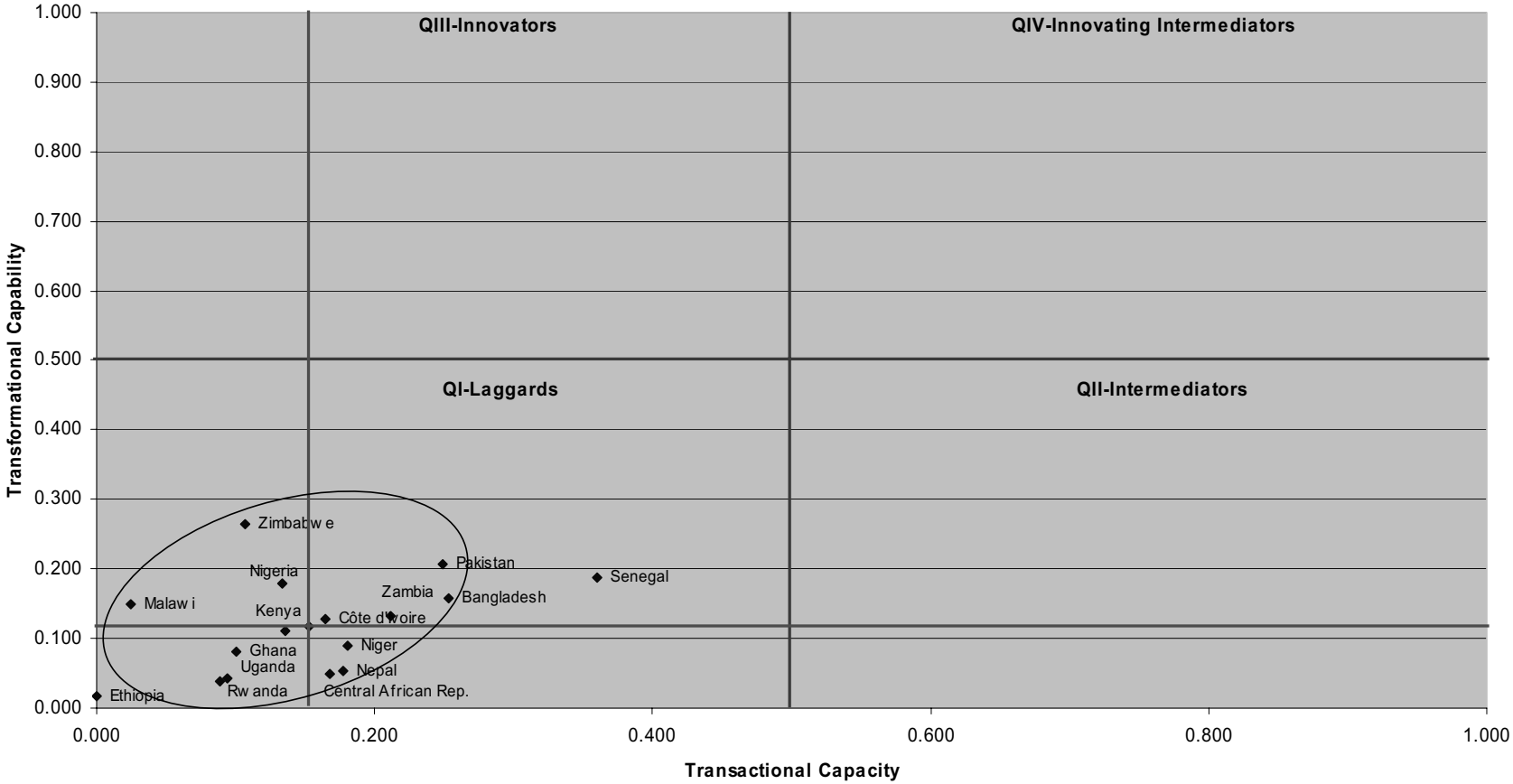
High-income economies (HIEs)
Australia, Austria, Bahamas, The, Barbados, Belgium, Canada, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, SAR, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Rep., Kuwait, Macao, SAR, Malta, Netherlands, New Zealand, Norway, Oman, Portugal, Qatar, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Taiwan Province, Trinidad and Tobago, United Kingdom, United States

Figure 2. Low-Income Economies 1993



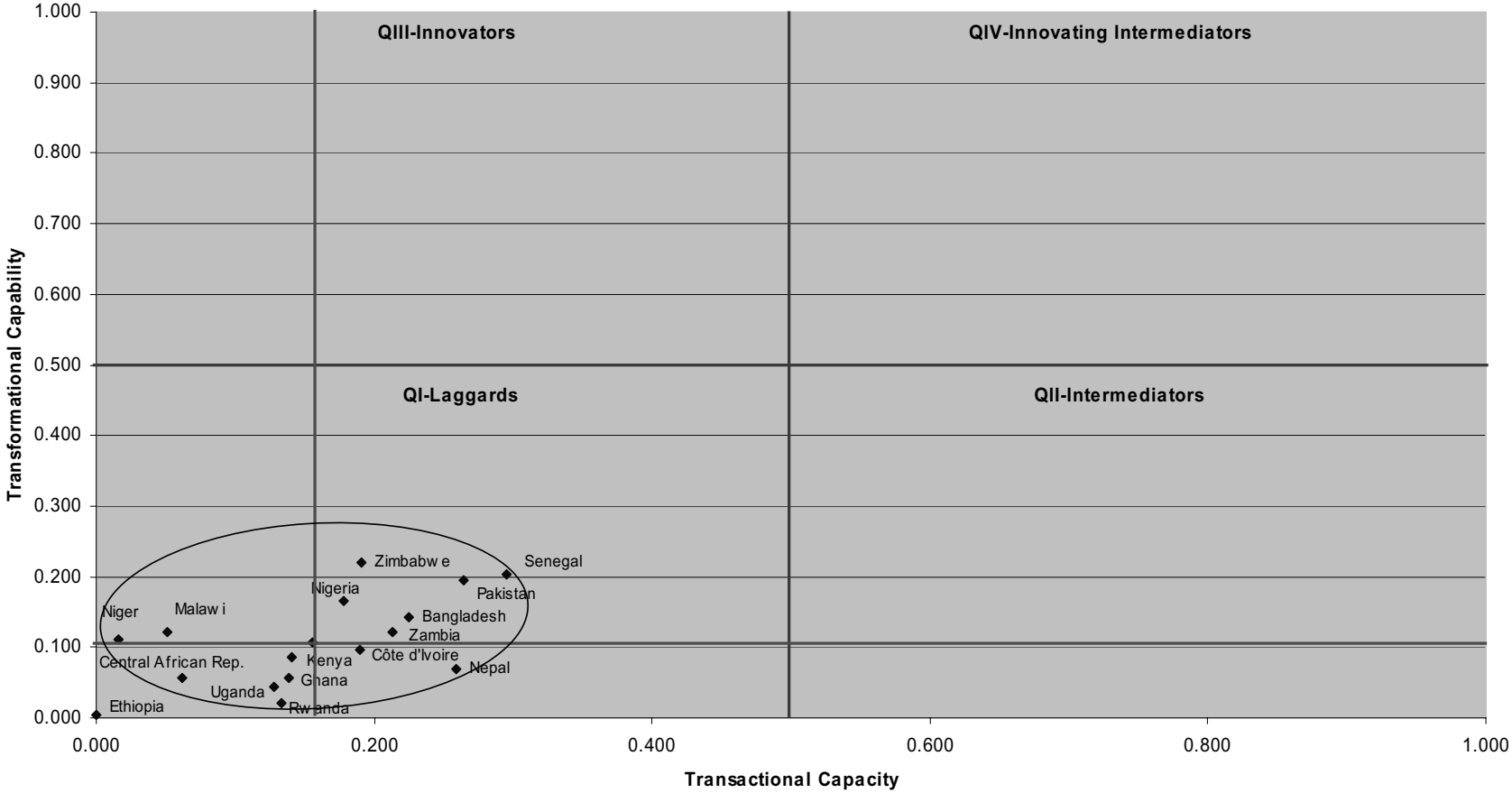
Source: author – based on data contained in Industrial Development Scoreboard – 2007 Update.

Figure 3. Low-Income Economies 1998



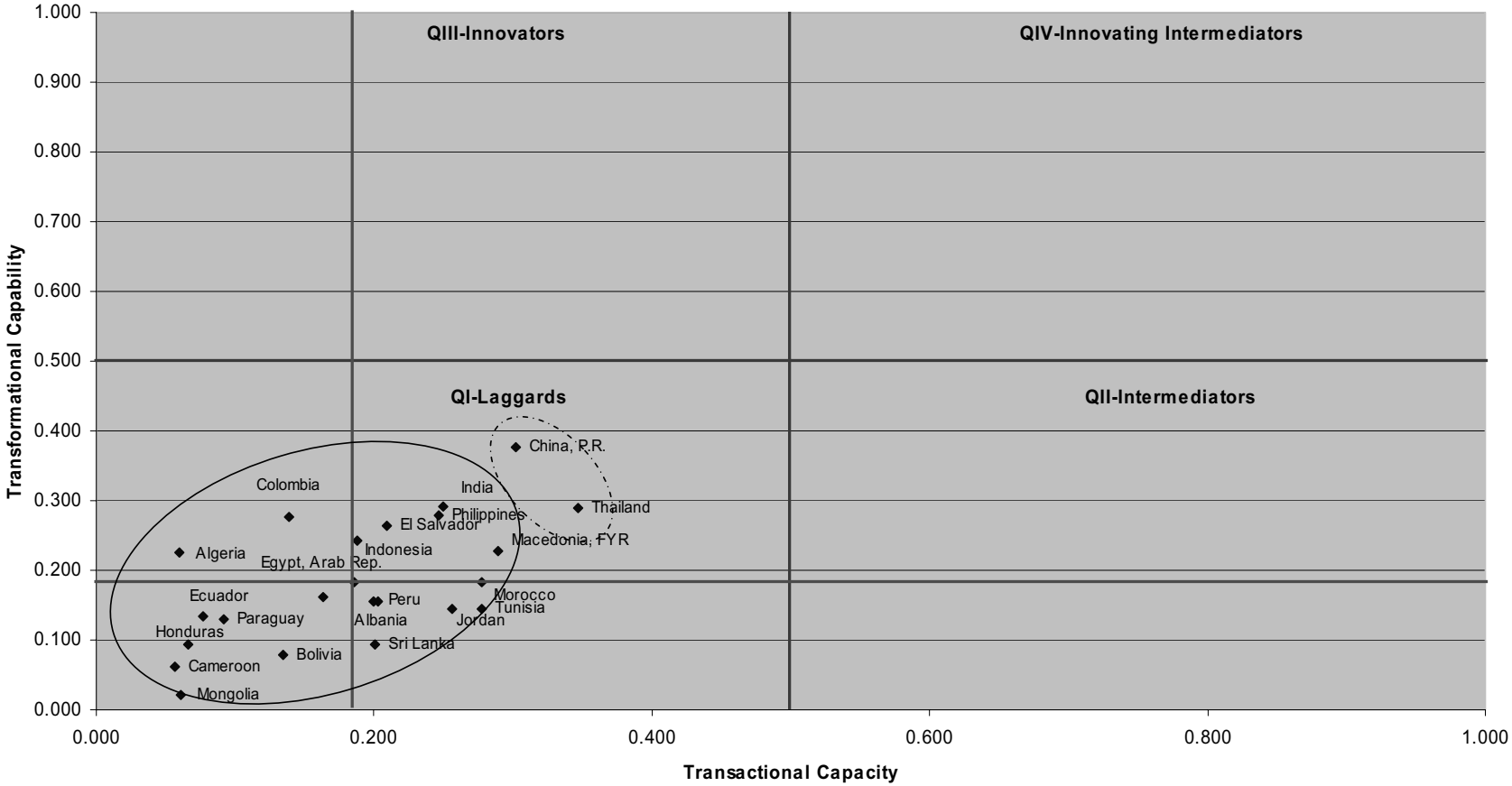
Source: author – based on data contained in Industrial Development Scoreboard – 2007 Update.

Figure 4. Low-Income Economies 2003



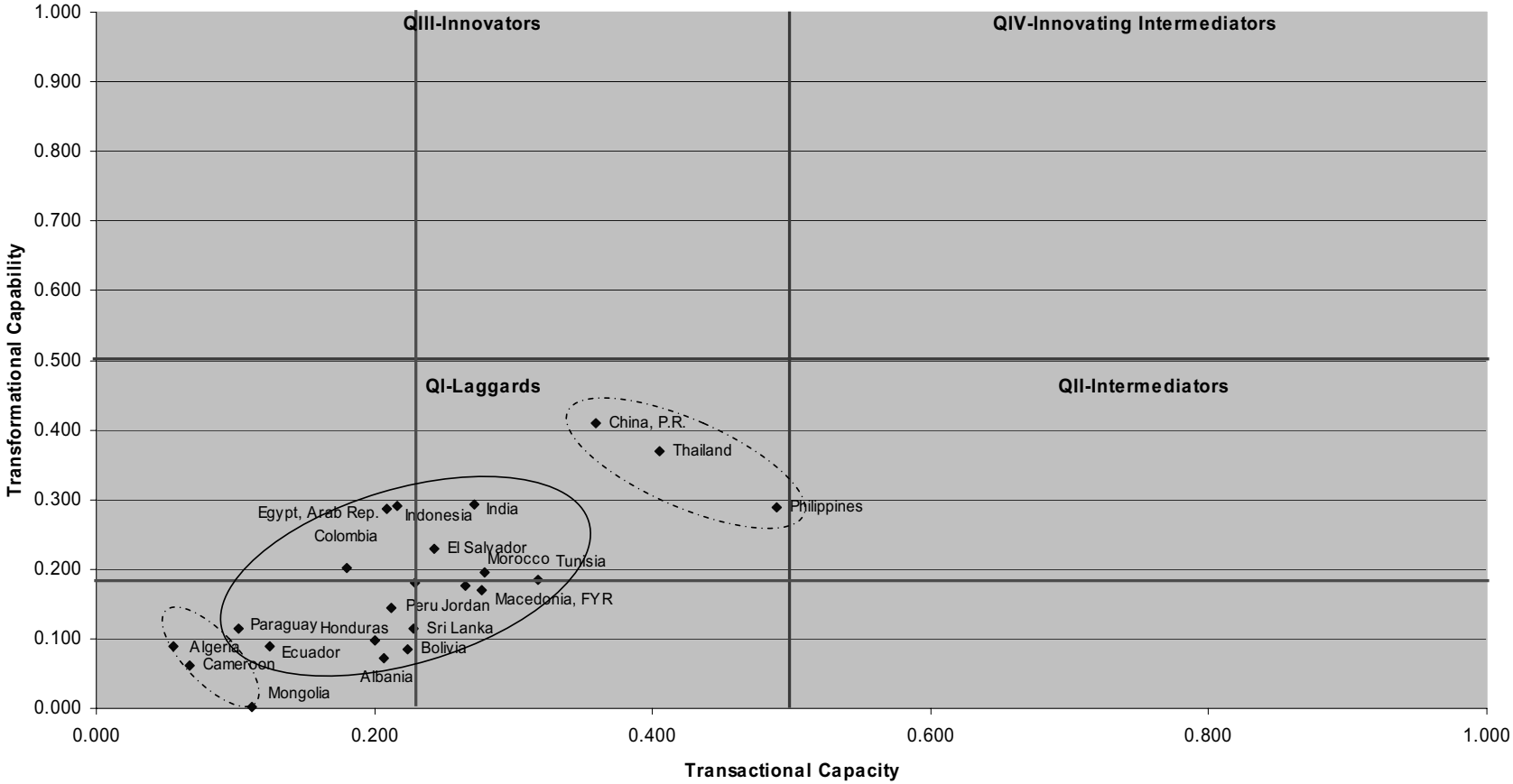
Source: author – based on data contained in Industrial Development Scoreboard – 2007 Update.

Figure 5. Lower-Middle-Income Economies 1993



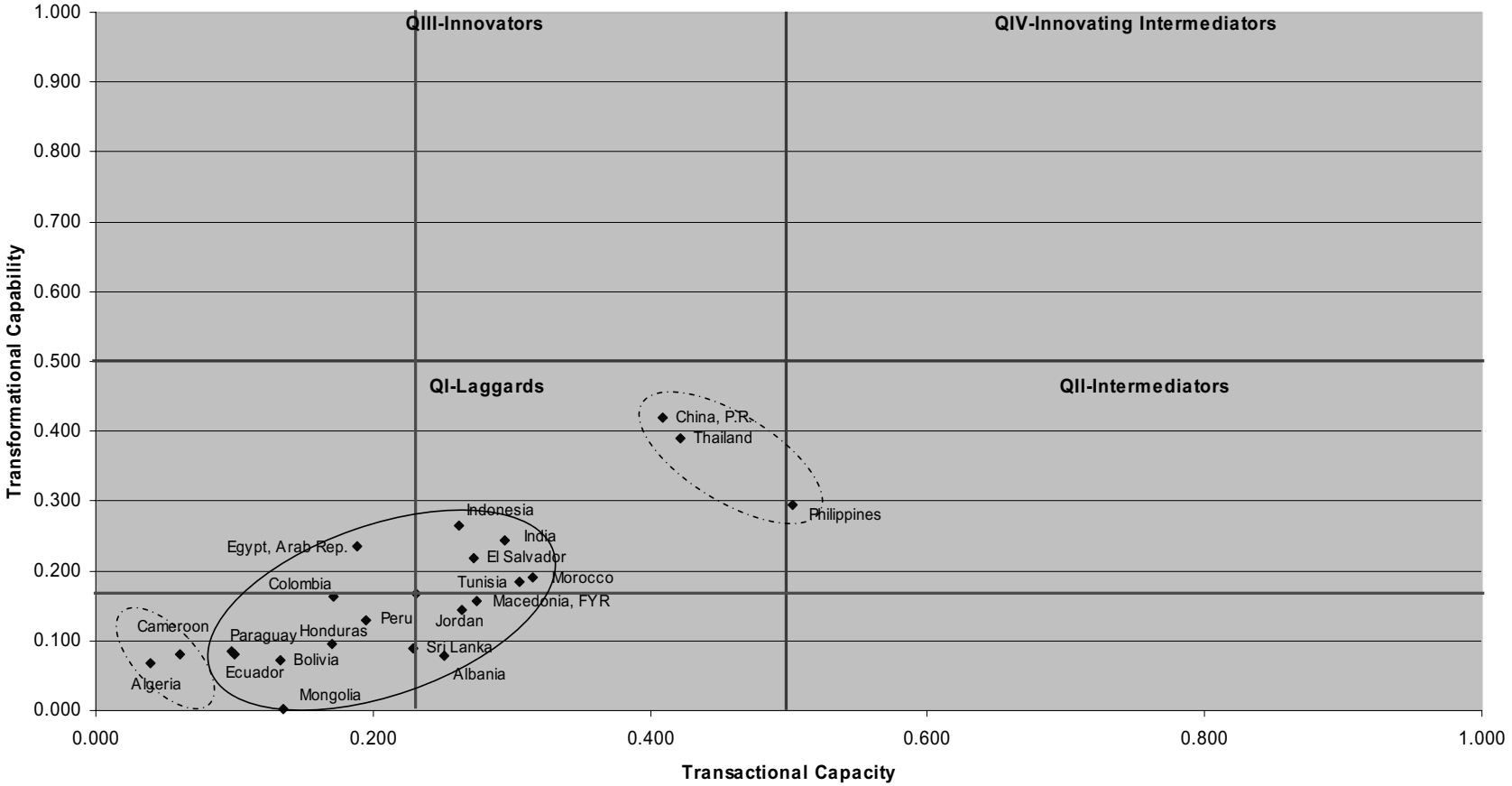
Source: author – based on data contained in Industrial Development Scoreboard – 2007 Update.

Figure 6. Lower-Middle-Income Economies 1998



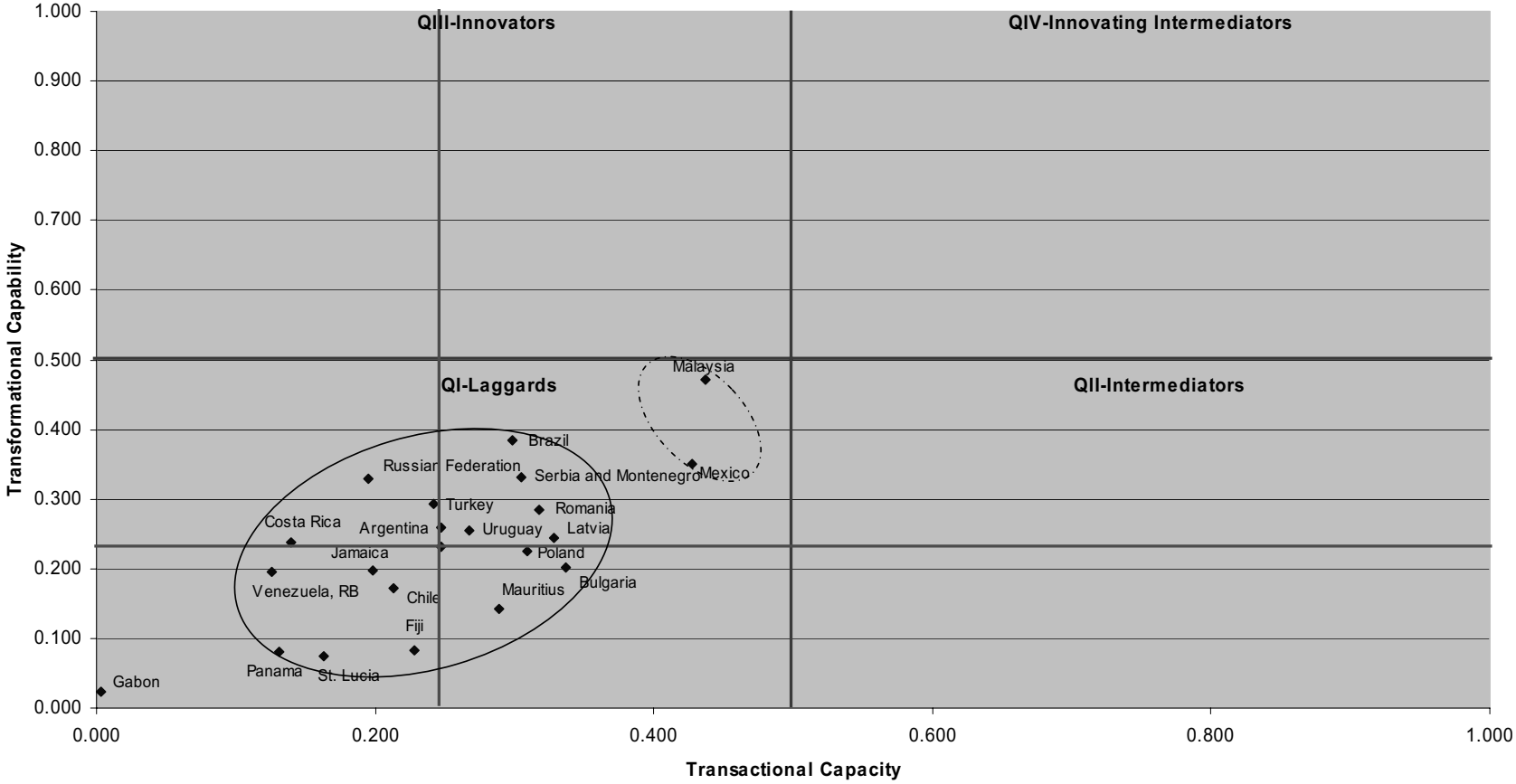
Source: author – based on data contained in Industrial Development Scoreboard – 2007 Update.

Figure 7. Lower-Middle-Income Economies 2003



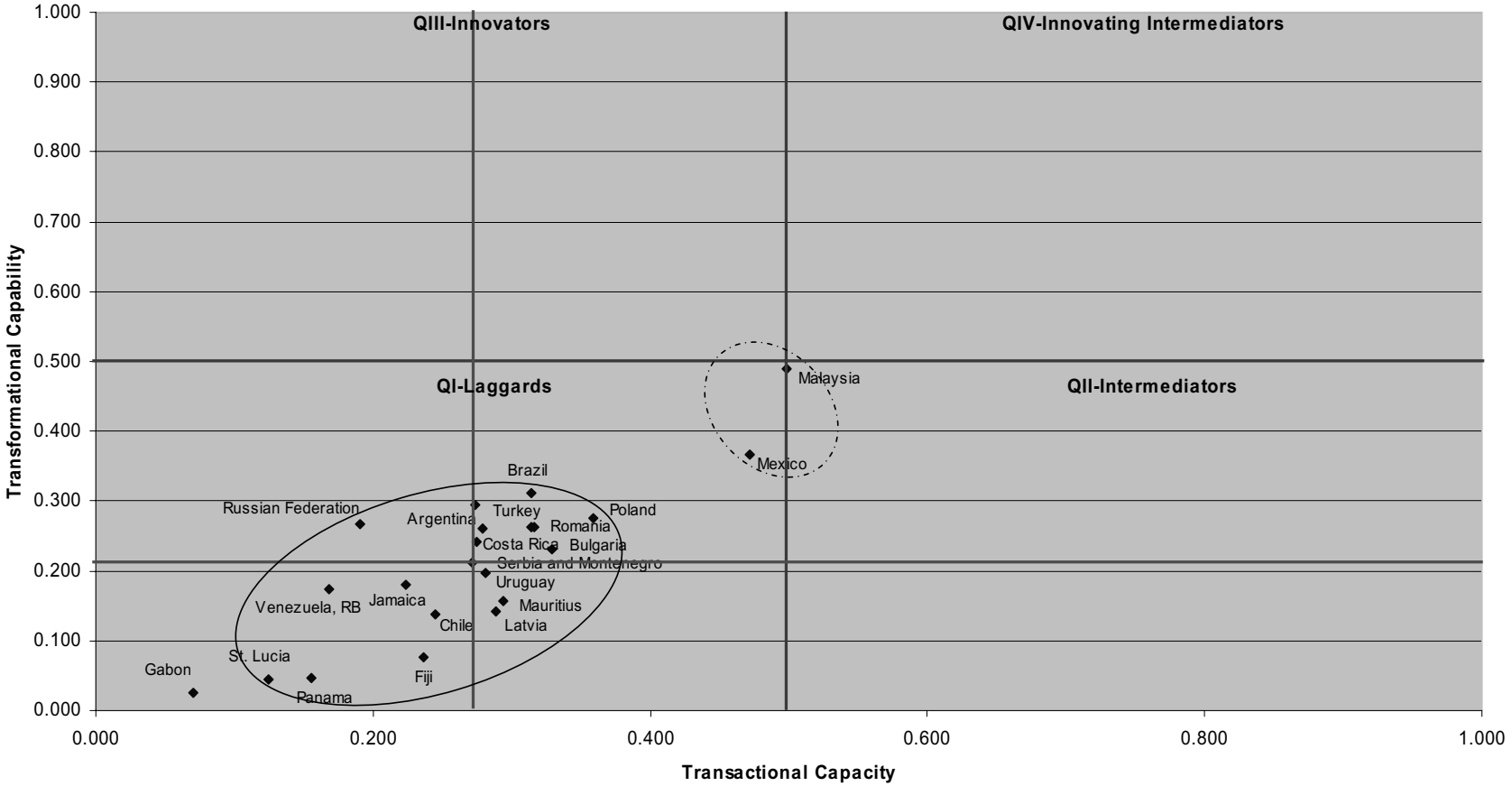
Source: author – based on data contained in Industrial Development Scoreboard – 2007 Update.

Figure 8. Upper-Middle-Income Economies 1993



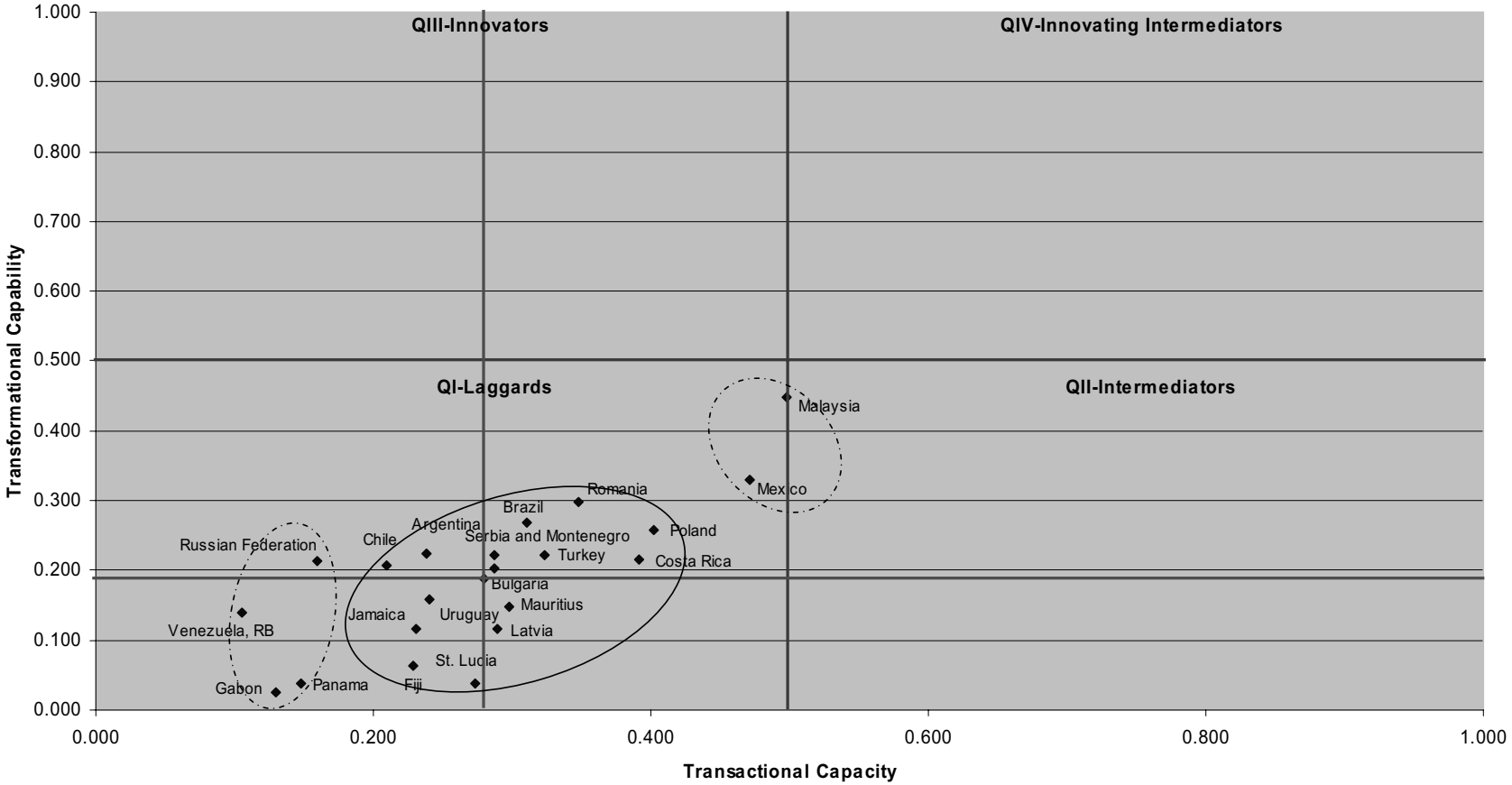
Source: author – based on data contained in Industrial Development Scoreboard – 2007 Update.

Figure 9. Upper-Middle-Income Economies 1998



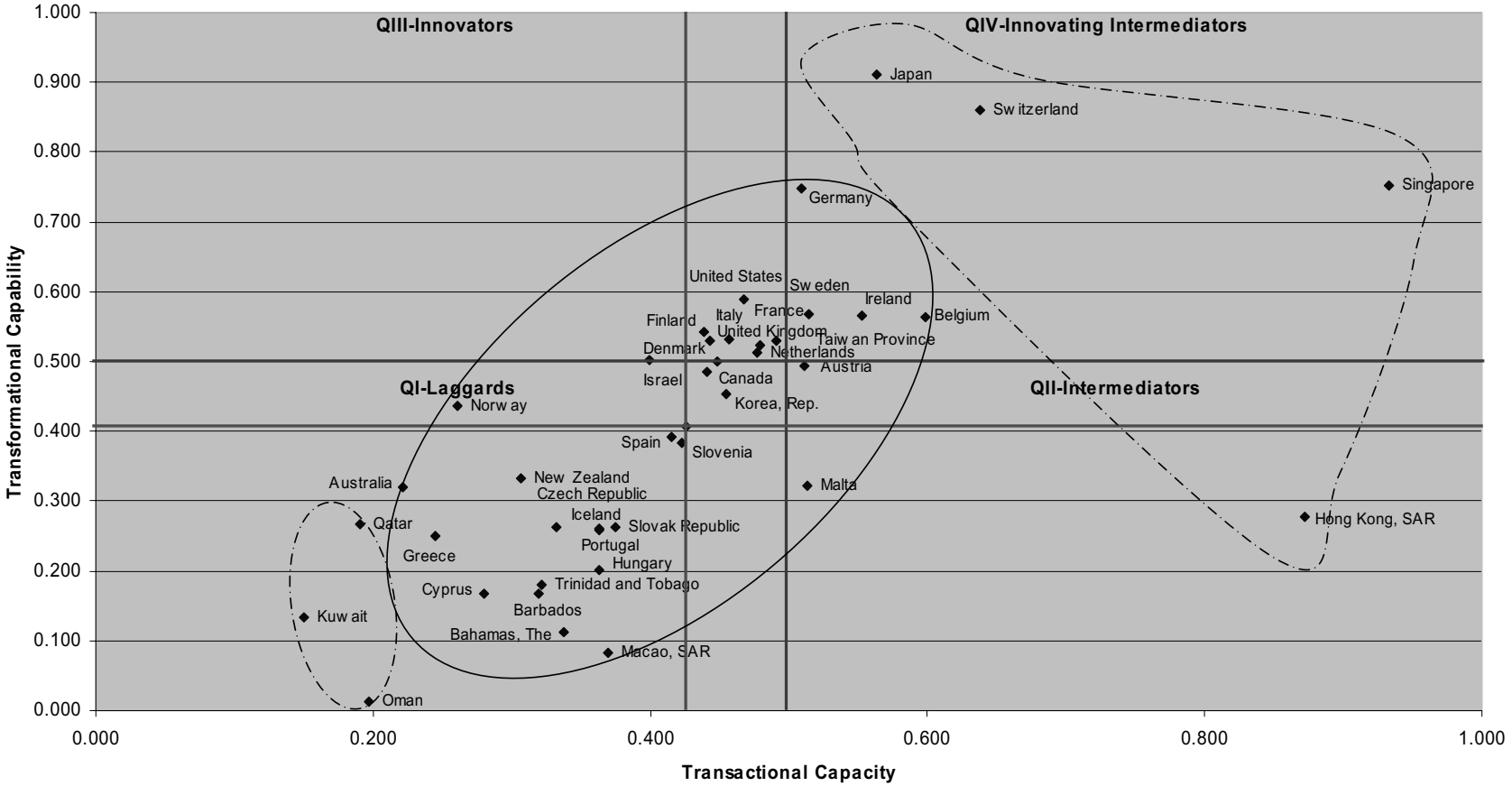
Source: author – based on data contained in Industrial Development Scoreboard – 2007 Update.

Figure 10. Upper-Middle-Income Economies 2003



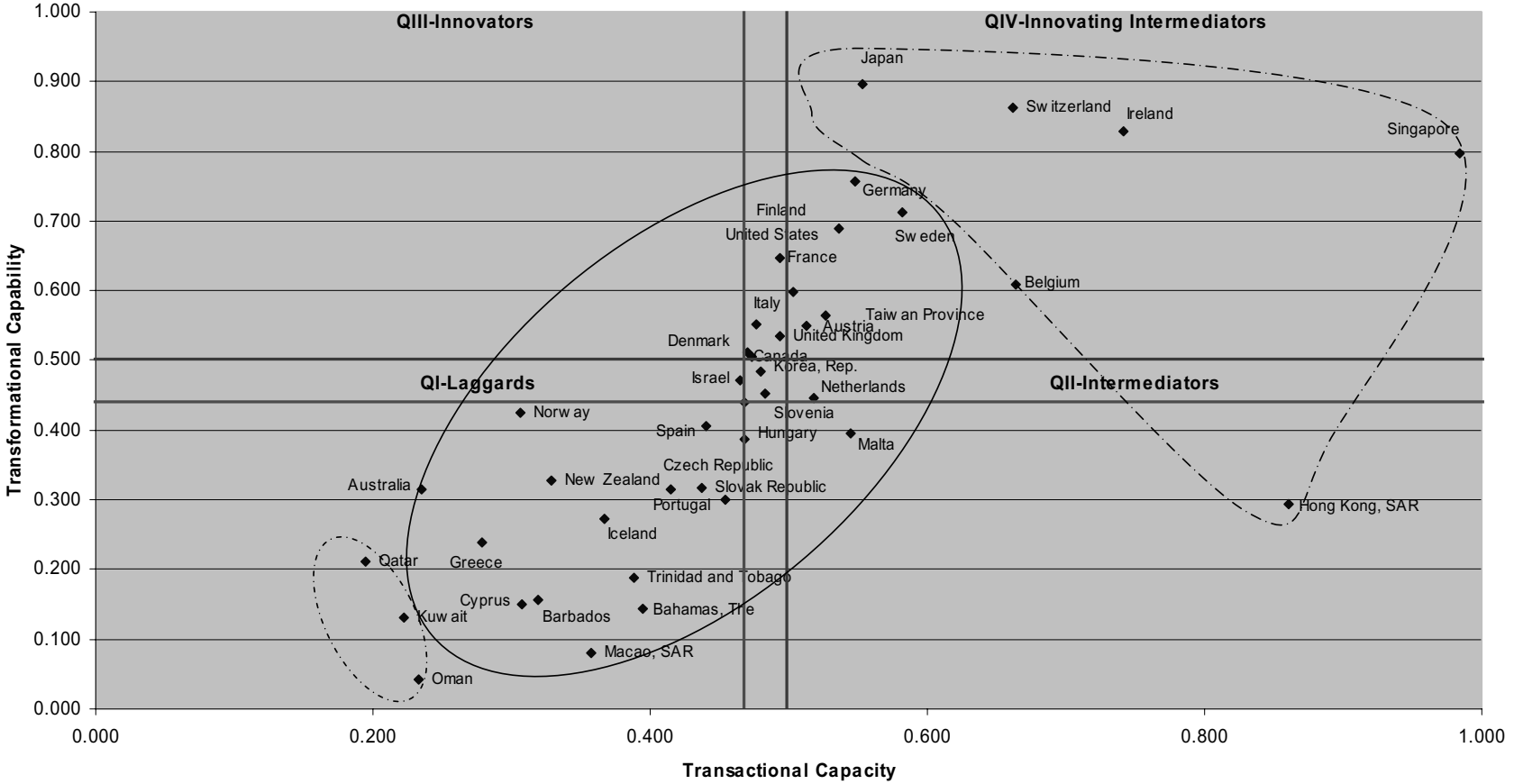
Source: author – based on data contained in Industrial Development Scoreboard – 2007 Update.

Figure 11. High-Income Economies 1993



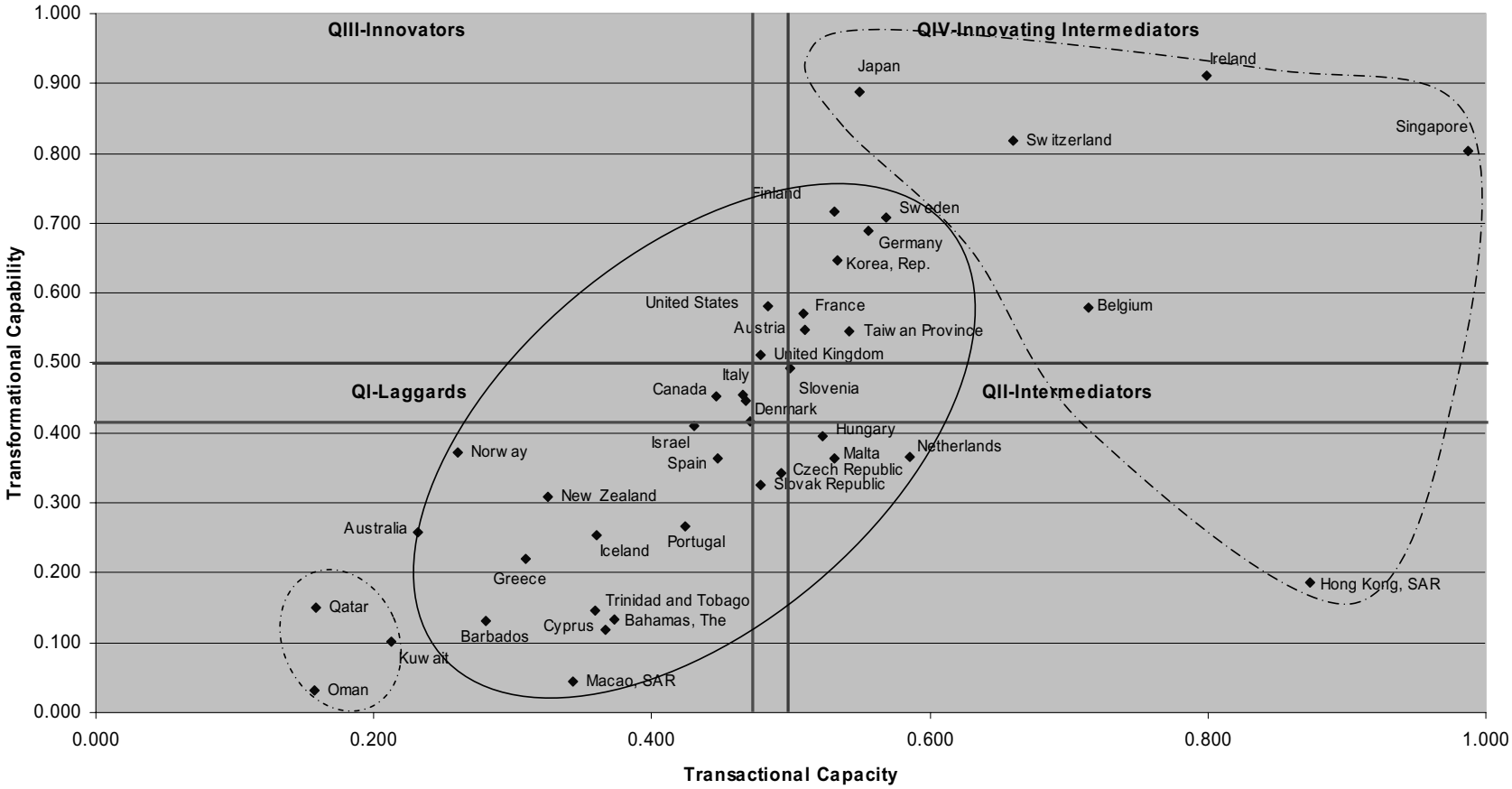
Source: author – based on data contained in Industrial Development Scoreboard – 2007 Update.

Figure 12. High-Income Economies 1998



Source: author – based on data contained in Industrial Development Scoreboard – 2007 Update.

Figure 13. High-Income Economies 2003



Source: author – based on data contained in Industrial Development Scoreboard – 2007 Update.

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