Institutional Transformations of Technology Policy in East Asia: The Rise of the Entrepreneurial State

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1. Introduction

Japan and the East Asian 'dragon economies' Korea, Taiwan and Singapore have been subject to a historically unique process of catching up with the Western economies. The institutional foundations of this process involve technology policies exercised by developmental states with a focus on the assimilation of new technologies. The rationale of this policy approach has been shifting recently as the capability for generating technological innovations becomes essential for sustaining economic growth, based on science-based technologies such as biotechnology. Accordingly, the East Asian developmental states are transformed into new types of entrepreneurial states. In discussing these issues, the chapter proceeds as follows. The first section addresses the East Asian developmental states and related technology policies. The second section takes on the institutional transformations of these policies. The following two sections address country examples: Japan as well as Korea, Taiwan and Singapore. The final section interprets these observations in terms of the Schumpeterian concept of the entrepreneurial state.

2. Technology Policies and Developmental States in East Asia

Following the decades of high performance growth from the 1970s to the 1990s, the high-performing East Asian economies have been witnessing the Asian financial crisis in 1997. Yet Korea, Taiwan and Singapore have regained their growth performance while Japan still serves as the regional centre of high-value added manufacturing and service operations – with China's development providing both stimuli and challenges. This "East Asian Renaissance" holds even in the aftermath of the global financial crisis of the late 2000s (Gill and Kharas 2007: 12-16; Asian Development Bank 2013: 3-5). Nonetheless, challenges in the domain of technology are eminent. Do institutional settings, which have been effective during catch-up growth, match the tasks of technological leadership in the context of new technologies, such as biotechnology, which are science-based and require distinct entrepreneurial efforts? Indeed, technological leadership is exercised by countries which fit the requirements of a dominant techno-economic paradigm, that is, a hegemonic mode of organising production and innovation most effectively (Freeman 2002: 193n). The responsiveness of technology policy to the productive needs of the private sector stands out in this regard, especially concerning the provision of R&D and s supportive institutional framework (Nelson 2004: 370n). Yet the East Asian economies differ beyond common patterns of export-orientation and strategic policy coordination. Japan's systemic approach to technology policy combined industrial structures dominated by large enterprises, *keiretsu*, with cooperative relations between government and business (Freeman 1987). Korea's industrial structures have been dominated by large enterprise conglomerates, *chaebol*, subject to intense government interventions. Taiwan's local enterprise networks have met comparatively lower degrees of government intervention. Singapore has been dominated by large foreign enterprises and local government-linked companies, combining government intervention with international openness (Hobday 1995: 196n).

This diversity has formed the basis for coping with the specificity of technological change in catch-up growth as East Asian firms have entered the international product

life cycle in the phase of standardisation, reversing its sequence until they exhibit developed productive capabilities, including R&D (Kim 1999: 112-5; Hobday 1995: 40n). Diverse modes of technological learning prevail as the Gerschenkronian latecomer advantage allows for skipping the original costs of innovation (Mathews 2006: 313n; Hobday et al. 2004: 1454n; Hobday 2003: 297-300). In this context, the East Asian innovation systems have come to share the following characteristics: an expanding education system with an emphasis on tertiary education and engineering; the rapid growth of business in-house R&D; a share of industrial R&D above 50% of gross expenditures on R&D; the basic development of science and technology infrastructures; strong influences of Japanese models of organization; high levels of domestic investment with high shares of Japanese foreign direct investment; major investment in advanced telecommunications; growth of export-oriented electronic industries; increasing participation in international technology networks (Freeman 1996: 178). These commonalities include a high degree of government involvement in the economy with a focus on the strategic upgrading of technologies (Reslinger 2012: 387-389). The World Bank's report "East Asian Miracle" has provided influential arguments on these issues. It states that technological change benefitted from policies that would highlight cost-benefit considerations and performance criteria, thus moderating the distorting effects of policy interventions (World Bank 1993: 5-8).

The concept of the developmental state reflects these issues, originally applied to the case of Japan. It maintains that states in late industrialising economies could promote goal-oriented strategies for administratively guiding industries and markets. The quality of these policies draws on the coherence of the economic bureaucracy and communication with the private sector (Johnson 1982: 19-21, 312n). A further interpretation of these mechanisms is provided by the notion of "embedded autonomy", which addresses the policy pattern of a Weberian type of bureaucracy that is embedded in social relationships with the private sector (Evans 1995: 12, 146-9). This functional imperative also characterises late industrialisation in Korea and Taiwan with its efforts at assimilating technologies already in use abroad (Amsden 1989: 3n). Exemplified by Korea, an interventionist developmental state implements performance standards on private sector firms, which receive subsidies in a reciprocal relationship (Amsden 1989: 8, 13n). The notion of "governed markets" addresses a corresponding location of innovative initiatives with government, stimulating the private sector under its leadership. Associated strategies technological foresight involve the study of technology development in leading as well as competing countries – with Japan as role model for Korea and Taiwan (Wade 1990: 28n, 334n). Thus, developmental states exercise a transformative capacity to coordinate economic development in accordance with the shifting conditions of international competition. The corresponding mode of governance involves a catalytic mechanism of public-private cooperation (Chang 1999: 186n; Weiss 1998: 7n, 67). A major component in these governance structures are intermediary institutions for private sector coordination, as pioneered in Japan and adapted all across East Asia. These deliberation councils highlight knowledge on coordination failures in the assessment of technological opportunities, among others by the establishment of technological standards (Aoki, Murdock and Okuno-Fujiwara 1997: 8n, 22n). Yet the inherent technological and institutional dynamics of catch-up growth feed back on the developmental state, thus heralding its institutional transformation.

3. Technological Change and the Transformation of the East Asian Development Model

Technology policy in catch-up growth becomes ever more complex as technology gaps are reduced. It needs to change emphasis towards the generation of new technologies, which requires a different policy framework (Freeman 2002: 208n). Thus, across East Asia, policies have shifted from resource mobilisation in support of industrialisation to the building of science and technology infrastructures, accompanied by the deregulation and internationalisation of industries and markets (Weiss 2000: 22; Hobday 1995: 200n; Amsden 1995: 27n; Amsden and Hikino 1993: 259). This is accompanied by a less hierarchical governance approach in technology policy involving an extended participation of both local and foreign enterprises, as government and private sector identify promising technological trends and learning externalities (Chang 2001: 73-5; Weiss 1998: 64n). Therefore, the state may persistently stimulate the upgrading of technological capabilities, moulded by legal and fiscal affairs, among others (Beeson 2009: 38; Thurborn and Weiss 2006; Wade 2005: 110n; Lall 2000: 14). In particular, the support of technological innovation requires a combination of public-private interactions, local coherence and international connectedness, while major policy challenges relate to the cultivation of entrepreneurship (Yusuf et al. 2003: 29; Yusuf and Evenett 2002: 181n). As government support of R&D in latecomer economies is biased towards applied research and product development, the expansion of basic research is eminent (Amsden and Chu 2003: 162n; Dodgson 2000: 402n). Also, the availability of venture capital in the funding of new technologies becomes a requirement (Beeson 2004: 35n).

All of this proceeds in a technological context that is marked by the emergence of a new techno-economic paradigm based on information and communication technologies as well as science-based technologies such as biotechnology (Perez 2003: 8-10). Their network patterns of organisation do not fit hierarchical patterns of resource mobilisation that matched resource-intensive industries of the past (Carlsson 2012: 9n; Coriat et al. 2003: 231n). These tendencies also matter for the spatial dimension of technology policy. The promotion of linkages between universities and industries focuses on knowledge-intensive agglomerations of innovative activities (Vang 2006: 16n; Hu und Mathews 2005: 1346n; Masuyama and Vandenbrink 2001: 40n). This cluster-oriented policy approach resembles a pattern of state-led networking in combining physical, knowledge and social capital (Ebner 2013: 1n; Yusuf et al. 2003: 249-254). At the same time, East Asian production networks take part in multi-layered "global networks of networks" with clusters serving as network hubs (Ernst and Kim 2002). In effect, a "modular economy" emerges that combines diverse regional, national and transnational models of economic organisation (Ganne and Lecler 2009: 22; Kuchiki and Tsuji 2011: 2-4).

In facing these challenges, efforts in the upgrading of knowledge and innovation infrastructures have been enormous. Adding to the effects of export-orientation and transnational economic integration, this expansion of the knowledge base contributes to competitive performance most sustainably (Brahmbhatt und Hu 2010: 178n). The GDP ratio of gross expenditures on R&D has been increasing above OECD average all across East Asia during the 2000s. Japan's GDP share of Gross Domestic Expenditures on R&D has slightly risen from 3% in 2000 to 3.39% in 2011. Korea's share has even risen from 2.3% in 2000 to 4.03% in 2011. Taiwan's has increased from 1.94% to 3.02%,

Singapore's from 1.85% to 2.23% (OECD 2013, Table 2). All these economies have exhibited a high share of the private sector way above OECD average, settled between 60 and 75% of R&D expenditures (Roy et al. 2012: 105; Gil and Kharas 2007: 146-152). Also, entrepreneurial conditions have improved. For instance, costs of business start-up have further decreased from already low levels (Asian Development Bank 2013: 314-315). In effect, in addition to Japan, Korea and Taiwan have emerged as innovating economies in fields such as semiconductor industries already since the 1990s (Mathews 2006: 328n). By 2004, Korea and Taiwan were the 4th and 5th biggest recipients of patents granted in the United States, predominantly in electrical and electronics technologies as well as in computers and communications, ranking only behind the United States, Japan and Germany (Gil and Kharas 2007: 154-160). Still, the question is whether a common East Asian system of innovation emerges. Korea and Taiwan have decreased reliance on Japanese technology during the 1990s, adding local technology content as well as foreign direct investment from the United States (Mahmood and Singh 2003: 1031n). Also during the 2000s, the Unites States has remained the largest source of patent citations with a share of 60%, followed by Japan's share of 20%. However, citations among the East Asian economies have increased to a share above 5%, focussing on electronics as well as information and communication technology (Brahmbhatt and Hu 2010: 184; Gil and Kharas 2007: 163-7). The institutional dimension of these tendencies points to transformations of technology policy in Japan as well as Korea, Taiwan and Singapore.

4. Institutional Transformations of Technology Policy in Japan

Japan has served as a role model for systemic approaches to technology policy. The concept of the developmental state has addressed Japanese policies for industrial and technological change, highlighting administrative guidance by the Ministry of International Trade and Industry, MITI (Johnson 1982: 315-9). In this vain, the Japanese development state is viewed as an epitome of "governed interdependence" between the state and the private sector in an institutionalised mode of cooperation on technological upgrading (Weiss 1998: 38n). These aspects have also informed the systems of innovation perspective and its pioneering research on Japanese technology policy, which discussed the interdependence between the policies of MITI, the organisation of company R&D, national education and training schemes, and the evolution of industrial structures (Freeman 1987: 4). Nonetheless, the Japanese innovation system has been persistently confronted with deficits in basic research and its commercial application. Already since the 1980s, the lack of cooperation between universities and industries has been singled out as an area of policy reform (Okimoto 1989: 67; Fransman and Tanaka 1995: 13n). Indeed, Japanese technology policy has been under pressure as Japan's internationally competitive and technologically advanced firms have outgrown the institutional conditions of the developmental state (Aoki 2002: 2; Callon 1995: 147n).

Flexibilisation, decentralisation and the competitive reorientation of governance structures have become prominent since the 1990s, also driven by a restructuring of the political-administrative system (Whittaker 2003: 80n). MITI was actually refurbished as Ministry of Economy, Trade and Industry, METI; a measure that could be interpreted as a branching out of its policies (Elder 2000: 5n). These efforts have been paralleled by an

opening of competitive structures, resulting from deregulation, privatisation and a renewed concern with competition policy. The internationalisation of Japanese R&D adds to this openness (Vogel 2006: 217-218; Porter and Sakakibara 2004: 35-36; Odagiri and Goto 1996: 268n). The corresponding transformation of Japanese technology policy reflects a shift from applied research under MITI's guidance towards a new approach that strengthens the local knowledge base in science-based industries by means of the cooperation between universities, industries and government. In governing these affairs, METI's competences in industrial policy, energy, and nuclear power are met by the new Ministry of Education, Science and Technology that administers university policy, basic research, and the general support of science and technology. In promoting the new approach, Science and Technology Basic Plans have been implemented since 1996. The lack of high-quality research infrastructures is singled out as a key problem in promising fields such as life sciences, materials, information and communication as well as environment (Okimura 2005).

The regional differentiation of technology policy proceeds with an emphasis on internationally interlinked knowledge agglomerations, exemplified local centers such as Tsukuba Science City and transnational efforts such as the East Asia Science and Innovation Area Initiative. A related strategic thrust points at small business innovation and venture capital in regional innovation networks (Tung 2013: 62n; Council for Science and Technology Policy 2010). All of this should further the generation of new knowledge through university-industry links and its diffusion through entrepreneurial start-ups beyond the operations of established large firms. Competitive funding of research centers and administrative autonomy for selected universities add to this scheme (Holroyd and Coates 2007: 35-37; Odagiri 2006: 213-221; Elder 2000: 18-21). The support of local innovation capabilities knowledge agglomerations builds on preceding projects such as the Technopolis Plan. However, METI's Industry Cluster Plan, which has been running since the early 2000s, actually differs from earlier efforts. It allows for a regional decentralization of governance and interactions, framed by transnational linkages with clusters in Asia, Europe and the United States (Fujita and Hill 2012: 29-39; Kitagawa 2007). Corresponding bottom-up initiatives in science-based clusters are predominantly driven by entrepreneurial start-ups, quite in line with METI's entrepreneurship and innovation strategies (Holroyd and Coates 2007: 46-48, 129-131; Ibata-Arens 2005: 92-94; Ibata-Arens 2004: 4n). In effect, the technology policy of the developmental state is transformed into a new model of governance. The cases of Korea, Taiwan and Singapore point in a similar direction.

5. Institutional Transformations of Technology Policy in Korea, Taiwan and Singapore

Both the Korean and Taiwanese developmental states have operated in authoritarian terms well until the early 1990s, thus differing from Japan with its democratic political system. Also, both in Korea and Taiwan, the completion of catch-up growth has made the private sector less dependent on government, thus allowing for a reconfiguration of government-business relations beyond the confines of the developmental state. In this vain, Korea and Taiwan have been going through country-specific changes in reorganising the steering capacity of government and administration (Evans 1995: 230n; Amsden 1989: 80n). Korean economic policies have been subject to market-oriented reforms, also stimulated by the Asian Financial Crisis since the late 1990s. Financial

instruments of technological upgrading such as preferential credit have become largely ineffective. This has been framed by a reform of corporate governance, aiming at the *chaebol*, as well as by a further opening of the Korean economy for international trade and investment. Still, national development remains a most relevant policy goal (Seliger 2013: 116-123; Lee and Han 2006: 322-323). In this context, Korean technology policy has been shifting from an "industrial learning paradigm" to a "technology creation paradigm" in the drive for a knowledge-based economy (Wong 2004: 491n; Wong et al. 2004: 46). Since its inception in the 1970s, Korean technology policy focused on applied research and technology transfer. The bulk of R&D expenditures has been carried by the private sector, that is, primarily by the *chabeol* with Samsung alone accounting for a quarter of private R&D expenditures. Since the 1990s, R&D operations have become less concentrated due to the entry of new entrepreneurial ventures undertaking R&D operations (Johann 2012: 54-57). Scientific research infrastructures have emerged as prominent policy features of university-industry-government interactions in local knowledge agglomerations. Corresponding efforts are differentiated with regard to firms, industries and markets, thus reflecting the diversity of the *chaebol*. Entrepreneurial ventures in science-based industries, embedded in regional networks, add to this profile (Lee 2011: 31-35; Nahm 2011: 160n; Hobday, Rush and Bessant 2004: 1455-1456). Crucially, Highly Advanced National Projects promote large-scale support of high-technology products in areas such as electronics consumer durables, including HDTV. Biotechnology, environment and materials are part of this strategic thrust, which has been institutionalized in the shape of the Korean National Science and Technology Council and its strategic plans since the early 2000s. Two new executive organs, the Ministry of the Knowledge Economy and the Ministry of Education, Science and Technology, operate with the same orientation since 2008 (Johann 2012: 179n; Hemmert 2007; Lee and Yoo 2007).

Korean concerns with biotechnology and other science-based industries are shared by Taiwan's technology policy. It highlights similar goals, although the Taiwanese industrial structure is more network-oriented and involves more foreign firms. Yet the segmentation of the value chain of the bio-pharmaceutical industry has provided both economies with opportunities for attracting high-value added operations. In this regard, Taiwan's technology policy stands out in combining the support of technological learning with a state-guided internationalisation of industrial structures (Tung 2013: 70n; Wade 2000: 12). Paralleling Japanese and Korean policy strategies, also Taiwan has been nurturing high-tech industries yet with a more pronounced emphasis on building international linkages for local knowledge agglomerations. Thus, Taiwan persistently utilises knowledge flows of global production and innovation networks, which are set to stimulate entrepreneurial capabilities (Wang and Ma 2011: 286n; Amsden and Chu 2003: 1n; Hu and Mathews 2005: 1347). However, Taiwan's promotion of the bio-pharmaceutical industry has exhibited an incremental character in line with the prevailing small and medium-sized enterprise networks – and quite different from the Korean policy approach that retreated from the concerted focus on *chaebols* only recently in favour of promoting new science-based ventures and their networks (Wang et al. 2009). Nonetheless, biotechnology firms in both Taiwan and Korea are still in an early stage of industry evolution, which means that they have not yet generated sustainable income and employment effects. Still, these firms are part of a new innovation regime that redefines the relationship between local and global economic affairs across East Asia (Wong 2011: 166-168; Wong et al. 2004: 46).

The logic of combining local and global resources in the strategic outreach of technology policy is most prominently represented by Singapore's city state economy. The Singaporean development model highlights the vision of a local knowledge agglomeration in a globalised knowledge-based economy. Singapore actually belonged to the pioneers in attracting foreign direct investment as a strategy for technological upgrading. Multinational enterprises serve as driving forces of economic development, paralleled by local operations of government-linked companies in a market-friendly setting. In line with the institutional patterns of the developmental state, the Singaporean Economic Development Board, EDB, has been guiding policy efforts in industrial restructuring and technological upgrading (Ebner 2004: 56-9). Singapore thus combines governmental steering capacity with the competitive logic of markets, while leveraging on foreign direct investment as a means of technological upgrading (Wong 2001: 564). Current tendencies in the transformation of this developmental model also pinpoint the emergence of a knowledge-based economy. This includes extended interactions between universities, research institutes and local as well as foreign enterprises. The nurturing of technology-intensive start-ups contributes to the new sets of policy goals that emphasise issues of entrepreneurship and creativity in the formation of Singapore as a globally interlinked knowledge agglomeration (Low 2004: 166n; Yeung 2006: 284n). Singapore's efforts at promoting a local science base for biotechnology, among others, represent this recombination of public knowledge infrastructures and private innovation strategies quite well, for university-industry linkages become a key strategic variable in a perspective of technology policy that is set to nurture entrepreneurial ventures (Wong 2011: 256n; Koh and Wong 2004: 275-280).

6. The Rise of Entrepreneurial States in East Asia

Various concepts have been proposed in addressing the institutional transformation of developmental states and technology policies in East Asia. For instance, it is argued that a new type of "transitional developmental state" balances state autonomy and private sector dynamism in a shift from interventionism to liberalisation – which may even strengthen state capacity in the enforcement of the market order (Wong and Ng 2001: 43-7). Also, exemplified by Taiwan, the formation of a revamped developmental state with post-industrial, innovation-driven and democratic credentials is proposed. It utilises governance mechanisms of competition and decentralisation in order to further its steering capacity in a rapidly changing technological environment (Wong 2005: 170-173). In associated terms, a "neo-developmental state" is said to operate in high-tech industries, promoting economies of scale, industrial R&D and skilled employment. It is complemented by a liberal type of "regulatory state" that regulates liberalised services, competition and international openness (Amsden and Chu 2003: 167-72). Also, a complete transition of the developmental state towards a market-oriented type of regulatory state has been projected (Jayasuriya 2005). In summary, East Asian developmental states are going through country-specific transformation processes, rooted in the dynamics of catch-up growth, which recombine their institutional components in line with prevailing economic, social and political constellations (Green 2007: 35-36). A further specification may require the exploration of strategies, capabilities and financial patterns of innovative enterprises as well as a reconsideration of the regulatory and developmental roles of states across the OECD (Lazonick 2008:

27n). Indeed, according to Chalmers Johnson's concept of the developmental state, the state functions of the latter cover only a fraction of government activities. Beyond the dichotomy of the developmental state with its industrial guidance and the regulatory state with its market regulation, diverse combinations of policy actors, goals and instruments are possible (Johnson 1982: 305). The transformation of policy approaches and governance patterns thus resembles a recombination of co-evolving institutional components in the formation of state functions (Ebner 2008: 301n).

This perspective points to the Schumpeterian notion of the entrepreneurial state, which addresses historically specific state functions in the creation of technological innovations. According to Schumpeter, the entrepreneurial state carries out entrepreneurial functions by promoting the introduction of technological innovations in an established economic setting (Ebner 2006: 510n). In the East Asian context, the emergence of entrepreneurial states and the related transformation of technology policies reflect a shift from catch-up growth to technological leadership. Also, it is set in the context of a new techno-economic paradigm of information and communication technologies and science-based industries such as biotechnology with distinct institutional implications (Ebner 2007: 103n). In reconsidering relevant state functions in support of technological change, then, regulatory, developmental and entrepreneurial states may be distinguished. They may be simultaneously present, yet they will be subject to constellations of hegemony and institutional tension. With regard to the matter of technology policy, these types of states may be approached from different angles, including the state as a normative order as well as a set of organisations and rules that influence technological change by regulatory, fiscal and other institutional means (Hart 2002: 181n). This typology of state functions in technology policy is depicted in Table 1.

Table 1: A Typology of State Functions in Technology Policy

	Type of State		
Characteristics	***Regulatory***	***Developmental***	***Entrepreneurial***
Normative Orientation	*Market Liberalism*	*Developmentalism*	*Entrepreneurialism*
Policy Rationale	*Resource Coordination*	*Factor Mobilisation*	*Innovation*
Fiscal Instruments	*Taxation, Subsidies*	*Taxation, Subsidies, Credit, Interest*	*Taxation, Subsidies, Venture Capital*
Governance Mode	*Rule-Based Hierarchical*	*Interventionist Hierarchical*	*Communicative Networked*
Policy Scale	*National*	*National*	*Multi-Scalar*
Technological Dynamics	*Competition*	*Assimilation*	*Creation*

The developmental state, which has been prevalent during East Asian catch-up growth, exhibits a normative orientation towards developmentalism, an ideology that perceives industrial development as a goal of nation-building. Its policy rationale highlights the mobilisation of the factors of production, labour and capital, in furthering an extensive type of economic growth. Fiscal instruments include taxation and subsidies as well as the channelling of credit and interest. Governance modes exhibit a hierarchical relationship between an interventionist state and the private sector. Technological dynamics reflect the assimilation of new technologies. In contrast to this, the regulatory state regulates the market system, as exercised in industrialised Western economies. Recently, it has also gained in relevance across East Asia. Its normative orientation leans towards market liberalism while the policy rationale focuses on resource coordination through the enforcement of market competition. Fiscal instruments focus on taxation and subsidies. Governance modes put the hierarchy of state and private sector in a rule-based framework. In this manner, technology dynamics reflect market competition.

With regard to East Asian technology policies, however, a specific set of state functions has become hegemonic, namely the entrepreneurial state and its concern with the generation of technological innovations. Being relevant all across the industrialised and emerging economies, it is most prominent in post-developmental East Asia with its shift from the assimilation of technological innovations to their entrepreneurial creation. The normative orientation of the entrepreneurial state addresses an ideology of entrepreneurialism that promotes creativity and novelty. Its policy rationale underlines technological innovation in an intensive type of economic growth. Fiscal instruments utilise taxation and subsidies as well as public venture capital. A hierarchical governance mode is combined with communicative networking. This goes together with a multi-scalar policy scale that strengthens local and regional as well as transnational interactions and thus differs from the national focus of both the developmental and regulatory states. Technological dynamics highlight the creation of new knowledge and its productive application in the generation of technological innovations. Technology policy then promotes innovations by strategic interventions as well as by providing institutional and physical infrastructures. However, innovation is a social process. Thus, democratisation and participatory structures gain in relevance as means for mobilising decentralised knowledge and innovation capabilities (Ebner 2007: 118-120; Ebner 2009: 382n).

6. Conclusion

As outlined above, current transformations of technology policy in East Asia may be approached in terms of the emergence of an entrepreneurial state. This notion entails the following propositions:

- The concern with technological leadership becomes a crucial feature of technological policy, which involves market interventions as well as the provision of institutional and physical infrastructures for innovation.
- Governance structures evoke a network pattern in the relations between government, business and civil society, based on knowledge flows that support policy learning.

- Technology policies of entrepreneurial states reflect the logic of globalisation in addressing the innovation capabilities of both local and foreign firms, universities and research institutes in knowledge-based agglomerations.

Entrepreneurial states in East Asia demonstrate diverse national varieties that range from Japan as pioneering late industrialiser via Korea and Taiwan as second generation tiers of catch-up growth to Singapore's high-performing city-state economy. All these entrepreneurial states exhibit country-specific combinations of governance modes that combine hierarchies, markets, networks and associations, among others, and thus add to the diversity among and within the evolving entrepreneurial states (Walter und Zhang 2012: 16-19). In this regard, technology policies in East Asia will be persistently challenged by the co-evolution of technological and institutional change in an economic setting that is subject to both regionalisation and globalisation.

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