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TECHNOLOGICAL GLOBALISATION AND REGIONAL SECURITY IN EAST ASIA

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ABSTRACT

Involves a growing disjuncture between processes of technological development, application and diffusion and individual states, technological globalization contributes distinctively to regional security in East Asia. The potential contribution of technological globalization to sustainable economic development and prosperity are important to regional states due to their contribution to comprehensive security, and has rendered it less threatening in this region than elsewhere. East Asian states have supported the deepening of processes of technological globalization through enacting measures designed to facilitate the integration of local industries into transnational commercial networks on a regional or even global basis.

Technological globalization contributes to regional security by encouraging East Asian states to consider their security in regional terms. This enables them to co-operate with their neighbours in providing an environment conducive to transnational research and development and production, including by minimizing the impact of inter-state politico-military rivalries that would impact negatively on their mutual prospects for sustainable economic progress. The progressive deepening of processes of technological globalization can be expected to continue supporting regional security.

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TECHNOLOGICAL GLOBALISATION AND REGIONAL SECURITY IN EAST ASIA

Introduction

Until recently, the securitization of technology derived from the perceived or potential impact of technological development, application and diffusion on states' relative military capabilities. This politico-military focus encouraged states to pursue self-serving policies that were instrumental in shaping the hierarchical, state-centric nature of the global technology order.[1] In order to prevent arms-related technological diffusion, states restricted the international activities of firms from 'strategic' industrial sectors. This reinforced inter-state technological resource disparities.

Structural change in the technology field threatens the traditional security/technology nexus. The established global technology order is being transformed by ongoing processes of technological globalization, which are producing a growing disjuncture between the structures of technological development, application and diffusion and individual nation-states. The impact of this transformation on the security interests of many states and on their capacity to attain critical technological objectives is manifest in policy responses at both the domestic and international levels.

This study will examine technological globalization in East Asia. It will focus on the impact of technological globalization on regional security, and argues that processes of technological globalization will reinforce the importance of regional security to East Asian states. Technological globalization is not seen in East Asia as constituting a threat to security as it is elsewhere. This is due to its potential contribution to sustainable economic development, which is considered important as a consequence of local comprehensive security concerns. Traditionally, this approach to security has encouraged a regional security focus on the part of many East Asian states. Technological globalization can be expected to help sustain concern

[1] For an overview of the traditional structure of the global technology order, see Peter Gál, 'Some Features of Research and Development Activity and Military R&D in Developing Countries.' *Bulletin of Peace Proposals* 19:3-4 (1988), 358.

and support for regional security in East Asia, even in the face of resurgent regional politico-military security threats.

This study will begin by examining processes of technological globalization and how they potentially affect the security/technology nexus. It will then proceed to analyse the emergence of technological globalization in East Asia and its impact on regional security in the evolving regional environment.

The Emergence of Technological Globalization

While it has roots that extend back to the European Industrial Revolution, technological globalization is essentially a feature of the postwar period.[2] Technological globalization is the product of a number of converging trends. It has evolved in parallel with the development of the liberal global economic order, particularly the emergence of a decentralized, post-Fordist production paradigm.[3] For example, global economic linkages increasingly involve transnational technological processes: the growth of transnational production networks and the increase in transnational technological application and diffusion has been mutually supportive. No feature better illustrates the expansion of transnational economic linkages than the scope of contemporary multinational enterprises (MNEs). The following table shows this relationship:

[2] It is important to distinguish technological globalization from earlier processes of technological 'internationalization' which stemmed from efforts by firms to establish foreign production facilities in order to duplicate production undertaken in their home countries, and to more efficiently meet the needs of particular export markets. The scope of technological internationalization was quite limited, involving only the foreign reproduction of technologies, and did not prompt radical policy changes on the part of the states concerned.

[3] See Robert W. Cox, 'Production and Security,' in David Dewitt, David Haglund and John Kirton, eds. *Building a New Global Order: Emerging Trends in International Security* (Toronto: Oxford University Press, 1993), 148.

Table 1
Transnational Scope of Selected Major Multinational Enterprises [4]

MNE	Original 'Home' State	Number of Major Subsidiaries	Number of States Based In
DaimlerChrysler	Germany/US	40	22
Sony	Japan	102	35
Tata Group	India	80	5
Thales Group	France	112	32
Toyota Tsusho	Japan	71	26

Technological globalization involves far more than the deepening or intensification of transnational linkages. It is also not merely a form of 'industrial leapfrogging' by developing states, though Alexander Gerschenkron did anticipate the potential impact of some of the processes inherent in technological globalization far in advance of their emergence.[5] Central to technological globalization is a transformation by which key actors in technological development, application and diffusion interact with each other. The division of labour that characterizes technological globalization corresponds poorly if at all to traditional organizational or territorial patterns. It is this radical transformation that renders many established features of technology policy obsolete.

The nature and extent of this structural transformation are due in large part to the impact of market forces and the central role of non-state actors in processes of technological globalization. Trends in the technology field have parallelled the earlier emergence of transnational production, where firms pursued industrial economies of scale on a regional or even global basis through decentralized production. Competitiveness in many industrial sectors is dependent on a capacity to offer cutting-edge products, but maintaining pace with technological progress has become increasingly difficult due to the spiralling costs of developing and producing advanced technologies. The resource requirements of developing and applying emerging technologies have risen in tandem with the expansion of technological

[4] Derived from www.daimlerchrysler.com, www.world.sony.com, www.tata.com, www.thalesgroup.com, and www.toyotsu.co.jp.

[5] See his *Economic Backwardness in Historical Perspective: A Book of Essays* (Cambridge, MA: Harvard University Press, 1962), 50.

frontiers. This has been reflected in the increasingly protracted developmental processes evident in many product areas and in the steady contraction of the intervals between the advent of new technological generations.[6]

High technology firms are finding the escalating costs of research and development (R&D) increasingly prohibitive: even large MNEs are often unable to meet their technological requirements independently.[7] As one information technology (IT) industry executive notes, 'We've been at this juncture of hitting technology walls before and we've always solved the problem. The difference now is that it's so expensive, no company can attack this on their own'.[8] The increasing burden posed by R&D constraints have forced a growing number of high technology firms to seek emergency financial assistance, accept a decline from the status of prime contractor or systems integrator to much more modest maintenance or subcontractor roles, or even abandon established product areas.[9]

The post-Cold War industrial environment has exacerbated these trends. The contracted defence market has had a severe impact on many research-intensive high technology industries. Previously reliant on these contracts, these firms have been deprived of large production runs, often awarded on a multi-year basis. Firms are increasingly vulnerable to changes in the spending priorities of individual states, and it is now not unusual for the fate of particular firms or even of entire national industries to rest on a single procurement programme or export order.

In the light of the more difficult business environment and the rising financial and infrastructure requirements of technological progress, high technology firms have been forced

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[6] Jeremy Howells and Michelle Wood, *The Globalisation of Production and Technology* (London: Belhaven Press, 1992), 41-42.

[7] Ibid., 48-50.

[8] Quoted in Charles Bickers, 'Staying in Touch.' *Far Eastern Economic Review* 163:42 (19 October 2000), 42.

[9] See n.a. 'Aerospatiale Bails Out Socata.' *Jane's Defence Weekly* 18:6 (8 August 1992), 10, n.a. 'Remake, Remodel, Realign.' *Jane's Defence Weekly* 18:17 (24 October 1992), 35-38 and n.a. 'Ferranti Calls in the Receivers.' *Jane's Defence Weekly* 20:24 (11 December 1993), 15.

to develop innovative approaches to attaining their technological objectives. The industrial landscape has been radically transformed by unprecedented industrial re-structuring. In many cases, this has reflected a regional or even global approach to R&D and production. These trends, which are contributing to a progressive de-territorialization of technological development, application and diffusion, are examined in greater detail in the section that follows.

The Structure of Technological Globalization

Technological globalization involves a number of key features, which are closely related:

An eroding distinction between technological development and application;
Polycentric processes of technological development and application; and
Expanded transnational technological diffusion.

It is important to note that while there is no evidence to suggest that technological globalization is a transitory phenomenon, it should not necessarily be considered linear or irreversible. Processes of technological globalization are subject to differing political and market influences, and it is developing at dissimilar rates in different states and regions. It is generally the case, however, that the more 'high tech' the industrial sector, the more evident and the greater the impact of processes of technological globalization.

Eroding Distinction Between Technological Development and Application

The traditional distinction between processes of technological development and application is eroding as R&D and production are increasingly likely to overlap. They are conducted as ongoing phases rather than in distinct stages. There has been a trend toward relatively seamless transitions from product development to pre-production to production as the interchange between basic and applied research grows.[10]

The growing concurrency between R&D and production is illustrated by trends in the aerospace field. Contemporary aerospace programmes often do not have the development of

[10] Howells and Wood, 41.

definitive production versions of aircraft following the conclusion of successful development programmes as their objective, but rather 'open systems' designed from the outset for continuous experimentation and development, including through pre-planned product improvements. Products formerly considered prototypes now constitute early production aircraft, and aircraft are produced in accordance to constantly changing specifications as their designs 'mature'.

Recent years have seen the emergence of an entirely new terminology to account for this: for example, language such as 'production representative test vehicle' and 'early operational capability system' is replacing 'prototype' and 'pre-production system'. Many firms have instituted organizational and operational changes to facilitate concurrent R&D and production. The European Aeronautic Defence and Space Company (EADS) recently restructured its activities, for example, with the explicit objective of supporting 'continuous improvement of processes and products'.[11]

The increasing overlap between development and production has been instrumental in technological globalization by contributing to the diffusion of R&D capabilities in concert with decentralized production facilities. This has been particularly evident in East Asia, where there is significant local participation in transnational production networks.[12]

Polycentric Processes of Technological Development and Application

Firms have responded to the more demanding requirements of technological development and application by developing new organizational and operational approaches at both the intra- and inter-firm levels and that help to distribute the resource burden involved. In organizational terms, this involves less hierarchical, polycentric processes of technological development and application, while operational innovations such as those that are redefining inter-firm

[11] Craig Hoyle, 'EADS Reshapes Research and Technology Strategy.' *Jane's Defence Weekly* 37:18 (1 May 2002), 22.

[12] See John Ravenhill, 'The Regionalization of Production and Competitiveness in East Asia,' in Robert Anderson et al, eds. *Innovation Systems in a Global Context: The North American Experience* (Montreal and Kingston: McGill-Queen's University Press, 1998), 177.

relationships have been conceptualized as the 'North American system of innovation.'[13] These changes are largely synonymous with what is being referred to as the 'Revolution in Business Affairs' (RBA). The development of polycentric processes of technological development and application has been facilitated by the widespread introduction of near-real time global telecommunications instruments such as the internet.

At the intra-firm level, initiatives granting much greater autonomy to individual affiliates and rationalization designed to help them focus on their 'core competencies' have contributed to the development of polycentric processes of technological development and application. Many firms have pursued more efficient R&D and production through specialization and divesting themselves of operations of secondary importance. For example, Jack Welch, Chairman and Chief Executive Officer of General Electric, stated that every one of its businesses that was not first or second in worldwide market share needed to be 'fixed, closed or sold'.[14] The trend toward the fragmentation of the formerly comprehensive capabilities of many larger firms has been accompanied by mergers and acquisitions designed to reinforce their strengths - as well as to eliminate competitors. Many high technology industrial sectors have experienced significant consolidation and declining numbers of prime contractors over the past decade as a result.

Firms have compensated for their loss of capacity in fields of secondary importance through outsourcing. David Angel notes firms' 'increased dependence on external sources of technological knowledge,' while Jeremy Howells and Michelle Wood argue that 'the whole panoply of extra-organisational linkages and collaborations between industrial firms and other agencies is crucial to the whole process of globalisation of production and technology'.[15] An indication of the extent of this is provided by the US firm Lockheed Martin, which by 1999 was

[13] John Alic, 'The North American System of Innovation in the Global Context,' in Robert Anderson et al, eds. *Innovation Systems in a Global Context: The North American Experience* (Montreal and Kingston: McGill-Queen's University Press, 1998), 151-54.

[14] Quoted in Mark Hewish, 'Re-directing the Defense R&D Pipeline.' *International Defense Review* 26:7 (1993), 555.

[15] David P. Angel, *Restructuring for Innovation: The Remaking of the U.S. Semiconductor Industry* (New York, NY: The Guilford Press, 1994), 12; Howells and Wood,, 63

partner to no less than 200 international alliances, only half of which were with European firms.[16]

Technological globalization increasingly features inter-firm arrangements that extend well beyond the product-specific collaboration on marketing or production that formerly constituted the extent of inter-firm collaboration. The arrangements evident under technological globalization range from joint ventures and formal strategic alliances to informal collaborative mechanisms and the contracting out of R&D to independent design consultancies. Armando Sodaro, Managing Director and General Manager of the Italian firm *Selenia Elsag Sistemi Navali,* explained its industrial strategy in the following terms: 'We are trying to link centres of excellence in various countries, preferably by creating common-held companies or joint ventures with existing, well respected suppliers elsewhere'.[17] Often, these arrangements are transnational in nature, involving participants based in widely dispersed locations. The German firm Diehl recently argued that 'companies such as Diehl are not able to preserve their cutting-edge technologies as well as their system and subsystem competence without effective international co-operation and access to the global market'.[18] The growth of transnational collaboration is illustrated in Table 2 below.

[16] Damian Kemp, 'Lockheed Martin in UK Restructuring.' *Jane's Defence Weekly* 32:1 (7 July 1999), 19.

[17] Joris Janssen Lok, 'Network for Success.' *Jane's Defence Weekly* 17:20 (16 May 1992), 861-62.

[18] David Mulholland, 'Export Drive.' *Jane's Defence Weekly* 40:17 (29 October 2003), 23.

Table 2
Representative Post-Cold War Transnational Strategic Alliances [19]

Firms Involved	Technology Area
Pilkington Optronics (UK) and Krupp Atlas Elektronic (Germany)	Electro-optics
Chartered Semiconductor (Singapore) and Lucent Technologies (US)	Semiconductor manufacturing technology
Texas Instruments (US) and British Aerospace Systems and Equipment (UK)	Avionics
SAGEM (France), SAT (France), Officine Galileo (Italy) and EFIM (Italy)	Electro-optics
Logistics Engineering Associates (US) and Defense Logistics (US) and OMI Logistics (UK)	Integrated logistic support tools
ATI Technologies (Canada) and Samsung Electronics (South Korea)	Digital television platforms

Major developmental programmes increasingly feature a lead contractor but no single overall design authority. Instead, programmes are characterized by teaming arrangements between 'capability partners' working in parallel, who act as design authorities in their own specific areas. An example is the US firm Sikorsky who is developing the S-92 helicopter in conjunction with Mitsubishi Heavy Industries of Japan, Embraer of Brazil, Gamesa of Spain, the Jingdezhen Helicopter Group of China and the Aerospace Industrial Development Corporation of Taiwan.[20]

Inter- and intra-firm technological arrangements frequently are quite flexible. This enables firms to adjust to changing technological and market requirements in a much more timely manner. A single firm may now be found supporting rival bids for the same contract, or firms may simultaneously collaborate on one project while competing on another.[21]

[19] n.a. 'Company Tie-Up to Beat Budget Cuts.' *Jane's Defence Weekly* 12:6 (12 August 1989), 272-73; Charles Bickers, 'Staying in Touch.' *Far Eastern Economic Review* 163:42 (19 October 2000), 42; n.a. 'US/UK Terrain System Tie-Up.' *Jane's Defence Weekly* 13:7 (17 February 1990), 286; n.a. 'ATI Technologies and Samsung to Cooperate on Next-Generation Digital TV Sets.' Asia Pacific Foundation of Canada, Canada-Asia News (7 November 2003); n.a. 'French Look to Co-operation.' *Jane's Defence Weekly* 15:5 (2 February 1991), 156; and n.a. 'Logistics Firms Form Up.' *Jane's Defence Weekly* 19:17 (24 April 1993), 7.

[20] Craig Hoyle, 'First Flight for S-92 Helicopter.' *Jane's Defence Weekly* 31:2 (13 January 1999), 11.

[21] See Richard Bassett and Damian Kemp, 'UK-French AFV Tie-Up Poses Many

Expanded Transnational Technological Diffusion

The tendency to disregard political or geographic barriers as seen in inter- and intra-firm arrangements for technological development and application under technological globalization has meant that transnational technological collaboration is fast becoming the norm in high-technology sectors. The willingness of many firms to integrate foreign subsidiary and non-subsidiary partners into their R&D and production programmes, facilitating the emergence and development of multiple centres of technological innovation, has led to a dramatic increase in transnational technological diffusion. Often, this process is driven by the desire to exploit the advantages of lower production or developmental costs. This is exemplified by Daimler-Benz Aerospace, which launched a Competitiveness Improving Initiative (CII) to relocate production to more cost-effective foreign locations.[22] This trend is in keeping with the growing predilection of firms to conceive of markets in terms that have little correlation with national boundaries. For example Eric van Amerongen, Chairman of Signaal, referred to their recent acquisitions of foreign firms in 1997 as a part of their 'multi-domestic, multi-state policy'.[23] This is reflected in the practice of situating complementary activities in different countries. It is increasingly the case that MNEs' diverse research facilities are assigned principal responsibility for a specific technical area within their global operations.[24]

Firms have long considered establishing local research facilities as an effective approach for market penetration and consolidation, particularly in their more sophisticated export markets. Increasingly, however, this motivating factor has been supplemented by the attraction of access to local resources for R&D, including local pools of scientific expertise and technical labour

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Questions.' *Jane's Defence Weekly* 31:3 (20 January 1999), 25 for an illustration of the resulting complexities of inter-firm collaboration.

[22] See n.a. 'DBA Examines its Cost-Cutting Options.' *Jane's Defence Weekly* 24:7 (19 August 1995), 18.

[23] Interview with Eric van Amerongen, *Jane's Defence Weekly* 27:25 (25 June 1997), 32.

[24] Howells and Wood, 36.

and lower-cost facilities.[25] In some cases, this has involved an evolutionary process with 'facilities with initial limited technical, design, quality control or process engineering units' evolving into 'more formalized research laboratories,' as well as through directly establishing or acquiring dedicated R&D facilities.[26] This dovetails the general trend in economic globalization, where growing numbers of firms have initiated structural changes designed to transform them from multinationals to transnationals, organized on a regional or even global basis.

The identity crisis afflicting an increasing number of MNEs indicates the extent to which de-territorialization is affecting these crucial technological actors. A growing number of firms are 'rebranding' themselves by adopting new corporate identities that obscure their national origins and which reflect the multinational realities of their operations and outlooks. Bernard Retat, Director-General of Thales, explained his firm's recent decision to adopt that name in place of its former 'Thomson-CSF'. According to Retat, the company's 'identity was increasingly changed and [they] had the feeling that the time had come to change [their] name. More than half [their] staff were non-French.'[27]

Table 3
Transnational MNE Identity Changes

Original Name	Revised Name	Country Base
Deutsche Aerospace	Daimler-Benz Aerospace	Germany
Hunting Engineering	Insys	UK
Hyundai Electronics	Hynix Semiconductor	S. Korea
Sperry, Burroughs	Unisys	US
TERMA Elektronik	Terma	Denmark
Thomson-CSF	Thales	France

This trend has been reinforced by the drive in many developing and emerging industrial states

[25] See Ibid., 33-34.

[26] Ibid., 31-32.

[27] Interview with Bernard Retat in *Jane's Defence Weekly* 35:5 (31 January 2001), 32. See also David Mulholland, 'Thomson-CSF Changes Name to Reflect Global Focus.' *Jane's Defence Weekly* 34:24 (13 December 2000), 18.

for technological progress. Many MNEs have felt pressured to contribute toward the development of local technological capabilities, even in cases where there was no economic rationale. As one company official noted, 'If you are not willing to transfer technology, then others will and then you are left in a worse situation'.[28]

Technological Globalization and the State

Technological globalization is having a major impact on states' technology policies. Decision makers in many states recognize the existence of processes of globalization. Consideration of the implications of technological globalization for important national objectives is reflected in awareness of the changed policy requirements that result. As early as 1989, for example, a report by the US Defense Advisory Board admitted that 'Technology is the new coinage of the realm and ours has been seriously depleted . . . We cannot maintain a lead by conservatism and protectionism'.[29] In 1997, US Defense Secretary William Cohen went further in acknowledging the importance of the RBA.[30]

Depending on its perceived impact in terms of the security concerns of particular states, policy responses to technological globalization have varied widely. Aspects of technological globalization that are considered positive in some states may be seen as negative elsewhere, depending on the local security/technology nexus. Technological globalization generally is viewed in positive terms when it is seen as contributing to military or economic development by facilitating access to technologies and to processes of technological development based elsewhere. Technological globalization generally is seen as negative where the overriding concern is over the erosion of national technological 'leads'. In such cases, this can serve to broaden the policy focus to encompass potential competitors as well as rivals. As Donald Snow notes:

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[28] n.a. 'IAI Breaks Silence on Clients, Contracts.' *Jane's Defence Weekly* 19:25 (19 June 1993), 7.

[29] n.a. 'USA Must "Run Faster" to Keep Lead.' *Jane's Defence Weekly* 12:22 (2 December 1989), 1255.

[30] Barbara Starr, 'Pressure on the US Giants.' *Jane's Defence Weekly* 28:24/25 (17 December 1997), 23.

> The inability to stem the flow of science and technology across borders becomes a national security concern both regarding restricting technology transfer to adversaries and sharing U.S. science with partners (EC and Japan).[31]

Negative perspectives toward technological globalization are frequently associated with concern over the sustainability of national defence industrial bases and the politico-military vulnerability of states that are unable to do so. Technological globalization complicates state defence industrial strategies, both in terms of their capacities to mobilize technology for the development of improved arms, and in terms of a capacity to 'surge' production when required. This is because globalized high technology industries are poorly configured for large-scale short-notice production increases. Traditional concern over dual-use technological proliferation has been supplemented by concern over what has been referred to as 'procurement security' on the part of a number of states.[32] Technological autarky remains an important objective for states that define their security concerns in terms of external military threats.[33]

For some states, technological globalization constitutes a major policy dilemma. States whose decision makers perceive a requirement to balance concerns about the economic viability of domestic firms with concerns about technological proliferation are faced with difficult policy choices. This is particularly the case when these domestic firms may depend on developing transnational technological ties. There are inherent tensions between policies which are potentially useful in fulfilling these objectives. A number of states have endeavoured to support those aspects of technological globalization perceived as beneficial to the development of local industrial capabilities while attempting to limit its negative impact. However, this endeavour has proven difficult in practice.[34] France's Defence Minister, Pierre Joxe, noted

[31] Donald M. Snow, 'High Technology and National Security: A Preliminary Assessment.' *Armed Forces & Society* 17:2 (1991), 250.

[32] See Luke Hill, 'EU Force Declared Operational but Capability Shortfalls Remain.' *Jane's Defence Weekly* 39:21 (28 May 2003), 3.

[33] For a useful overview of state policy responses in respect to defence industries, see Keith Hayward, 'The Globalisation of Defence Industries.' *Survival* 43:2 (2001), 118-19.

[34] It is important to note, however, that states have faced what Andrew Moravcsik terms the 'autarky-efficiency dilemma' since the sixteenth century. See his 'Arms and Autarky in

that 'The French State will not become indifferent to this [aerospace] sector, which is vital to our industrial, technological and scientific development'.[35] He also argued that 'French industry must work to maintain the technological edge it has won in certain defence areas and foster greater co-operation with defence suppliers in other countries, pooling of exchanging know-how', while admitting that this would lead to the 'gradual Europeanization of France's industrial landscape'.[36]

The increasingly problematic relationship between states and processes of technological development, application and diffusion under globalization is leading many states to revise key aspects of their technology policies. In some cases, this has reflected redoubled efforts to attain traditional technological objectives, such as preventing or controlling the proliferation of dual-use technologies, while other states have focussed on developing much closer relations with the non-state sector, or on supporting the development of strategic industrial alliances in critical sectors. The changed policy requirements stemming from technological globalization also have prompted a number of states to redefine their inter-state relations.

Developing and emerging industrial states have displayed some of the strongest support for technological globalization, due to its potential contribution to their technological and economic development. Technology's perceived importance in developmental terms to these states is suggested by the fact that it was only when security concerns shifted from questions of political sovereignty to development in the 1960s emerged as a major policy issue in these states.[37] It is worth noting that states as diverse as Mexico, India and Taiwan have developed comprehensive strategies designed to facilitate local integration into transnational processes of technological development and application. Technological globalization is not entirely

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Modern European History.' *Daedalus* 120:4 (1991), 23.

[35] Carol Reed, 'France Will Back Aerospace R&D.' *Jane's Defence Weekly* 15:26 (29 June 1991), 1192.

[36] n.a. 'Joxe's Vision of Euro Army.' *Jane's Defence Weekly* 17:25 (20 June 1992), 1074.

[37] Harvey W. Wallender III et al, *Technology Transfer and Management in the Developing Countries: Company Cases and Policy Analyses in Brazil, Kenya, Korea, Peru, and Tanzania* (Cambridge, MA: Ballinger Publishing Co., 1979), 12.

positive from the perspective of developing states, however: its increased potential to drain off scarce scientific and technical manpower exacerbates established 'brain drain' concerns.

Regardless of perceptions of technological globalization, it presents a novel policy challenge for states, in that traditional unilateral policy instruments are much less effective in terms of actors and highly diffused processes. As Scholte asserts:

> [Under] contemporary globalizing circumstances . . . [a state cannot] exercise complete authority over transborder associations or global companies . . . In short, even where contemporary states are legally entitled to do so, they have been quite unable singularly and fully to control the global spaces which affect their jurisdictions. To be sure, states can influence supraterritorial activities - sometimes quite substantially. However, even the best-endowed state has not had the means to assert *sovereign* control over transborder relations.[38]

This potentially encourages states to look beyond their own borders in developing policy responses to globalization, potentially in concert with other, like-minded states. Scholte points to the rise of regionalization - defined in terms of 'multilateral regional regulatory regimes' - as a response to globalization, for example.[39] There are a number of factors which impact the form of state policy responses, and which have led to major regional differences.

Technological Globalization and Regional Security

Understood in terms of a general propensity toward an understanding of security that extends to a region from its constituent states, the impact of technological globalization on the security/technology nexus potentially extends to regional security. This is not synonymous with the regional stability or degree of regional integration that Mohammed Ayoob rightly criticizes as providing a conceptual basis for this term.[40] Though regional security can potentially contribute toward regional stability or integration, the relationship between

[38] Jan Aart Scholte, *Globalization: A Critical Introduction* (New York, NY: St. Martin's Press, 2000), 136-37.

[39] Ibid., 146-47.

[40] See Mohammed Ayoob, 'Regional Security and the Third World,' in Mohammed Ayoob, ed. *Regional Security in the Third World: Case Studies from Southeast Asia and the Middle East* (Boulder, CO: Westview Press, 1986), 3-4.

regional security and order, stability and integration at the regional level is highly problematic. Regional security should be thought of less as a qualitative condition than a general understanding, which informs approaches to security-related questions on the part of regional states.

The potential of technological globalization to impact on regional security derives from its scope for influencing states' approaches to their regional environments. Given recognition of the transnational nature of the processes involved and of the limited utility of unilateral state policies under conditions of globalization, there is considerable scope for technological globalization to encourage states to consider security in regional terms and to pursue regional approaches to security-related technological issues.

The salience of regional security is more apparent in some areas than others. In East Asia, comprehensive security concerns arising out of states' formative experiences have long encouraged interest in regional security. East Asia is distinguished by the degree of importance attached by state actors to domestic as well as external aspects of security. While many regional states have devoted considerable attention to the requirements of defence against external military threats, they have not neglected the domestic security environment. Singapore, for example, has developed a Total Defence approach to security, which includes civil, economic, psychological and social aspects alongside military defence.[41]

The East Asian approach to domestic security is quite distinctive. In this region, this extends well beyond the focus on order and stability that underlies what is generally referred to as 'internal security.' Many East Asian states' domestic security concerns involve a strong emphasis on human security and 'performance legitimacy', which have driven efforts to promote successful economic development and prosperity. The close relationship between economic aspects and security in East Asia has been noted by a number of authors, including Jusuf Wanandi, who writes that 'concepts of national resilience and regional resilience . . . are premised upon the close relationship between security and economic development

[41] Tim Huxley and Amitav Acharya, 'Security Perspectives in South-East Asia.' *International Defense Review* 20:12 (1987), 1604.

(prosperity)'.[42]

Most East Asian states have staked their economic development on successful participation in the global economy. The widespread regional acceptance in recent years of the limitations of inward-oriented economic policies has led states to focus their attention on the possibilities accruing from export-oriented strategies. The path that such strategies have taken - which has frequently included participation in regional production networks - has encouraged states to approach national security in regional terms. Lee Hsien Loong, Singapore's Minister for Trade and Industry, stated that 'The development of the regional economies will benefit Singapore. As the region prospers, our position in the global business centre will be enhanced' reflects a general regional perspective.[43] As Amitav Acharya and Richard Stubbs point out, 'regional security issues cannot be divorced from regional economic issues'.[44]

This approach to security has encouraged a higher degree of cooperation than among those states who focus primarily on politico-military security. Transnational economic engagement in East Asia transcends politico-military rivalries, despite enduring inter-state tensions and a number of potentially serious territorial and resource conflicts. A very high degree of economic interdependence characterizes East Asia, including extensive regional production networks. As John Ravenhill observes, 'The regional political economy now consists of clusters of interrelated manufacturing sectors that are better described as networks than as unconnected industries'.[45] Regional networks frequently encompass states that are not close to each other in political terms or which are rivals. China and Taiwan provide the most striking example of the extent to which non-traditional security concerns have displaced traditional

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[42] Jusuf Wanandi, 'The Security Implications of Regional Trade Cooperation,' in National Defense University, ed. *Economics & Pacific Security: The 1986 Pacific Symposium* (Washington, DC: National Defense University Press, 1987), 61-65. For a useful overview of the regional economics/security nexus, see Stuart Harris, 'The Economic Aspects of Security in the Asia/Pacific Region.' *Journal of Strategic Studies* 18:3 (1995), 34-46.

[43] n.a. 'Singapore: Facing the Future.' *Military Technology* 14:2 (1990), Special Supplement 5.

[44] Amitav Acharya and Richard Stubbs, '"The Perils of Prosperity?" Security and Economic Growth in the ASEAN Region,' in M. Jane Davis, ed. *Security Issues in the Post-Cold War World* (Cheltenham: Edward Elgar, 1996), 99.

[45] Ravenhill, 177.

politico-military security concerns, contributing to regional security. The symbiotic economic relationship between China and Taiwan preceded the development of a cross-strait dialogue in the 1990s and has survived major fluctuations.[46] China and South Korea similarly have developed increasingly strong economic linkages, despite the former's traditional support for North Korea.[47] Further evidence of ~~the~~ shared comprehensive security concerns at the regional level is provided by the plethora of cooperative economic initiatives which have been pursued through regional multilateral fora such as Asia-Pacific Economic Cooperation (APEC) and the Association of Southeast Asian Nations (ASEAN).[48]

Technological Globalization in East Asia

The East Asian region has seen the extensive development of technological globalization. East Asian firms have been instrumental in the development of regional transnational ties and at the forefront of regional processes of technological globalization. This is in keeping with the general pattern of regional economic integration in East Asia, where the business sector has played a central role.[49] Japanese firms have led the way in regional processes of technological globalization, but have now been joined by firms based in South Korea, Taiwan, Singapore and elsewhere in the region. The extent of regional states' integration into the transnational processes has been apparent at the global as well as the regional level: developing East Asian states as well as Japan figure prominently in the 'new international division of labour.' One notable aspect of this has been the acquisition or establishment of foreign subsidiaries by regional firms, as illustrated in Table 4 below.

[46] See J.D. Kenneth Boutin, 'Cross-Strait Trade and Investment: Economic and Security Implications for the Republic of China.' *Issues & Studies* 33:12 (1997), 80-92.

[47] See Choongyong Ahn, 'Economic Relations between Korea and China: Current Conditions and Outlook.' *The Korean Journal of International Studies* 29:1 (2002), 61-81.

[48] See Amitav Acharya and J.D. Kenneth Boutin, 'East Asia's Regional Order after the Economic Crisis,' in Ng Chee Yuen and Charla Griffy-Brown, eds. *Trends and Issues in East Asia 2000* (Tokyo: International Development Research Institute/Foundation for Advanced Studies on International Development, 2000) 42.

[49] Ravenhill, 187.

Table 4
Selected Foreign Acquisitions by East Asian Firms [50]

Parent Firm	Home State	Foreign Acquisition	Location of Foreign Acquisition
Daewoo	S. Korea	Mangalia Shipyard	Romania
ST Engineering	Singapore	Halter Marine	US
Taiwan Semiconductor Manufacturing Co. Ltd.	Taiwan	WaferTech	US
TCL International	China	Schneider	Germany

The resulting success of East Asian states has given rise to the 'Asian Miracle' cliché. A number of previously 'developing' regional states has grown at such a pace that it is now possible to categorize them as 'emerging industrial states.'

Regional states have supported the emergence and deepening of technological globalization in East Asia. Many East Asian states have undertaken initiatives designed to enhance the integration of locally-based firms at the regional or global level. This includes through assistance in establishing strategic partnerships with foreign firms and by providing the supporting infrastructure behind local participation in transnational R&D and production processes. The governments of both Singapore and South Korea, for example, have negotiated cooperative R&D agreements with states or multilateral bodies based outside the region.[51]

Technological globalization is proving to be an inherent part of regional economic developmental processes, under which states' economies are being rendered increasingly interdependent. The developmental trajectories of most East Asian states suggest that processes of technological globalization will be further entrenched as they continue to progress into ever more advanced product areas.

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[50] Daewoo Mangalia Shipyard, www.dmhi.ct.ro; Robert Karniol, 'Eyes on Expansion.' *Jane's Defence Weekly* 39:17 (30 April 2003), 27; www.wafertech.com/wt/index.htm; n.a. 'Chinese Firms Buy into Global Market.' *People's Daily* (15 November 2002), http://english.peopledaily.com.cn.

[51] Carol Reed, 'Australia Commits to the Future.' *Jane's Defence Weekly* 20:23 (4 December 1993), 21-23; Barbara Starr, 'Pentagon to Revitalize the NATO-Nunn Programme.' *Jane's Defence Weekly* 20:23 (4 December 1993), 19-20.

The Contribution of Technological Globalization to East Asian Regional Security

The importance attached to technological development, application and diffusion in security terms by East Asian decision makers ensures that technological globalization will elicit state policy responses. The regional security/technology nexus has reflected the perceived importance of technology both in traditional politico-military and non-traditional economic security terms. What sets East Asia apart from regions such as Latin America or Western Europe, however, is the degree to which technological globalization is viewed in positive terms. The processes involved in technological globalization are widely perceived as providing the means for East Asian states to advance in technological terms. This includes both in respect to their overall technological capabilities, which potentially provides a basis for sustained economic development and prosperity, and in terms of aiding the development of more advanced defence-industrial capabilities.

The positive regional attitude toward technological globalization evident in East Asia demonstrates the prioritization of non-traditional security concerns. While technological globalization does support defence-industrial development in terms of providing enhanced access to advanced technologies, it simultaneously reduces states' capacities to mobilize technology in the face of restrictions or sanctions on technology-related contacts with other states. The fact that East Asian states support technological globalization in spite of this critical shortcoming suggests considerable scope for possible contributions to regional security.

In fact, technological globalization contributes to regional security in East Asia by reinforcing the existing tendency of many states to approach questions of security in regional terms. The regional development of processes of technological globalization encourages East Asian states to consider the contribution of the region as a whole to their economic development. For this reason, states are disinclined to attempt restricting the development of transnational processes of technological development and application, or preventing technological diffusion. Even Taiwan, which has justifiable concerns over the long-term impact of cross-strait technology transfers, has not pursued this with any vigour.[52] Both China and Taiwan have endeavoured to minimize the impact of bilateral tensions in the technology field. For example, state-owned

[52] Boutin, 89-90.

firms from both countries are participating in the development of Sikorsky's S-92 helicopter.[53]

The positive impact of technological globalization on regional security is also evident in the active role taken by regional states in developing transnational linkages. China and Taiwan, for example, have sought to enhance formal cross-strait technological ties. In July 1998, Chinese Science and Technology Minister, Zhu Lilan, led a delegation to Taiwan to discuss bilateral science and technology exchanges.[54] Efforts of this nature reveal awareness of the importance of the broader region to important questions of national security.

Given the importance attached to technological progress in East Asia, the inability of any regional state to promote sustained technological progress on its own, and the importance of the broader region to technological progress, regional security can be expected to remain an important focus for East Asian states. The development of increasingly intensive transnational technological ties in East Asia serves to reinforce the regional security tendency. The importance of transnational technological cooperation will increase in tandem with the gradual progression of regional firms into the development and production of increasingly advanced technologies in the aerospace, IT and biotechnology sectors. This will make it progressively more difficult to consider security independently of the broader region. Technological globalization potentially may even be able to help mitigate the impact of heightened politico-military security concerns by providing decision makers with strong reasons to avoid courses of action threatening to regional technological ties.

While technological globalization can be expected to support the deepening of regional security in East Asia, this will not necessarily be accompanied by processes of institution-building. The leading role of the non-state sector in processes of technological globalization relieves state actors of much of the responsibility for developing inter-state arrangements transnational cooperation. While states have an important part to play in technological globalization, in East Asia this has been much less evident than in regions such as Western Europe. East Asian states are largely content to allow local firms to develop their

[53] Hoyle, 11.

[54] Sean Boyne, 'Taiwan's Troubles: National Defence Report Highlights Chinese Threat.' *Jane's Intelligence Review* 10:9 (1998), 28.

own mechanisms for transnational technological development and application. They intervene only where circumstances make this particularly necessary. This detached approach is in keeping with established regional approaches to many security-related questions, as exemplified by the 'ASEAN Way' in Southeast Asia. Regional acceptance of such an approach to important security-related questions obviates much of the requirement for official mechanisms.

The East Asian preference for informality in inter-state relations enhances technological globalization's potential contribution to regional security. Technological globalization centred on mechanisms based in the non-state sector is endowed with greater durability than those closely linked to inter-state processes, such as formal institutions and informal regimes. State-based processes are much more vulnerable to policy shifts on the part of member and participating states.

Conclusion

Technological globalization supports regional security in East Asia to a greater extent than is the case elsewhere. Technological globalization is reinforcing East Asian states' established predisposition to consider security in regional terms. The central role of technological globalization processes in the ongoing efforts of regional states to further develop their economies in the context of the global economy suggests that it will continue to have this effect.

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