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Firms in the Global Economy**

*Henry Wai-chung Yeung*  
*Professor of Economic Geography, Department of Geography,*  
*National University of Singapore*

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# From Followers to Market Leaders: Asian Electronics Firms in the Global Economy

Henry Wai-chung Yeung

Professor of Economic Geography, Department of Geography, National University of Singapore

and

Visiting Scholar, International Centre for the Study of East Asian Development

**Abstract:** This paper draws upon a large database of original data collected through personal interviews with top executives from almost 70 leading firms in the four Asian newly industrialized economies of Hong Kong, Singapore, South Korea, and Taiwan. Focusing on the electronics industry, I aim to explain how a number of leading Asian electronics firms are articulated into global production networks and become major players in their respective market niches. Developing a triangular theoretical framework, I seek to explain the complex relationships between the dynamic articulation of these leading Asian electronics firms into different global production networks and their simultaneous upgrading from typical followers to market leaders. As a critique of the dominant developmental state discourse, I argue that the interplay between corporate strategies and home base advantages within the context of changing global production networks can offer a better explanation of the differentiated competitive outcomes of these Asian firms. I conclude the paper with some significant implications for theory and policy in relation to corporate development in Asian economies.

**Keywords:** Asian firms, global production networks, corporate strategies, home base advantages

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# **From Followers to Market Leaders: Asian Electronics Firms in the Global Economy**

## **Introduction**

The past two decades witness the intensified articulation of the Asia Pacific region into the global economy through tendencies and processes associated broadly with economic globalization. While much social science literature has been written on globalization and its impacts in the Asia Pacific region (see Olds et al., 1999; Davies and Nyland, 2005), we know relatively little about how some Asian firms are articulated into global production networks and become major players in their respective industries (cf. Schütte, 1994; De Meyer et al., 2005; Yeung, 2007). This relative lack of understanding of firm-level behaviour reflects the general underestimation of the critical importance of business firms in *driving* globalization processes. In economic geography, the influence of the “cultural turn” and the “relational turn” and the subsequent interest in the mundane and everyday economic life has sidestepped the issue of researching into how business firms perform as the mover and shaper of the capitalist global economy (see Yeung, 2003; 2005a).

In this paper, I want to resurrect the significance of studying firms as an important economic-geographical phenomenon (see also Markusen, 1994; Yeung, 2005b). My concern is particularly influenced by the rise of powerful business firms from the four Asian newly industrialized economies (NIEs) of Hong Kong, Singapore, South Korea, and Taiwan – broadly known as “Asian firms”. As I will demonstrate empirically, this relatively new phenomenon of the growing competitiveness of Asian firms in the global economy has much to do with the opportunities created by economic globalization. Their story is also particularly relevant for geographical studies of the Asia Pacific because of the rapidity of their emergence and the critical role played by their home bases. In other words, geography matters here because different home bases provide different mix of competitive advantages that might be exploited by these Asian firms in their attempt at globalization. The four NIEs

have different mix of institutional contexts and resource repertoires that lead to the emergence of leading firms in different sectors. It is thus not surprising that over half of the global fabric production is controlled by two leading Hong Kong firms, over 70% of world's 50 million annual shipment of computer notebooks are produced by four Taiwanese firms, two of the world's largest semiconductor foundry manufacturers are Taiwanese, two-thirds of the US\$10 billion offshore oil rigs order are held in the books of two Singaporean marine engineering firms, and Samsung and Hyundai from South Korea have become household brand names in less than one decade. The list can go on much further.

More importantly, this recent rise of Asian firms in the global economy needs to be reckoned with in contemporary economic-geographical research because of potential theoretical and empirical contributions (see Yeung and Lin, 2003). My argument does not imply that no study on these Asian firms has ever been conducted in economic geography (e.g. Olds, 2001; Poon and MacPherson, 2005; Coe and Lee, 2006; Poon et al., 2006). Rather, I argue that we lack a coherent theoretical framework robust enough to account for this phenomenon. In the management literature (e.g. Lau et al., 2000; Leung and White, 2004; De Meyer et al., 2005), existing studies tend to emphasize firm-specific corporate strategies and competitive advantages, thereby ignoring the wider institutional contexts from which these Asian firms have emerged. Management researchers also pay insufficient attention to how the performance of individual Asian firm can be linked to its participation in global production networks – a conceptual apparatus developed by the Manchester School (Henderson et al., 2002; Coe et al., 2004; Hess and Yeung, 2006; see also Bathelt, 2006). In the development literature, the primary focus has been placed on how developmental states in Asia have pursued different economic development strategies and fashioned distinctive growth trajectories for their national economies (Amsden, 1989; 2001; Wade, 1990; Weiss, 1998; 2003; Woo-Cumings, 1999; cf. Chan et al., 1997; Boyd and Ngo, 2005). Their work is much

more concerned with the transformations and adjustments of *domestic institutions* in economic governance. There is insufficient attention to the complex interplay between global production networks and corporate strategies of Asian firms. This genre of the developmental state also runs contrary to the popular discourse that prematurely declares the demise of the nation state in a “flat” global world (e.g. Ohmae, 1995; Friedman, 2005; cf. Yeung, 1998a).

In this paper, I aim to bring together important theoretical insights from these different strands of established literature to develop a synthetic framework that incorporates dynamics of global production networks, firm-specific competitive strategies, and institutional embeddedness of the home base. In what might be called a “triangular framework” (see Figure 1), I argue that corporate competitive strategies are a necessary but not sufficient condition for explaining the success of Asian firms in the global economy. For these strategies to work in their favour, Asian firms need to capitalize on emerging opportunities made available because of changing global production networks. The capacity of these Asian firms in articulating into favourable global production networks is also significantly shaped by the supportive institutional contexts of their home bases. Taken together, these three “legs” underpinning Asian firms – appropriate strategies, favourable GPNs, and supportive home bases – need to be interactively present for them to compete effectively in the global economy. In short, there is a *strategic coupling* when these three elements are complementary and mutually reinforcing.

While the next section will develop this triangular framework in greater detail, the subsequent three sections will explain how different strategies pursued by Asian firms lead to differential competitive outcomes. A note on methodology is necessary here. The empirical evidence presented here originates from a major transnational research project in which personal interviews with top executives of leading Asian firms were conducted in the four

NIEs. We interviewed a total of 68 leading Asian firms between June 2004 and June 2006: 19 Hong Kong firms, 13 South Korean firms, 24 Taiwanese firms, and 12 Singaporean firms. These firms were selected on the basis of their 2003/2004 operating revenues or turnover captured in the OSIRIS database published by Bureau van Dijk Electronic Publishing, a comprehensive database containing detail financial information on publicly listed companies worldwide. We selected the top 50 firms from each of the four NIEs and approached them for personal interviews with their top executives. Among the 68 leading Asian firms interviewed, 15 were in the top-10 and 29 were in the top-20 by operating revenues in their respective economies. Eleven of them were ranked in UNCTAD's (2005) Top 50 TNCs from developing economies. Some 33 of the interviewees were CEOs/Presidents or Managing Directors, whereas another 32 were Executive Directors, General Managers, or (Senior/Executive) Vice Presidents. In some cases (e.g. Samsung Electronics), personal interviews with several top executives were conducted. In all interviews lasting between one to two hours, we took an open-ended approach and used only brief interview aides. Extensively background information from all available public sources was consulted to form the basis of customized qualitative questions during each interview. All except one interview were taped and transcribed and these transcripts and other relevant information form the empirical basis of this paper.

**Global production networks, corporate strategies, and the home base advantage:  
towards a triangular framework**

To explain the rise of leading Asian firms, we first need to ground our empirical analysis in a robust theoretical framework. In this triangular framework (Figure 1), a convenient point of analysis starts with changing *global production networks* (GPNs). Based on Henderson et

al.'s (2002) description, GPNs involve both business firms and national economies in organizationally complex and geographically extensive ways.

Production networks – the nexus of interconnected functions and operations through which goods and services are produced, distributed and consumed – have become both organizationally more complex and also increasingly global in their geographic extent. Such networks not only integrate firms (and parts of firms) into structures which blur traditional organizational boundaries – through the development of diverse forms of equity and non-equity relationships – but also integrate national economies (or parts of such economies) in ways which have enormous implications for their well-being. At the same time, the precise nature and articulation of firm-centred production networks are deeply influenced by the concrete socio-political contexts within which they are embedded (Henderson et al., 2002: 445-46).

Typically, a GPN consists of one or more global lead firms – often globally significant transnational corporations (TNCs) – that coordinate and control the vast network of their overseas affiliates, strategic partners, key customers, and non-firm institutions (see also Coe et al., 2004; Hess and Yeung, 2006). Take the computer industry as an example. A brand name company such as Dell or Hewlett Packard (HP) is likely to be a global lead firm, coordinating its own R&D and manufacturing affiliates worldwide and its less than a dozen strategic partners such as electronic manufacturing service (EMS) providers. It also has to coordinate marketing activities with its key customers worldwide and to deal with non-firm institutions such as labour organizations and civil society organizations (CSOs) in different host countries. This diversity of firms and institutions in different countries explains why a GPN is organizationally complex and geographically extensive.

For the purpose of this paper, one important aspect of contemporary GPNs in many industries is their *changing organizational dynamics*. Since the early 1990s, global lead firms in different GPNs and sectors have moved towards a business model of increasing specialization in value chain activities. This trend has been much further accelerated since the late 1990s, particularly in the electronics, automobile, and clothing sectors (Gereffi et al., 2005). What this value chain specialization entails is a more strategically focused role played by global lead firms in the upstream (R&D) and downstream (marketing, distribution, and

post-sale services) segments of the value chain, leaving much of the manufacturing portion of the value chain to its international strategic partners and supply chain managers. This “organizational fix” in GPNs differs from Harvey’s (1982) idea of a “spatial fix” when capital needs to relocate geographically in order to maintain its profitability and to take advantage of cheaper costs elsewhere. The notion of a “spatial fix” does not necessarily account for changing organizational dynamics (see also MacLeod, 2001). Organizational fix here refers to how global lead firms reorganize their global production networks in order to extract greater value from specialization in core competencies and to increase market competitiveness of their products manufactured by strategic partners. While this organizational fix in certain industries may entail spatial relocation of productive facilities, its global geography does not necessarily fit nicely into the idea of a spatial fix. The rise of Asian NIEs as important manufacturing centres in the global electronics industry, for example, is not simply a matter of capital’s “spatial fix”.

There are many reasons accounting for this trend towards value chain specialization and the vertical disintegration of production networks (see also Borrus et al., 2000; Cheng and Kierzkowski, 2001; Dicken, 2003a; Gereffi, 2005). The validity of these reasons may also vary depending on the sectors and sub-sectors chosen for analysis. However, two critical factors are generally applicable. First, *time-to-market* becomes one of the most important competitive pressures that force global lead firms to reconsider their roles in GPNs. As product life cycles become increasingly shorter due to disruptive technological change and market preferences, time-to-market has emerged as a critical success factor in global competition (Stalk and Hout, 1990; Schoenberger, 1994; 1997). Global lead firms are finding it increasingly hard to excel in every aspect of the value chain and therefore prefer to specialize in segments of the value chain that they possess the greatest core competencies. These segments usually encompass research and development (R&D), product design,



manufacturing of core products, marketing, distribution, and, in some cases, post-sale services.

Second, as global competition steps up and product life cycles become shorter, global lead firms are much more concerned with *cost drivers*, particularly production costs. With greater maturity in manufacturing technologies and lower profit margins from manufacturing products, production can now be outsourced to specialized manufacturers that enjoy both scale and scope economies and therefore significant cost advantages. Over time, these specialized manufacturers grow into massive scale and become transnational corporations in their own right. This outsourcing possibility also enables global lead firms to concentrate on their core competencies and strategic businesses and to mitigate investment risks associated with market demand fluctuations.

This increasing specialization in value chain activities by global lead firms in the GPNs of many key sectors in today's global economy have two significant implications for our understanding of the rise of Asian firms. First, as "latecomers" in global competition, Asian firms benefit from this increasing demand for strategic partners and supply chain management from global lead firms that are mostly based in advanced industrialized economies in North America, Western Europe, and Japan. As I will demonstrate further in this paper, these NIE firms have relentlessly pursued certain competitive strategies that give rise to their favourable cost advantages and production capabilities (see also Hobday, 1995a; Shin, 1996; Li, 2003; Poon and MacPherson, 2005; Poon et al., 2006). Going back to the core argument of this paper, there is thus a strategic coupling between global lead firms' greater demand for manufacturing partners in Asia and the growing capability of these Asian manufacturers to fulfill this demand.

Second, the trend towards increasing specialization in value chain activities in GPNs also points to the opening up of new market avenues and opportunities for *technological*

*upgrading*. This is an important implication because such possibility for industrial upgrading was not apparent during the earlier decades (1960s-1980s) with the emergence of the new international division of labour (Frobel et al., 1980). Much of international production taking place during these earlier decades was low value labour-intensive assembly work. GPNs of global lead firms then, particularly those from the US, were much more vertically integrated, involving very few external firms and institutions (see Henderson, 1986; Henderson and Scott, 1987; Scott, 1987). Since the 1990s, however, the increasing upstream and downstream specialization by global lead firms have opened up certain market segments for Asian firms, particularly in low- and medium-value mass products that are not seen as core competencies or products to these global lead firms. Meanwhile, increasing specialization in value chain activities requires greater technological inputs and sophistication, resulting in greater opportunities for strategic partners in Asia to upgrade their technologies. This process of technological upgrading occurs because global lead firms can benefit from the concurrent R&D and co-evolution of product/process technologies in their strategic partners. This process of co-development also expedites the time-to-market of new products, thereby presenting a “win-win” solution for global lead firms and their strategic partners.

The above analysis presents only one facet of the triangular framework (Figure 1), namely the changing organizational dynamics of GPNs that occur in different sectors in the global economy today. But it does not adequately account for the rise of Asian firms. These organizational dynamics, while becoming more favourable to firms and institutions previously *external* to these GPNs, do not directly explain why Asian firms are the chosen strategic partners and how these Asian firms emerge to become major niche players in their own right. In other words, these changing organizational dynamics are useful global contexts for us to evaluate the effectiveness of specific corporate strategies pursued by different Asian firms. This brings us to the second facet of the triangular framework – *corporate strategies as*

dynamic processes of competing in the global economy. In this paper, I argue that three such corporate strategies can be observed among leading Asian firms and the next section will elaborate on each of them in relation to detail empirical evidence.

The first corporate strategy actively pursued by Asian firms refers to *strategic partnership* through technological upgrading. As latecomers lacking technological and market know-how, many Asian firms started off as subcontractors for global lead firms by engaging in a kind of organizational relationship generally known as original equipment manufacturers (OEM) suppliers. In this mode of international subcontracting, Asian suppliers to OEM firms experience very limited scope for technological upgrading as their global lead firm customers often supply product specifications, manufacturing equipment, and process technologies. Asian manufacturers pursuing a low cost strategy tend to be suppliers to OEM firms. They face tremendous competitive pressures as the barriers to entry in the OEM subcontracting market are relatively low. This in turn explains why some Asian firms have chosen to bypass the strategy as OEM suppliers by pursuing a competence-based strategy that enables them to emerge as strategic partners of global lead firms in GPNs (see empirical evidence below). Through continuous investment in R&D capabilities and production efficiency, these Asian firms have become original design manufacturers (ODM) and integrated electronic manufacturing service (EMS) providers. As ODM and EMS providers, these Asian firms are much better positioned in value chain activities because they are seen as strategic partners in these GPNs. Global lead firms not only rely on these Asian ODM and EMS providers for their manufacturing services, but more importantly engage their original design and research capabilities for new product development. These Asian firms thus become a strategic partner rather than merely a subcontractor in the global value chain activities of these lead firms.

The second corporate strategy deployed by leading Asian firms is about *developing market niches* on a regional and, sometimes, global basis. Instead of moving along the OEM-ODM continuum, these Asian firms have chosen to specialize in certain market niches and, over time, developed proprietary expertise in these value chain activities. These activities can be specialized components, integrated modules, and full-scale services. In each type of activities, these leading Asian firms have accumulated several decades of knowledge and experience in relation to their activities in the domestic market – a point I shall return to later in this section. Some of them have also developed “first-mover” advantages through technological and organizational innovations that are hard to be imitated by their competitors (see also Mathews, 2002).

The third corporate strategy, perhaps the most difficult to succeed, is for leading Asian firms to develop *original brand names*. To transform organizationally from OEM/ODM to original brand manufacturers (OBM) represents a quantum leap in corporate strategies and demand on resources. While leapfrogging in technological development in a latecomer situation might be possible through a process of “up-scaling” of production capacity and capital investment (see Amsden and Chu, 2002), growing a globally recognizable brand name can be a daunting task. Still, some leading Asian firms have successfully pursued this pathway to win market shares in global competition. This strategic orientation requires not only technological and managerial competencies, but also market knowledge. As latecomers to the global economy, many Asian firms are relatively slow in their globalization efforts. Those few Asian firms that are at the forefront of globalization tend to become significant global players over time through establishing their brand names.

Still, one may wonder why leading firms from the four Asian NIEs tend to compete against global players in *different sectors* or *different segments* of the same sectors – Hong Kong in clothing and services, Singapore in electronics, transport, and trading, South Korea

in consumer electronics, semiconductor, and automobile, and Taiwan in electronics and semiconductor (see also Feenstra and Hamilton, 2006). This leads us to the third facet of the triangular framework (Figure 1) – the *home base* as the geographical foundation of competitive advantage of national firms. Economic-geographical studies have argued for over a decade that place origin matters in the competitiveness of firms (Dicken, 1994; 2000; 2003b; Yeung, 1998a; 1998b). Drawing upon Whitley's (1992; 1999) business system perspective, I have argued elsewhere that firms from Hong Kong and Singapore have experienced different evolutionary contexts and therefore trajectories of internationalization (Yeung, 2002). Four elements of this home base advantage are important: (1) ownership patterns, (2) business formation and coordination, (3) management processes, and (4) work and employment relations. There is no doubt that these elements of business systems vary significantly among the four Asian NIEs, thereby producing national firms that bear certain imprints of their place origin. These imprints can sometimes be an obstacle to global competition, when Asian firms are locked into their past trajectories of, say, cost-based and low-value competition.

On the other hand, the home base imprint can be a favourable factor in propelling these Asian firms into the global marketplace. First, limited domestic markets have compelled firms from both Hong Kong and Singapore to seek international markets right at the beginning of their formation. Second, strong pro-business industrial policies in Singapore, South Korea, and Taiwan have favoured certain “national” champions that, over time, become significant global players. Third, the strong development state in Singapore, South Korea, and Taiwan has been able to keep labour movements in check and therefore stabilized employment relations and cost structures. Last but not least, some Asian NIEs such as Singapore and Hong Kong are able to attract inward foreign direct investments (FDI) by global lead firms, enabling a favourable condition for their domestic firms to be plugged into

the GPNs of these global lead firms. Concluding their analysis of the globalization of Asian firms, business strategy researchers Yip and Lin (2005: 215; original italics) note that:

... it is clear that geography *does* play a role primarily by shaping a company's resources and competitive advantages because success in globalization is driven by a complex mix of factors – including customer market, products and services, business systems, assets and resources, partners, and economies of scale and scope – most of which are impacted by their native-country environments.

To sum up this triangular framework (Figure 1), it argues for an *integrated* view of Asian firms in the global economy in relation to the changing organizational dynamics of GPNs, firm-specific corporate strategies, and home base advantages. By going beyond the narrower concerns of management studies with corporate strategies and development studies with state policies, the triangular framework offers some broad conceptual insights to guide empirical analysis. This comprehensiveness in theoretical construction is necessary, as firms and states are competing in a much more complex world of global competition. The framework also brings together theoretical insights from ally disciplines such as international political economy, development studies, and management studies of business organizations. To illustrate the empirical validity of this framework, the next three sections will tackle on each of the three dimensions that enable leading Asian firms to compete successfully in the global economy.

### **Windows of opportunity: the globalization of electronics production networks**

The electronics industry represents the most convincing case study of how Asian firms can benefit from the changing organization of GPNs in the industry and strong home base advantages. Compared to another industry in which Asian firms excel – clothing and garment industry, electronics is also an industry that has significantly market development potential and possibility for technological upgrading. As one of the first truly global industries, electronics covers a wide range of sectors, from semiconductors to consumer electronics.

While the story of Asia's rise in the electronics industry has been told in several studies (e.g. Mathews, 1996; Mathews and Cho, 1998; McKendrick et al., 2000), few have conducted detail firm-level study across the four Asian NIEs to specify the complex interactions among the three conditions explained in the triangular framework (Figure 1).

As noted in the previous section, one of the most significant developments in the global electronics industry since the 1960s has been the *globalization of production* from dominant centres in North America and Western Europe to Asia (Henderson, 1989; Angel, 1994; Dicken, 2003a: Chapter 12). During this complex and overlapping process of globalizing production networks in the electronics industry, particularly in the personal computer and semiconductor sectors, different windows of opportunities have emerged for budding Asian manufacturers. At the early stage during the 1960s and the 1970s, few Asian manufacturers were plugged into these global production networks that remained fairly vertically integrated. Leading American, Europe, and later Japanese manufacturers established production facilities in the Asian NIEs in order to take advantage of their cheaper labour and infrastructure costs. The manufacturing capabilities of local Asian firms were relatively weak and thus most of these local firms served as low-end component suppliers to electronics TNCs. As OEM suppliers, these Asian manufacturers were mere *followers* of the production demand controlled by their TNC customers.

By the 1980s, some of these existing Asian firms had accumulated sufficient production know-how to take on more complex subcontracting work from established TNCs. Meanwhile, a new generation of engineers and production managers employed in major electronics TNCs such as HP, National Semiconductor, and Seagate became entrepreneurs in their own right and established manufacturing facilities to partake in the rapidly growing outsourcing markets. Some Asian engineers and senior managers in the US were also returning to their home economies to set up their own businesses (Hsu and Saxenian, 2000).

As the global electronics industry became increasingly competitive by the late 1980s, particularly in the personal computer (PC), semiconductor, and consumer electronics sectors, time-to-market and cost efficiency emerged as prime considerations of brand name global lead firms. In order to focus on developing new technologies and to shorten their product development cycles, many global lead firms began to consolidate their GPNs, leading to the outsourcing of a significant portion of their manufactured products in the forms of specialized components and integrated modules. This changing organization of GPNs from vertical integration to greater fragmentation of production created an extremely important and favourable context for the emergence of domestic electronics firms in Singapore, South Korea, and Taiwan (Hobday, 1995b; Mathews and Cho, 1998; Borrus et al., 2000). This fragmentation of value chain activities in the PC and semiconductor industry in Asia, enhanced by technological innovations and, sometimes, spatial proximity, results in the rise of a number of specialized component suppliers, manufacturing service providers, and modular manufacturers.

By the late 1990s, the world of electronics industry experienced another “revolution” with the emergence of *contracting manufacturing* as the key platform to achieve cost efficiency through economies of scale and supply chain management (Sturgeon, 2002; 2003). In this mode of industrial organization, global lead firms in GPNs engage large globalized contract manufacturers as their strategic partners to take care of their manufacturing activities, while they specialize in the higher return premium product markets and higher value-added activities such as R&D, production development, marketing, and sometimes, distribution. As shown in Table 1, for example, most of the world’s leading brand name computer companies outsource a large proportion of their notebook computers to contract manufacturers in Taiwan. These global lead firms also outsource their desktop computers to other contract manufacturers in Asia and concentrate on their server business and other high value-added



activities. This reorganization of GPNs continue to benefit Asian firms that are well plugged into the production networks of large contract manufacturers and system integrators.

Meanwhile, electronics manufacturers in Singapore, South Korea, and Taiwan are quick to capitalize on their established market positions and production know-how to emerge as major manufacturing players in the global electronics industry.

### **Competing globally: the emergence of Asian electronics firms as market leaders**

This section analyzes how selected Asian firms in my study have emerged as significant market leaders in specific segments of the electronics industry by pursuing different competitive strategies and articulating into dynamic global production networks. While the rise of these Asian electronics manufacturers would not be possible without the changing organization of GPNs coordinated by global lead firms from the US, Western Europe, and Japan, it is equally important to note that not all Asian electronics manufacturers were able to seize these opportunities. To explain these firm-level differences, we have to examine their *corporate strategies*. As these firm-level details are summarized in different tables, the empirical analysis in this section will be conducted at a general level.

More specifically, there are two types of competitive strategies engaged by electronics Asian firms – ODM/EMS and specialized value chain partners. As summarized in Table 2, some of these leading Asian firms have emerged as *strategic partners* of global brand name electronics firms through the competitive strategy of being premier ODM and EMS providers. In the ODM category, Taiwan's Quanta Computer and Compal Electronics are legendary in their rise to become the world's top two largest PC notebook producers within a span of two decades. Founded in 1988 and 1984 respective, Quanta and Compal achieved a combined operating revenue of US\$22.8 billion and market capitalization of US\$7.8 billion. To put these figures in perspective, the world's No.1 PC brand name

company Dell had a revenue of US\$49.2 billion in 2005 (<http://www.dell.com>, accessed on 23 June 2006). Both Quanta and Compal started off as original design manufacturers (ODMs) for brand name PC companies such as IBM, Compaq (before being acquired by HP in 2002), Dell, and Toshiba. As system integrators illustrated in Figure 2, both companies were able to combine their advanced design capabilities in Taiwan with production efficiency in China and global supply chain management capability to create a total system solution for their brand name PC companies. By shipping *directly* to customers and marketing channels preferred by their global lead firm customers, Quanta and Compal can capitalize on lead time reduction and thus gain a margin that would otherwise have gone into inventory costs (see also Yang and Hsia, 2006). By focusing on the ODM strategy, both companies contribute significantly to new product development and specifications of their global lead firm customers, thereby mitigating the switching risks associated with OEM business. Playing this integral role in the notebook business of their global lead firm customers, Quanta and Compal have emerged as key strategic partners of their global brand name customers in the fiercely competitive PC market. Their production organization becomes a critical link in the global value chain of this sector and they are the global market leaders in spearheading continuous innovations in organizing this value chain.

In the EMS category of competitive strategy, the role of Asian firms goes well beyond notebook computers to cover the entire range of electronics products, from computers and peripherals to consumer electronics, telecommunications equipment, medical instruments, and automotive devices. The key to these Asian EMS providers is their capability in managing the *entire* value chain of a product from its design to manufacturing and fulfillment. They are also different from system integrators such as Quanta and Compal described earlier because as EMS providers, these Asian firms also manufacture key components internally. As such, EMS providers tend to handle a much greater range of electronic products and have

their factories located in different parts of the world, from Asia to Europe and America. Take Singapore's Venture Corp as an example (see Table 2). While it is significantly smaller than world's No.1 EMS provider, Flextronics – a US-origin manufacturer headquartered in Singapore, in operating revenue, it is one of the most profitable EMS providers. In 2005, Venture's operating revenue was US\$1.95 billion, compared to Flextronics' US\$15.3 billion (<http://www.flextronics.com>, accessed on 23 June 2006). Still, Venture is able to corner a large share of computer peripherals market such as HP's printers, Iomega's storage devices, and Agilent Technology's networking devices. Venture's EMS capability is underpinned by its "seamless transition" from R&D to manufacturing and its strong design capability since inception in 1989. This "seamless transition" is a critical competitive advantage in the EMS business as global lead firm customers always require very strong product design support, manufacturing capability, and delivery efficiency (Interview with Chairman and CEO, Singapore, 19 May 2006). Taiwan's Hon Hai Precision Industry Co. Ltd. (registered as Foxconn) is another interesting example of a family-owned plastic manufacturing company that has emerged as one of the world's top EMS providers. Enjoying an operating revenue of US\$12.5 billion in 2005, Hon Hai has become Taiwan's largest manufacturing group and No.1 manufacturer of desktop PCs and PC servers for worldwide global lead firm customers (<http://www.foxconn.com>, accessed on 23 June 2006). It has worldwide manufacturing facilities in Asia, North America, and Western Europe, and R&D centres in the US and Japan.

The above examples of ODM system integrators and EMS providers are a rare breed of leading Asian manufacturing firms that have successfully capitalized on the rising tide of outsourcing in the global electronics industry since the 1990s. There is another group of Asian firms that pursue the second strategy of being value chain partners in specific *market niches*. By specializing in specific niches of the electronics value chain through technological excellence, production capability, and economies of scale, these Asian firms have emerged

as successful market leaders in their own right. In the global electronics industry today, a typical product such as a PC or a mobile phone requires a large number of high value specialized components, ranging from integrated circuit (IC) chips and LCD displays to memory and power supply devices. Each of these specialized components requires sophisticated technological capabilities and scale economies that only market leaders can harness to their competitive advantage.

As shown in Table 3, a number of Taiwanese and Singaporean manufacturers have become market leaders in providing each of these specialized components. In the semiconductor sector, Taiwan Semiconductor Manufacturing Company (TSMC) has become the world's largest independent semiconductor foundry with a turnover of US\$8.23 billion in 2005. Together with Taiwan's United Microelectronics Corporation (UMC) – world's second largest, TSMC has pioneered foundry manufacturing as an innovative way of semiconductor production through which high-tech design houses in the US, Western Europe, and Japan can specialize in IC chip design and TSMC/UMC can meet their wafer fabrication needs based on designs supplied by these high-tech houses (also known as “fabless” semiconductor firms). In 1990, this external sourcing of wafer fabrication need was still limited, as most semiconductor firms preferred in-house wafer manufacturing. Angel's (1994: 142) study found that US semiconductor firms in his survey performed some 84.4% of wafer fabrication need in-house. By 2004, TSMC alone contributed to 7% of the total value of the world's semiconductor output. With a market capitalization of US\$47 billion in 2005, TSMC accounted for 23% of global IC production (Interview with Public Relations Manager and Company Spokesperson, Taipei, 12 July 2004). TSMC (and UMC) is now a major strategic partner to the world's leading semiconductor companies.

In other segments of the semiconductor value chain, there are highly successful Asian firms offering specialized services (see Table 3). In the upstream segment of chipset design

and production, Taiwan's VIA Technologies has a long history as a strategic partner of Advanced Micro Devices (AMD) from the US. In 2000, VIA supplied some 80% of AMD's chipsets. Although Intel is the world's No.1 chipmakers with its own in-house wafer fabrication facilities, VIA enjoys more production flexibility than Intel because it relies on third-party wafer fabrication facilities. As a "fabless" chipset supplier, it has become a top customer for Taiwan's TSMC. The VIA-TSMC combination affords it better access to the latest wafer fabrication technologies developed by the world's largest foundry service provider and greater production flexibility in terms of chipset volumes and designs (Interview with Vice President, Taipei, 7 July 2004). In the downstream segment, Singapore's STATS ChipPac and Taiwan's Silicon Precision Industries Corporation (SPIL) have rode on the industry's strong growth to become the world's two largest semiconductor testing and assembly solutions providers. Founded in 1995, STATS ChipPac specializes and enjoys world leadership in 3D packaging and mixed signal test that can be applied to a wide range of high-value semiconductor devices such as logic and memory devices and flip chips. It provides these services to the world's largest wafer foundries, integrated design manufacturers (IDMs), and "fabless" design houses (Interview with President & CEO, Singapore, 30 May, 2006). On the other hand, SPIL is much more closely connected to Taiwan's semiconductor industry. More than 50% of its revenue comes from Taiwan's wafer foundries, mainly TSMC and UMC. PC-related customers also account for more than 50% of its revenue (Interview with IR Manager, Taipei, 7 July 2004).

In the specialized components segment of the electronics value chain, several Asian firms are exceptional market leaders amongst the world's leading suppliers of LCD display devices (SK Corporation, AU Optronics, and Quanta Display), memory devices (Nanya Technology, Macronix, and Winbond), flexible printed circuit boards (WBL), switching power supply (Delta Electronics), disk drive die cast plates (MMI Holdings), and IC resistors

(Yageo). These specialized component manufacturers have annual revenues in 2005 that ranges from MMI's US\$410 million to SK Corporation's US\$47.7 billion. There is thus a large variety of firm sizes and product mix. By focusing on particular electronic components, these Asian firms have accumulated significant technological competence and manufacturing efficiency and become strategic partners to system integrators and EMS providers worldwide, particularly those in their home economies. In each of these specialized components, the Asian firm concerned has developed a very significant presence in the global market, often in the top three positions by market share and dominance.

Apart from pursuing such competitive strategies as strategic partnership and niche market leaders, some Asian firms have managed to develop *globally recognized brand names* as an organizational platform to compete in the global economy. By venturing into original brand manufacturing (OBM), these Asian firms in Table 4 are competing head-on with the likes of Sony and Philips in consumer electronics and Dell and HP in the computer industry. In their early years of corporate development during the 1980s and up to the mid 1990s, four of these Asian firms pursued the strategy of being value chain partners of global lead firms in the computer and electronics industry (see also Hobday, 1998). Acer, for example, was one of the approved IBM-compatible PC manufacturers in Taiwan during the 1980s. Through this strategic partnership with global lead firms, Acer's founder Stan Shih learnt the important lesson of having one's own brand name. During the 1990s, he launched several rounds of aggressive organizational transformations, leading to backward integration into R&D activities and forward integration into marketing and distribution (Li, 1998; Mathews, 2002). By the time Acer underwent another round of major reorganization in 2001 that led to the founding of four independent companies (Acer, BenQ, AU Optronics, and Winstron), Acer had become a globally recognized brand name. Its combined brand value with BenQ

(formerly Acer Peripherals) was more than US\$1 billion in 2004 (Interview with Acer's President and BenQ's Chairman & CEO, Taipei, 14 June 2004 and 15 July 2004).

Just as Acer and its associate BenQ are pursuing aggressively OBM, two South Korean consumer electronics firms, Samsung and LG, are competing aggressively in the global economy. Samsung Electronics, in particular, refocused its business after the 1997/1998 Asian economic crisis by investing heavily in corporate branding and R&D. Similar to its Taiwanese counterparts, Samsung was seen as a manufacturer of low-end finished products prior to the crisis (see Lee, 1995; L. Kim, 1997; Y. Kim, 1998). By focusing on the Samsung branding in computers, telecommunications, semiconductors, and home appliances, Samsung has been able to achieve global market leadership in several areas indicated in Table 4: telecommunications (No.2 in mobile handsets), semiconductors (No.1 in memory chips), and home appliances (No.1 in LCD TVs in Europe and No.2 in the US). According to its Vice Chairman and CEO Jong-Yong Yun (2005: 72), Samsung's brand value doubled from US\$5.2 billion in 2001 to US\$10.8 billion in 2004. Moreover, Samsung Electronics has invested heavily in R&D activities since the mid 1990s in order to achieve and sustain its "first mover" advantages in memory chips and LCD displays (Shin and Jang, 2005). In both markets, heavy investments in R&D and production facilities are necessary before economies of scale can be achieved. These investments can pose as formidable barriers to entry to latecomers and other competitors. In the DRAM memory chip market, for example, Samsung not only emerged as the world leader as early as 1992, but also continued to sustain its technological leadership for four generations of DRAMs. It has created a greater gap from its competitors such as Micron Technologies (US) and Infineon Technologies (Germany). Its critical success factors are related to timely investments, speedy ramping up of production scale, and process innovations (Interview with Executive Director for

International Business and Vice President for Global Marketing, Seoul, 28 May 2004 and 29 June 2005).

Among the five global leaders in Table 4, Singapore's Creative Technology began its corporate success in 1989 as an OBM of its proprietary Sound Blasters that set the *de facto* standard for PC audio. While it continued to serve as strategic partners of global lead firms in the computer industry, it launched its own brand name MP3 players in 2002 that rival Apple Computer's iPod. Riding on its success in the sound card business, Creative Technology's inroad into the MP3 market is a significant move that transforms the company from a specialized component leader to a global player in multimedia consumer electronics.

While the above analysis shows that Asian firms have adopted different strategies to take advantage of changing organization of global production networks in the electronics industry, a critical question remains unanswered. Despite the convergence in corporate strategies at the firm level, why have the four Asian NIEs experienced contrasting trajectories in their articulation into these electronics GPNs? Are there any specific factors unique to each of their home base that account for these divergent competitive outcomes in the global economy?

### **Place matters: Asian firms and their home base advantages**

This observation of the importance of *home base advantages* brings us back to the triangular framework in Figure 1. These advantages can be analyzed in three dimensions. First, there is no doubt that the rise of Taiwan, Singapore, and South Korea as the world's major exporters of IT-related producers is an intended outcome of strategic industrial policy actively pursued by the respective governments (Amsden, 1989; 2001; Mathews and Cho, 1998; Amsden and Chu, 2003; Feenstra and Hamilton, 2006). Since the 1970s, the three governments have been actively promoting electronics as the key growth sector. However,



they have taken different pathways to achieve such an aggressive objective. Whereas Taiwan and South Korea rely mostly on domestic firms in collaboration with foreign high-tech companies (US and, late, Japan), Singapore is much more open to global lead firms in GPNs. Since the mid 1970s, the Taiwanese government has been aggressively investing in infrastructures (e.g. Hsinchu Science-based Industry Park; see Hsu, 2004), research institutes (e.g. Industrial Technology Research Institute and Electronics Research Service Organization), and, sometimes, high-tech capital-intensive start-ups (e.g. TSMC). It has also provided general incentives to attract returning Taiwanese engineers who have developed successful careers in Silicon Valley (Hsu and Saxenian, 2000). Several founders of leading Taiwanese electronics firms in Table 3 belong to this group of returnees: Morris Chang (TSMC), Miin Wu (Macronix), Hung-Chiu Hu (Mosel Vitelic), and VIA Technologies (Cher Wang).

Similarly, the South Korean government has invested heavily in selected business conglomerates known as *chaebols* (see Chang, 2003). Some of the leading *chaebols* include Samsung and LG. By establishing the Korea Institute of Science and Technology (KIST) in 1966 and the Korea Institute of Electronics Technology (KIET) in 1976, the South Korean government has also played a critical role in technological development (Shin, 1996; Choung et al., 2000; Cyhn, 2001). Unlike Taiwan, however, the South Korean government was directly involved in picking industrial winners and subsidizing their R&D expenditure. Lacking indigenous capability in the manufacturing industry, Singapore's Economic Development Board (EDB), on the other hand, has been attracting world class electronics companies such as HP, Philips, General Electric, and Matsushita to locate their value chain activities in Singapore (see Low et al., 1993; Chan, 2002). The rise of leading Singaporean firms is thus directly related to the kind of global lead firms brought into Singapore. The Singapore government is also actively promoting bilateral free trade agreements (FTAs) in

order to maintain its locational attractiveness in the regional production networks aiming at the US market.

The divergent outcome is fairly obvious today. Domestic Taiwanese firms in Tables 2 and 3 form the backbone of a fully integrated value chain in the global electronics industry, comprising large-scale system integrators (e.g. Quanta and Compal), EMS providers (e.g. Hon Hai), and foundry providers (e.g. TSMC and UMC) to specialized design houses (e.g. VIA), service providers (e.g. SPIL) and component suppliers (e.g. display, memory, and power devices). South Korean firms such as SK Corporation, Samsung, and LG are very large in size and scale, primarily because of the active “visible hand” of the home government in selecting “national champions” and the concentrated market organization in South Korea’s economic development history. There is thus a high degree of vertical integration of value chain activities within each *chaebol*.

On the other hand, the Singapore government explicitly seeks global lead firms to industrialize the city-state. In developing a strong electronics industry, the state provides direct and indirect assistance to grow local suppliers (Chia, 1997; Brown, 1998; Perry and Tan, 1998; Mathews, 1999; Chan, 2002). Some of these local suppliers have eventually become strategic partners of global lead firms, providing important manufacturing services (e.g. Venture), specialized components (e.g. MMI and WBL), and specialized services (e.g. STATS ChipPac). As compared to Taiwan, however, Singapore does not have an indigenously owned and fully integrated value chain in the electronics industry. In Hong Kong, the lack of such explicitly articulated strategic industrial policy results in the much more fragmented development of the electronics industry in the city-state (see Lo, 1985; Henderson, 1991; Lui and Chiu, 1994; Yeung, 2000). Very few electronics firms from Hong Kong have been able to develop market leadership in the global semiconductor and computer industry. Some of them are market leaders in niche electronics products such as electric

motors (e.g. Johnson Electric), batteries (e.g. Gold Peak Industries), and home improvement products (e.g. Techtronic Industries). In other words, home base government policy and institutional context can significantly influence the strategic participation and outcomes of Asian firms in global production networks.

Second, the home base advantage can come from the availability of such external economies as *clusters* and *strong inter-firm networks*. Among the three NIEs, domestic firms in Taiwan and Singapore perhaps benefit most from their access to these external economies, as both economies have fully developed electronics industrial clusters. In Taiwan, IT-related electronics cluster is particularly well developed to cover the entire value chain from R&D and design to specialized components and modules and system integration and EMS (see Table 3). This home base cluster advantage greatly facilitates the development of strong inter-firm networks in the computer manufacturing industry. System integrators such as Quanta and Compal and EMS providers such as Hon Hai can benefit from the enormous capability of strategic suppliers in Taiwan that can offer both price competitive specialized components and time-sensitive deliverability. The same external economies can also be enjoyed by these specialized component players because of their geographical and relational proximity to large-scale wafer suppliers such as TSMC and UMC and TFT-LCD producers such as AU Optronics and Quanta Display. Taiwanese electronic firms have thus developed world-class capabilities in both manufacturing and supply chain management.

In Singapore, local electronics firms are able to tap into the strong presence of global lead firms in electronics clusters. In the hard disk drive (HDD) industry, for example, local suppliers such as MMI have developed technological know-how and market expertise through accumulated experience in supplying to global lead firms such as Seagate, Conner Peripherals (later acquired by Seagate), Western Digital, and Maxtor. The presence of these global lead firms in Singapore's HDD cluster has contributed to the emergence of Singapore

as the world's largest producer during the 1990s (see McKendrick et al., 2000). By 2000, Singapore still maintained a 35% share of the world's hard disk drives market by volume (Chan, 2002). As illustrated in Figure 3, Singapore continues to play a very important role in Seagate's global production network. As the world's market leader in HDD, Seagate has chosen to locate its Operational Headquarters in Singapore (so is Flextronics, the world's largest EMS provider). In the case of MMI in Table 3, Seagate accounts for some 60% of its revenue today. Being close to the Seagate's Operational Headquarters where R&D activities are located is very important in its role as a strategic partner supplying die cast plates. MMI's engineers are able to participate in Seagate's HDD product development right at the beginning of the product life cycle and this is critical to MMI's successful business partnership with Seagate (Interview with Group Managing Director, Singapore, 22 June 2006).

Moreover, these cluster economies exist within the territorial boundaries of both Taiwan and Singapore as well as *across* different geographical locations in nearby countries (i.e. China and Southeast Asia). Both economies benefit from their access to low cost hinterlands that enable the emergence of regional production networks in Greater China and Southeast Asia. Almost without exceptions, Taiwanese firms in Tables 2-4 have invested heavily in production facilities in mainland China (see also Yang and Hsia, 2006). Even Singaporean firms such as Venture, MMI, and WBL have very significant production presence in China in order to serve their global lead firm customers such as HP and Motorola. In Southeast Asia, Singaporean firms and some Taiwanese firms (e.g. Delta Electronics) can tap into specific electronics clusters such as the HDD industry in Thailand and the PC industry in Penang, Malaysia. Most Southeast Asian countries are also low cost production locations that sustain the price competitiveness of these electronics manufacturers.

Third, the role of *business groups* in home economies can make a significant difference to the rise of Asian firms in the global economy. In all three NIE economies of Taiwan, Singapore, and South Korea, there exist powerful business groups that are mostly family-owned and managed. While some management scholars have argued against the role of family business in promoting high-tech industries (e.g. Carney, 1998; 2005; Ahlstrom et al., 2004), two peculiar advantages can be derived if a high tech firm belongs to a family business conglomerate: long term investment horizons and broader financial base. In order to compete effectively in such capital-intensive market niches such as memory chips (e.g. Samsung and Nanya Technology), TFT-LCD (e.g. Samsung and LG), and flexible printed circuits (e.g. WBL), these Asian market leaders need to invest heavily in capital equipment and R&D expenses that may not be recouped within a short period of time. The lack of “patient capital” in most capital markets means that internal resources within family business groups can be mobilized to enable such investments. For example, Nanya Technology had experienced five years of loss before its DRAM business finally took off and became publicly listed in 2000. As a strategic part of Taiwan’s largest family business group – the Formosa Group controlled by the Wang family, Nanya Technology benefited from intra-group long term investments and other specialist assistance from other Formosa companies such as Nanya Plastics (Interviews with Executive Assistant to President, Taipei, 15 June 2004). Furthermore, this presence of “patient capital” within family business groups is related to the broader finance base of these groups. For example, WBL’s investment in the Nasdaq-listed M-Flex, the world’s second largest flexible printed circuits producer, is underpinned by the Group’s successful century-long business in motor trading in Southeast Asia. Serving as a “cash cow”, WBL’s motor trading provided the necessary capital to finance such a high-risk investment as M-Flex during the 1980s (Interview with Group CEO, Singapore, 1 June 2006). Similarly, Samsung’s semiconductor division received critical support from other divisions

within the same group during the important catching-up period in the late 1980s (see Shin and Jang, 2005).

Not all business groups in Taiwan and Singapore are family-owned though. In Taiwan, there are significant intra-group synergies within the Acer Group and the Quanta Group. Today, the Acer Group comprises of several heavy-weight players in the global computer and electronics industry: (1) Acer Inc – world's No.5 brand for PCs and notebooks (US\$9.72 billion sales in 2005), (2) BenQ – world's leading manufacturer of computer peripherals (US\$5.52 billion sales in 2005), (3) AU Optronics – world's third largest manufacturer of large-size TFT-LCD devices (US\$6.63 billion sales in 2005), and (4) Wistron Corp. – Acer's former PC manufacturing division (US\$5.05 billion sales in 2005). In 2005, the Acer Group had more than 60,000 employees worldwide and generated combined sales of US\$26.92 billion. There is thus much synergy between AU Optronics' TFT-LCD manufacturing and BenQ's dominance in the global LCD monitor market. The same intra-group synergy is also evident in the link between Quanta Computer as a PC notebook system integrator and Quanta Display as the world's fifth largest TFT-LCD producer. In Singapore, the rise of STATS ChipPac has much to do with the fact that STATS was formerly part of the Singapore Technologies Group that has its own semiconductor manufacturing facilities (Chartered Semiconductor Industries). The development of STATS ChipPac to become the world's top three semiconductor assembly and testing service provider benefits significantly from this intra-group synergy, particularly during its formative years between 1995 and 2000 (Interview with President & CEO, Singapore, 30 May 2006).

## **Conclusion**

This paper has developed a triangular framework to account for the rise of Asian electronics firms in the global economy. In becoming market leaders in their respective

segments and niches in the global electronics industry, these Asian firms from Singapore, South Korea, and Taiwan have pursued specific corporate strategies that differentiate them from competitors in Asia and elsewhere. Drawing upon in-depth interview information and publicly available data, I have shown how the changing organization of global production networks in the electronics industry provides a favourable competitive context for the emergence of these Asian firms. I have also demonstrated the importance of home base advantages in supporting the articulation of these Asian firms into powerful GPNs. Taken together, my conceptual framework and empirical evidence shows that firm-specific factors alone are insufficient in explaining the meteoric rise of these Asian firms in the global economy. Doing so requires us to take a triangular approach that considers simultaneously the complex interrelationships between global production networks, corporate strategies, and home base advantages.

The experience of these Asian firms in the global electronics industry has important implications for theory and policy in relation to corporate development in Asian economies. At the theoretical level, this paper has demonstrated the relevance of situating firm-level analysis within broader economic-geographical processes that operate at both global and regional/local scales (see Dicken, 2000; 2003b; Yeung, 2005a). While the firm is an economic institution organizing production in contemporary capitalism, it is important for us to theorize and understand how its organizational processes intersect with other processes at a variety of geographical scales. In this paper, I have shown how the successful development of an Asian firm cannot be understood independently of its wider industrial organization on the global scale and its place-specific business systems.

In terms of policy implications, two issues clearly stand out. First, while leading firms from the Asian NIEs have made a significant presence in such global industries as electronics and clothing and garments, the competitive performance of firms from these Asian NIEs in

other global industries such as automobiles and chemicals remains to be seen. As evident in this paper, there are historically- and geographically-specific windows of opportunities associated with the changing organization of electronics GPNs that allow Asian firms to emerge and succeed as market leaders. Identifying and acting on such windows of opportunities in other global industries presents a challenging policy choice to economic agencies in respective Asian economies.

Second, in sectors and industries that are much more regulated (e.g. utilities, infrastructures, banking, telecommunications), Asian firms face formidable challenges to establish themselves as global market leaders. While some of the interviewed firms in my study have achieved significant presence in the regional marketplace (e.g. Singapore Telecom, CapitaLand, and Sembcorp Industries), they are facing much greater challenges when they globalize into North America and Western Europe. The enormous regulatory and nationalistic hurdles confronting Indian-owned Mittal Steel's US\$33 billion takeover of the world's second largest steel mill, Luxembourg-based Arcelor, in the first half of 2006 testifies this uneasy and challenging pathway of globalizing Asian firms. To become global market leaders in these regulated industries requires Asian firms to focus on their core capabilities and to leverage their unique competitive advantages that can be transferred across national boundaries.

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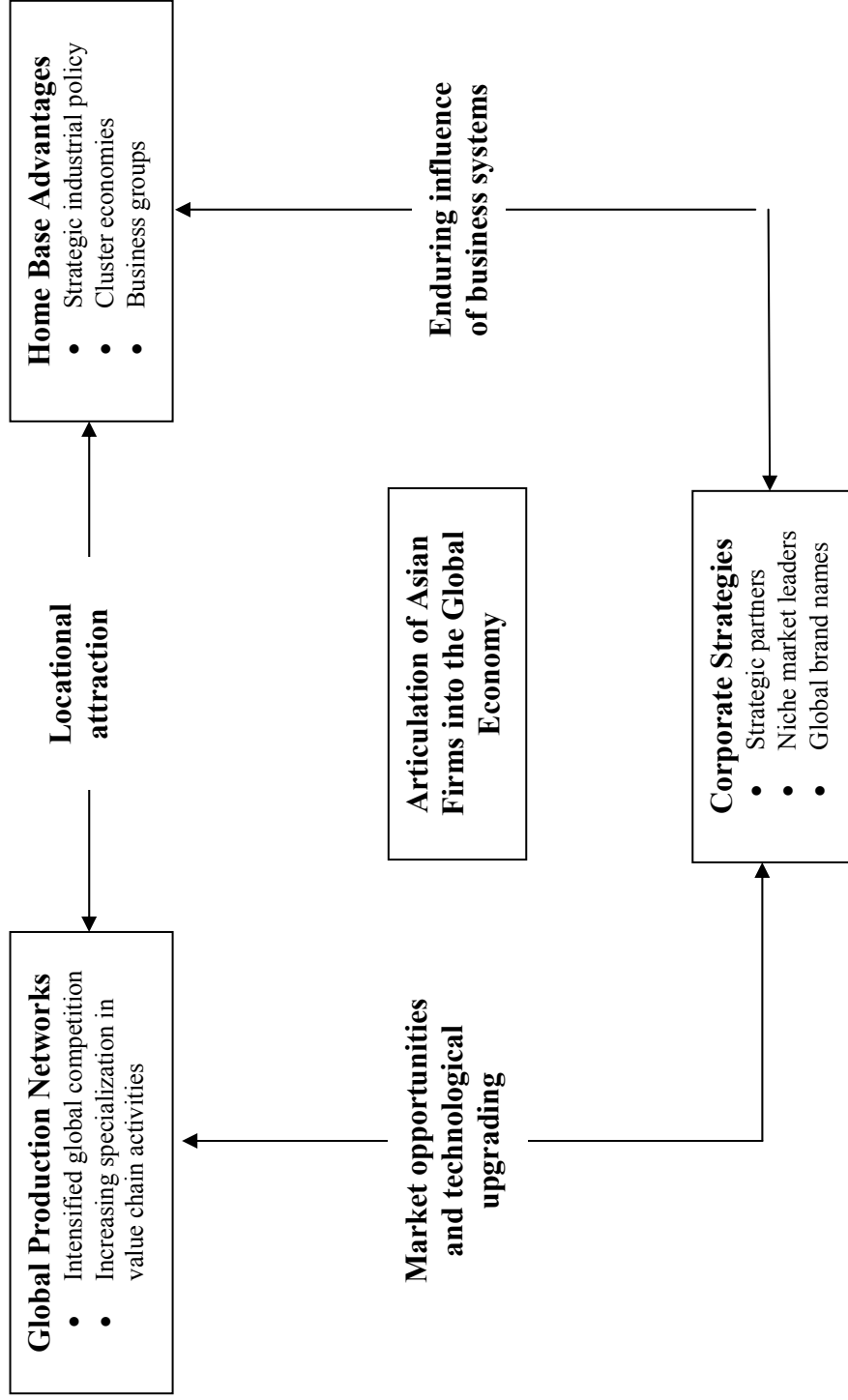
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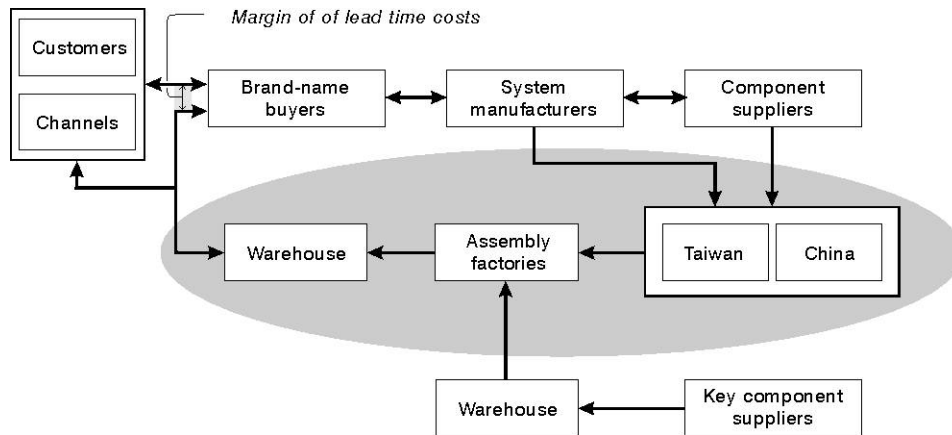
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**Figure 1. A triangular framework for analyzing the rise of Asian firms in the global economy**



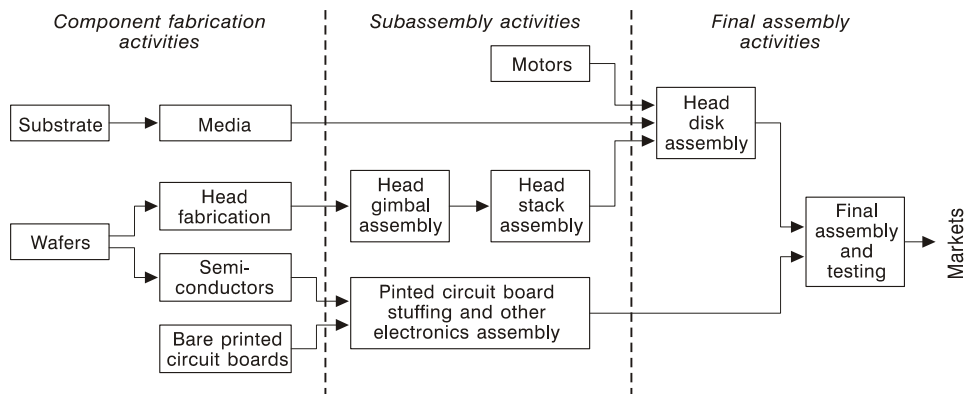


**Figure 2. The organization of notebook computer manufacturing by Taiwanese system integrators**



Source: Redrawn based on Yang and Tsia (2006: Figure 2).

**Figure 3. The role of Singapore in Seagate's hard disk drive production network**



**Worldwide locations: an example of Seagate Technology and its suppliers**

Component fabrication activities	Subassembly activities	Final assembly activities
1. Media Manufacture: Japan (e.g. Komag) Malaysia (e.g. Komag) Thailand Singapore	China Indonesia Malaysia Philippines Singapore Thailand (e.g. Read-Rite)	China Malaysia Singapore Thailand
2. Wafers, Heads and Semiconductors Japan (e.g. Read-Rite) Northern Ireland (e.g. Read-Rite) USA (e.g. Read-Rite)		

Source: Adapted from Gourevitch *et al.*, 2000 (Figures 1 and 3).

**Table 1. Outsourcing of the world's top ten notebook brand name companies, 2003**

Company	Proportion of outsourcing	Taiwanese OEM/ODM manufacturers
APPLE	100%	Quanta, Elitegroup
DELL	90%	Quanta, Compal, Wistron
HP	90%	Inventec, Arima, Quanta
IBM	90%	Wistron, Quanta
NEC	80%	Arima, FIC, Wistron, Mitac
SHARP	50%	Quanta, Mitac, Twinhead
SONY	20%	Quanta, ASUS
Fujitsu-Siemens	15%	Quanta, Compal, Wistron
Toshiba	15%	Compal, Inventec

Source: Yang and Tsia (2006: Table 1).

**Table 2. Asian firms as strategic partners of lead firms in global production networks**

Company name	Global Ranking (2004/5) <sup>1</sup>	2005 revenue (US\$bn) <sup>2</sup>	market cap (US\$bn) <sup>2</sup>	Competitive strategy	Dynamics of global production networks	Home base advantage
<b>Singapore</b>						
Venture Corp	World's Top 10 EMS	1.95	2.24	Strategic partner of HP, Iomega, and Agilent Technology	Increasing outsourcing of manufacturing to strategic partners	Entrepreneurial spin-off from HP Singapore
<b>Taiwan</b>						
Compal Electronics Inc	No.15 in World's IT100 (Business Week) in 2004 World's second largest PC notebook producer (17% of market share)	8.11	3.22	Strategic partner of major PC notebook brand names such as Dell, HP, and Toshiba	Increasing outsourcing of manufacturing to strategic partners	Strong design and engineering capabilities; well developed supplier networks; access to low cost production in China
Hon Hai Precision Industry Co Ltd.	World's Top 3 EMS 25 <sup>th</sup> in WIR 2005 ranking	12.5	6.00	Strategic partner of major PC lead firms and other electronics brand name companies	Increasing outsourcing of manufacturing to strategic partners	Well developed PC industry; proximity to suppliers; access to low cost production in China
Quanta Computer Inc.	World's largest PC notebook producer (30% of market share) 33 <sup>rd</sup> in WIR 2005 ranking	14.67	4.55	Strategic partner of major PC notebook brand names such as Dell, IBM, and Apple	Increasing outsourcing of manufacturing to strategic partners	Strong design and engineering capabilities; well developed supplier networks; access to low cost production in China

<sup>1</sup> Information from corporate websites and personal interviews. WIR ranking refers to the Top 50 transnational corporations from developing economies by foreign assets in 2003 available in UNCTAD's (2005) *World Investment Report 2005*, Annex Table A.I.10.

<sup>2</sup> Data are collated from the OSIRIS online database and corporate interviews.  
Source: Author's interviews.

**Table 3. Asian firms as niche market leaders in global production networks**

Company name	Global Ranking (2004/5) <sup>1</sup>	2005 revenue (US\$bn) <sup>2</sup>	2005 market cap (US\$bn) <sup>2</sup>	Competitive strategy	Dynamics of global production networks	Home base advantage
<b>Singapore</b>						
MMI Holdings	World's leading precision component supplier in the hard disk drive industry	0.41	0.14	Strategic partner of Seagate and other HDD manufacturers	Increasing outsourcing of specialized components and modules	Well developed HDD industry since the 1990s and proximity to operational HQs of key customers in Singapore
STATS ChipPac	Top 3 semiconductor assembly and testing company in the world	1.16	1.32	Strategic partner of major semiconductor companies	Increasing outsourcing of specialized services	Formerly part of a government-linked electronics group with its own semiconductor manufacturing arm.
WBL	No.2 globally in flexible printed circuits manufacturing: M-Flex No.17 hottest company in the US by Business Week, 2006	1.18	0.43	Strategic partner of Motorola	Greater demand for specialized components in mobile devices	Good access to low cost production locations in Asia
<b>South Korea</b>						
SK Corporation	2005: 2nd company in the world to mass produce colour millbase for TFT-LCD after Japan.	47.73	6.63	Strategic partner of major consumer electronics companies	Higher demand for mass produced monitors and TV sets	Access to technology and materials
<b>Taiwan</b>						
AU Optonics Corporation	World's 3rd largest manufacturer of large-size TFT-LCD	6.63	8.70	Strategic partner of BenQ and major computer system integrators	Higher demand for mass produced monitors and TV sets	Better access to computer system integrators; part of the Acer Group
Delta Electronics (Taiwan) Inc	World's No.1 in switching power supply systems, 2005 44 <sup>th</sup> in WIR 2005 ranking	2.50	3.74	Strategic partner of major computer system integrators	Increasing outsourcing of manufacturing by brand name computer firms to system integrators in Taiwan	Well developed PC industry; proximity to customers; access to low cost production in China

**Table 3 (cont'd). Asian firms as niche market leaders in global production networks**

Company name	Global Ranking (2004/5) <sup>1</sup>	2005 revenue (US\$bn) <sup>2</sup>	2005 market cap (US\$bn) <sup>2</sup>	Competitive strategy	Dynamics of global production networks	Home base advantage
Macronix International Company Limited	World's top 10 flash memory supplier	0.57	0.80	Strategic partner of major computer system integrators	Increasing outsourcing of manufacturing by brand name computer firms to system integrators in Taiwan	Well developed PC industry and proximity to customers
Nanya Technology Corporation	Global leader of memory manufacturing and memory foundry service. World's No.5 DRAM supplier in 2004	1.62	2.32	Strategic partner of major computer system integrators and global brand names (e.g. Dell and HP)	Increasing outsourcing of manufacturing by brand name computer firms to system integrators in Taiwan	Well developed PC industry; proximity to customers; part of the Formosa Group
Quanta Display	World 5th largest large area TFT-LCD producer, market share 5.5%	1.91	1.67	Strategic partner of Quanta Computer	Increasing outsourcing of manufacturing by brand name computer firms to system integrators in Taiwan	Well developed PC industry; proximity to customers; part of the Quanta Group
Siliconware Precision Industries Corporation	Top 3 global IC package & test service provider	1.36	3.25	Strategic partner of TSMC and other major semiconductor companies	Increasing outsourcing of specialized services	Strong links with domestic semiconductor firms
Taiwan Semiconductor Manufacturing Company Limited	Production accounted for over 7% of the total value of the world's semiconductor output in 2004, world leader in foundry sector 36 <sup>th</sup> in WIR 2005 ranking	8.23	47.06	Strategic partner of major tabless semiconductor companies	Increasing outsourcing of semiconductor manufacturing to strategic partners	Strong government support through capital investment and R&D institutes
VIA Technologies, Inc.	Taiwan's largest semiconductor design company and 2nd to Intel worldwide as a supplier of chip sets	0.73	0.84	Strategic partner of AMD	Increasing outsourcing of chip design to strategic partners	Well developed PC industry; proximity to supplier (TSMC); part of the Formosa Group

**Table 3 (cont'd). Asian firms as niche market leaders in global production networks**

Company name	Global Ranking (2004/5) <sup>1</sup>	2005 revenue (US\$bn) <sup>2</sup>	2005 market cap (US\$bn) <sup>2</sup>	Competitive strategy	Dynamics of global production networks	Home base advantage
Winbond Electronics Corporation	The largest brand name circuit supplier in Greater China region	0.92	1.34	Strategic partner of major computer system integrators	Increasing outsourcing of manufacturing by brand name computer firms to system integrators in Taiwan	Well developed PC industry and proximity to customers
Yageo Corporation	World's largest producer in chip resistors, with 1/3 of the global market	0.53	1.03	Strategic partner of major computer system integrators	Increasing outsourcing of manufacturing by brand name computer firms to system integrators in Taiwan	Well developed PC industry and proximity to customers

<sup>1</sup> Information from corporate websites and personal interviews. WIR ranking refers to the Top 50 transnational corporations from developing economies by foreign assets in 2003 available in UNCTAD's (2005) *World Investment Report 2005*, Annex Table A.I.10.<sup>2</sup> Data are collated from the OSIRIS online database and corporate interviews. Source: Author's interviews.

**Table 4. Asian firms as globally recognized brand names**

Company name	Global Ranking (2004/5) <sup>1</sup>	2005 revenue (US\$bn) <sup>2</sup>	2005 market cap (US\$bn) <sup>2</sup>	Key sector	Dynamics of global production networks	Home base advantage
<u>Singapore</u> Creative Technology	No.1 in PC sound cards No.2 in branded MP3 players	1.2	0.44	IT electronics	Earlier experience as OBM partners to global lead firms in the computer industry (e.g. Acer, Dell, Microsoft and Intel)	Strong government support for R&D activities and brand name development
<u>South Korea</u> Samsung Electronics	No. 4 in electronics category in Fortune "Global Most Admired Companies"; 2003: No.1 in memory chips and LCD driver IC; No.2 in mobile handsets (revenue and market share); No.1 in sales of LCD TVs in Europe and No.2 in the US 4 <sup>th</sup> in WIR 2005 ranking	79.71	95.96	Consumer electronics	Decreasing competitiveness of incumbent lead firms in global consumer electronics; earlier experience as OEM/ODM partners to global lead firms in the semiconductor industry	Strong government support for R&D activities and brand name development
LG Electronics	2004: Top 3 global PDP module maker, 22% market share; No.2 in the world's LCD monitor market 9 <sup>th</sup> in WIR 2005 ranking	43.94	12.54	Consumer electronics	Decreasing competitiveness of incumbent lead firms in global consumer electronics; earlier experience as OEM/ODM partners to global lead firms in PC peripherals	Strong government support for R&D activities and brand name development

**Table 4 (Cont'd). Asian firms as globally recognized brand names**

Company name	Global Ranking (2004/5) <sup>1</sup>	2005 revenue (US\$bn) <sup>2</sup>	2005 market cap (US\$bn) <sup>2</sup>	Key sector	Dynamics of global production networks	Home base advantage
<b>Taiwan</b>						
Acer Incorporated	2004: World's No.5 brand for total PCs and notebooks, and highest year-on-year growth among the top 5 vendors 43 <sup>rd</sup> in WIR 2005 ranking	9.72	5.67	Personal computers	Earlier experience as OEM/ODM partners to global lead firms in the PC industry (e.g. IBM and HP); increasing specialization by global lead firms in upstream and downstream activities	Well developed PC industry; proximity to suppliers in Taiwan and China; strong government support for R&D activities and brand name development
BenQ Corporation	World's Top 3 LCD monitor manufacturer; BenQ-brand ranked No.5 worldwide 37 <sup>th</sup> in WIR 2005 ranking	5.52	2.39	Computer peripherals and consumer electronics	Earlier experience as OEM/ODM partners to global lead firms in PC peripherals; increasing specialization by global lead firms in upstream and downstream activities	Proximity to suppliers in Taiwan and China; part of the Acer Group (formerly Acer Peripherals)

<sup>1</sup> Information from corporate websites and personal interviews. WIR ranking refers to the Top 50 transnational corporations from developing economies by foreign assets in 2003 available in UNCTAD's (2005) *World Investment Report 2005*, Annex Table A.I.10.

<sup>2</sup> Data are collated from the OSIRIS online database and corporate interviews.  
Source: Author's interviews.