Handbook of East Asian Entrepreneurship

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Entrepreneurial strategies in Asian latecomer firms

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Introduction

What are the distinctive features in entrepreneurial strategies that East Asian firms have adopted to pursue their growth and prosperity? And what theoretical framework can be employed to account for those features? In this chapter, we explore these two questions and provide some preliminary answers. Our examples come from the Chinese wind power and solar photovoltaic (PV) industries, which have emerged and internationalized extremely rapidly, rising to world dominance in less than a decade (Mathews and Tan, 2012). While these firms and their accelerated internationalization are of interest from many perspectives (not least their contribution to the greening of international business), we emphasize in this chapter the challenge they pose for conventional theories of internationalization.

The emergence and growth of entrepreneurial firms from East Asia has been the subject of intensive research for the past several decades. Previous studies have focused on entrepreneurial firms from the region, ranging from family businesses from Hong Kong, high tech firms in Taiwan, Korean business conglomerates (chaebols), Japanese business networks, to emerging multinational manufacturers from China. There has also been great heterogeneity across the environments of firms within the region. The region encompasses the second largest advanced economy (Japan), newly industrialized economies (NIEs), including Taiwan, South Korea and Hong Kong, and the largest emerging economy (China). Not only are economies in the region at various levels of economic development, there also exist large differences in their political systems, cultures, and industrial structures.

Despite wide-ranging differences among firms and their environments in the region, some remarkable features have emerged in strategies of many entrepreneurial companies. Those features are certainly most profound in firms from latecomer economies such as South Korea and Taiwan, and now China; but they could also be observed in some Japanese firms especially when Japan itself was a latecomer. Common features shared by many latecomer firms include rapid growth and accelerated internationalization, innovation, reliance on personal and organizational networks, leverage on foreign technologies, as well as the strong role of the state in those firms’ success.

We apply a theoretical framework that one of us has developed to account for the entrepreneurial strategies of East Asian latecomer firms, namely the linkage, leverage and learning (LLL)
Entrepreneurial strategies in latecomer firms

framework (Mathews, 2002, 2006a, 2006b). The LLL framework was originally introduced to explain the internationalization strategies and international success of what were dubbed ‘Dragon Multinationals’ from the Asia Pacific region, as an alternative and complementary framework to the dominant OLI (ownership, locational, internalization) account in International Business.

The OLI framework outlines three types of advantages as the driving forces of foreign direct investments by multinationals (Dunning, 2000). The OLI framework suggests that the multinational companies enjoy certain a priori microeconomic advantages in host markets over domestic rivals. These are: (1) they can invest overseas and compete with local companies despite the liabilities of foreignness that lie in their ownership-specific advantages (O) over local firms such as brand, superior technologies or returns to scale; (2) they enjoy locational attractions (L) of the host countries such as cheaper factors of production; and (3) they benefit from internalization advantages (I) of the company that can enjoy by engaging in producing abroad rather than through trade in the open market (ibid.). Note that these are all concepts deriving from microeconomics (with its unrealistic assumptions based on equilibrium), whereas the alternative framework of LLL is based on strategizing, where firms are held to take decisions in conditions of uncertainty, disequilibrium and market dynamics. A comparison and contrast between the LLL and the OLI frameworks in accounting for advantages of multinationals over local firms is reproduced in Table 2.1.

In this chapter, we extend the LLL framework along three interrelated fronts. First, we examine the growth and success of firms from East Asia, whether in their domestic or international domains. We apply the LLL framework to capture both international expansion as well as domestic growth strategies of firms. Second, we focus on entrepreneurial firms, especially those that were founded relatively recently when the region has been increasingly integrated into the global economy and the region itself has undergone phenomenal economic and institutional transitions.

### Table 2.1 OLI and LLL frameworks compared

<table>
<thead>
<tr>
<th>Criterion</th>
<th>OLI</th>
<th>LLL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources utilized</td>
<td>Proprietary resources</td>
<td>Resources accessed through linkage with external firms</td>
</tr>
<tr>
<td>Geographic scope</td>
<td>Locations established as part of vertically integrated whole</td>
<td>Locations tapped as part of international network</td>
</tr>
<tr>
<td>Make or buy?</td>
<td>Bias towards operations internalized across national borders</td>
<td>Bias towards operations created through external linkage</td>
</tr>
<tr>
<td>Learning</td>
<td>Not part of the OLI framework</td>
<td>Learning achieved through repetition of linkage and leverage</td>
</tr>
<tr>
<td>Process of internationalization</td>
<td>Not part of the OLI framework: MNEs’ international reach assumed</td>
<td>Proceeds incrementally through linkage</td>
</tr>
<tr>
<td>Organization</td>
<td>Not part of OLI framework; organization could be multinational or transnational</td>
<td>Global integration sought as latecomer advantage</td>
</tr>
<tr>
<td>Driving paradigm</td>
<td>Microeconomics: transaction cost economics</td>
<td>Strategy: capture of latecomer advantages via resource leverage</td>
</tr>
<tr>
<td>Time frame</td>
<td>Comparative static observations, comparing one point in time with another</td>
<td>Cumulative development process</td>
</tr>
</tbody>
</table>

Source: Adapted from Mathews (2006a, p. 21).
We argue that this is the group of firms for which the LLL framework is best suited. Third, we articulate the dynamic nature of the framework, highlighting the mutual reinforcements among linkage, leverage and learning processes, and how firms without substantial initial resources can build advantages through the LLL processes in a disequilibrium setting. We then apply the framework to the important recent case of global expansion of Chinese renewable energy firms, in the wind power and solar photovoltaic (PV) sectors.

In particular, we take the perspective of entrepreneurship in our analysis. Stevenson and Jarillo (1990: 23) define entrepreneurship as ‘a process by which individuals—either on their own or inside organizations—pursue opportunities without regard to the resources they currently control’. Stevenson and colleagues further contrast and compare the entrepreneurial approach and the administrative approach in management behaviour along eight dimensions, as summarized by Brown et al. (2001) (Table 2.2). An entrepreneurial approach is not exclusive to small and medium-sized enterprises (SMEs) but is also applicable to large firms (Stevenson and Jarillo, 1990). From a Schumpeterian entrepreneurial perspective, we argue that East Asian entrepreneurial firms use the LLL strategies not so much to reduce ‘transaction costs’ as neoclassical economists would argue, but rather for the purpose of discovering and creating opportunities, and then taking advantage of them through sustained programmes of investment.

In the following sections we will first examine linkage, leverage and learning as three entrepreneurial strategies of East Asian latecomer firms, and briefly outline the dynamic, interacting processes that drive growth and success of the firms. We will then provide some recent evidence regarding firms in the Chinese renewable energies sector to illustrate and test those points.

<table>
<thead>
<tr>
<th>Table 2.2: Entrepreneurial vs. administrative focus in management</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Entrepreneurial focus</strong></td>
</tr>
<tr>
<td>Driven by perception of opportunity</td>
</tr>
<tr>
<td>Revolutionary with short duration</td>
</tr>
<tr>
<td>Many stages with minimal exposure at each stage</td>
</tr>
<tr>
<td>Episodic use or rent of required resources</td>
</tr>
<tr>
<td>Flat, with multiple informal networks</td>
</tr>
<tr>
<td>Based on value creation</td>
</tr>
<tr>
<td>Rapid growth is top priority; risk accepted to achieve growth</td>
</tr>
<tr>
<td>Promoting broad search for opportunities</td>
</tr>
</tbody>
</table>

Source: Adapted from Brown et al. (2001, p. 955).
Entrepreneurial strategies in latecomer firms

Linkage, leverage and learning as entrepreneurial strategies of East Asian latecomer firms

We adopt a strategic approach to birth, growth and internationalization of East Asian entrepreneurial firms, and in so doing utilize the fundamental concept of ‘resource leverage’ introduced to the management literature by Hamel and Prahalad (1993). In place of the traditional emphasis on strategy as ‘fit’ between a firm’s activities and the business environment, Hamel and Prahalad emphasized that successful firms initiate strategic actions that change the environment, and where they take actions is based not on what they already have but on what they aim to achieve. The leverage of resources (such as technologies, patents, knowhow) through such strategic actions as creation of joint ventures, making acquisitions or licensing technologies are central to such a view of strategy. These concepts were applied by Hamel and Prahalad to cases of business success in leading economies, mainly Japan and the USA—but the concept also fits the needs of latecomer firms that start with little but are able to catch up quickly to incumbents through judicious use of resource leverage strategies. From the perspective of entrepreneurial strategies, the process of resource leverage (RL) proceeds through three stages—linkage, leverage and learning.

Linkage

Linkage as an entrepreneurial strategy involves the efforts of entrepreneurial and latecomer firms to establish formal and informal connections with others in order to access external resources. Resource leverage always has to begin with some form of linkage. Linkage can be effected through strategic alliances, partnerships, and joint ventures; and through informal connections that take such forms as guanxi. Linkage can also be reflected at different levels, including personal and organizational networks (Hoang and Antoncic, 2003).

The importance of linkage via strategic networks to firm performance has been widely recognized in the strategy literature in general (Gulati et al., 2000) and for Chinese entrepreneurial MNEs in particular (Peng, 2012). Compared with the networking of more established firms, entrepreneurial networking is considered to be more urgent for the survival of start-ups; to be more intensive as entrepreneurs tend to make more efforts to establish, develop and maintain strong ties with stakeholders; and to have a larger impact on firm performance.

The entrepreneurial strategy of linkage seems particularly relevant and significant in the context of East Asian latecomer firms. Inter-linkage of firms has long been regarded as ‘the most important organizational feature’ of Asian businesses, and to some extent, Asian capitalist systems (Hamilton, 1996: 2). Networks of firms from different countries in East Asia are formed through various mechanisms and show different characteristics (Hitt et al., 2001, 2011). For Chinese entrepreneurs, the focus has been on informal social networks, or guanxi, derived from ‘personal relationships bounded in geographical, social or institutional space’ (Zhou et al., 2007: 674). Social network ties are regarded as a key determinant for Chinese entrepreneurs to discover, evaluate and exploit opportunities (Tang, 2010); and to gain performance benefits from growth and international expansions (Zhou et al., 2007). Given the strong role that the state plays in the economy, entrepreneurs not only need to develop and maintain interpersonal ties with managers in other firms but sometimes more importantly with government officials (Peng and Luo, 2000).

Linkage plays a vital role in the emergence and growth of new high-tech ventures in East Asian countries such as Taiwan (Lin et al., 2006). As described in Mathews (2006c), the Taiwanese electronics industry was made possible largely because of the opportunities created by the vertical disintegration of the global PC industry in the 1980s, and the position of Taiwanese firms as OEM carriers. On the other hand, Taiwanese firms also benefited from the linkages among
themselves that were strengthened by the birth of high-tech parks and the resulting cluster effects. Further, analyses of more recently emerging industries in Taiwan such as solar PVs based on patent citation data reveal that Taiwanese firms have largely benefited from international technology diffusion (Wu and Mathews, 2012).

Leverage

Entrepreneurship is ‘the process of discovering new ways of combining resources’ (Sobel, 2007). In view of this, what is important to entrepreneurs and entrepreneurial firms is not what they ‘possess’, but what opportunities they can ‘discover’ and how they may take advantage of them. This notion departs from the traditional resource-based view of the firm, which emphasizes ‘existing’ resources and capabilities of the firm as the source of its sustained competitive advantages, and which evaluates strategic effectiveness of the resources based on whether they are valuable, rare, costly to imitate and well organized (Barney, 2002). As has been observed in many successful entrepreneurial firms from the region, they may not appear to be distinguished from others, at least initially, in terms of the resources.

In his commentary on the original paper by one of us where the LLL framework appeared (Mathews, 2002, 2006a), Narula (2006) states:

[i]f the dragon MNEs did not have some kind of superior ownership advantage, it is inconceivable that they would be able to leverage networks and international partnerships with ‘incumbents’ to acquire complementary resources if they had nothing to offer in return!

We argue that the statement misses an important point in relation to entrepreneurship in general and to the leverage strategy deployed by latecomer entrepreneurial firms in particular. The process of entrepreneurship is not necessarily based on exchange of resources with equivalent economic values, but rather on the leverage of opportunities that have arisen and the entrepreneur’s willingness to take the risks involved (Stevenson and Jarillo, 1990). In the case of white goods industries, this process has been analysed for cases of emerging market MNEs such as Mabe from Mexico, Arcelik from Turkey and Haier from China, where each company demonstrates accelerated internationalization and innovative strategies when compared with earlier incumbents (Bonaglia et al., 2007).

Latecomer firms may leverage opportunities they have discovered to ‘leapfrog’ in technology and access the market. Discussions of such leapfrogging strategies, as outlined in Lewis (2007), are found in several streams of research, including technology transfer, national innovation systems and/or learning networks. First, the leapfrogging is likely to be enabled by technology transfer, especially from advanced to developing economies. Technology transfer can take place through a range of channels, including licensing, R&D collaboration, FDI, joint ventures, trade of capital goods, and recruitment of skilled employees. Second, the national innovation system of the receiving country (see e.g. Lundvall, 1992) forms an essential condition in determining the absorptive capability of the latecomer firm, or the receiver in a technology transfer. Finally, technology transfer is likely to be initiated in the learning networks of the latecomer firm, which is termed as linkage strategies above.

Learning

Many Asian firms have undergone a transformation from emulators to innovators (Chittoor et al., 2009; Luo et al., 2011). A learning strategy seems to be the key driver in this process. However, compared with that of established firms from Western advanced economies, the learning process of many East Asian latecomer firms has several features. First, the State has been a key force
in driving the learning process of many East Asian latecomer firms. As discussed in Mathews (2006c), government agencies in East Asian countries, and their interaction and mutual support, have played an important role in fostering technology breakthroughs in key areas as identified to be critical to industrial development of the countries. Especially important among the government agencies are various public research institutions, such as the Industrial Technology Research Institute (ITRI) in Taiwan, the Korea Institute for Industrial Economics and Trade (KIET) and the Electronics and Telecommunications Research Institute (ETRI) in Korea, and the Institute of Microelectronics (IME) in Singapore. The role of such institutions in fostering and guiding the processes of learning in East Asia is shown in Figure 2.1.

The learning behaviour of many East Asian latecomers has distinctive characteristics. Many of them are quick learners (‘fast followers’), and underpinning the learning pattern of those entrepreneurial firms is the strong market pressure they face to catch up and compete with their Western counterparts in the same market, whether it is the domestic market in the home country or the international market. On the other hand, as latecomers, entrepreneurial firms from the region have the learning advantages of ‘newness’ because they face less technological and market uncertainties in choosing what to learn and also ‘because they possess fewer deeply embedded routines’ (Luo et al., 2011: 39).

Why are the LLL strategies so pronounced among East Asian entrepreneurial firms? While it is not our intention here to provide a thorough discussion, we would like to explore two possible roots of those strategies. First, the region has been deeply influenced by the Confucian philosophy which emphasizes that ‘individuals are not isolated entities but a part of a larger system of

![National system of economic learning in East Asian countries](source: Adapted from Mathews (2002))
interdependent relationships’ (Hitt et al., 2001: 358). Embodied in this culture, Asian firms seem more skilful and willing to link with others in their business dealings based on trust. Second, the environment that entrepreneurial firms face in the region is more volatile than that in Western countries. Those firms face greater competitive pressure, more regulatory uncertainties and more rapid industrial changes; and thus conventional strategies based on linear analysis seem less likely to work for those firms. The latecomer firms have no alternatives but to engage in LLL.

The dynamic nature of the LLL framework

The linkage, leverage and learning strategies are not independent, rather they interact and mutually reinforce each other. The dynamic LLL framework (Figure 2.2) suggests that the capabilities of the firm are built up through the mutual reinforcement process of the three strategies which drive the growth of the firm. Social capital built through linkage can help the company both leverage its needed resources and access knowledge (learning) (Hitt et al., 2001). The process can be repeated in a never-ending sequence, with fresh linkages creating further opportunities for leverage of resources and the L&L steps being accomplished with greater efficiency and effectiveness in a process of learning, or what might be called collective entrepreneurship (Mathews, 2009).

LLL is a process that brings latecomer firms into greater and greater levels of integration into the global economy, which is the most useful way of thinking about the process of internationalization in a global era.

Applying the LLL framework to the Chinese renewable energy sector

In this chapter, we take the Chinese renewable energy sector as a test case for the discussion above. We specifically focus on entrepreneurial initiatives in two industrial segments of the sector, namely the wind and solar PV industries, which provide evidence for the applicability of the LLL framework to entrepreneurial strategies. The creation, expansion and internationalization of those renewable energy industries in China have been phenomenal.¹
Entrepreneurial strategies in latecomer firms

The competitiveness of Chinese indigenous firms from those industries in both the domestic and international markets has been evident. In the wind power industry, Chinese wind turbine manufacturers took four places in the list of Top Ten wind turbine manufacturers in the world (Table 2.3). Chinese turbines have now been sold in more than 19 countries, and exports of Chinese wind turbines have increased from a mere 2.3 MW in 2007 to 430 MW in 2012 (GWEC, 2012). Similarly, Chinese PV manufacturers supply about half of the world solar PV modules; and nine of the top 15 solar PV module manufacturers in the world are currently from China (and 10 out of 15 if Canadian Solar is counted as a Chinese company, which it is in all but name) (Table 2.4).

**Table 2.3 Market shares of top 10 wind turbine manufacturers, 2011**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Wind turbine manufacturer</th>
<th>Country of origin</th>
<th>Global market share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vestas</td>
<td>Denmark</td>
<td>12.9</td>
</tr>
<tr>
<td>2</td>
<td>Goldwind</td>
<td>China</td>
<td>9.4</td>
</tr>
<tr>
<td>3</td>
<td>GE Wind</td>
<td>USA</td>
<td>8.8</td>
</tr>
<tr>
<td>4</td>
<td>Gamesa</td>
<td>Spain</td>
<td>8.2</td>
</tr>
<tr>
<td>5</td>
<td>Enercon</td>
<td>Germany</td>
<td>7.9</td>
</tr>
<tr>
<td>6</td>
<td>Suzlon Group</td>
<td>India</td>
<td>7.7</td>
</tr>
<tr>
<td>7</td>
<td>Sinovel</td>
<td>China</td>
<td>7.3</td>
</tr>
<tr>
<td>8</td>
<td>United Power</td>
<td>China</td>
<td>7.1</td>
</tr>
<tr>
<td>9</td>
<td>Siemens Wind Power</td>
<td>Denmark</td>
<td>6.3</td>
</tr>
<tr>
<td>10</td>
<td>Ming Yang</td>
<td>China</td>
<td>2.9</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td></td>
<td>21.5</td>
</tr>
</tbody>
</table>

Total Sales > 40 GW

*Source: REN21 (2012).*

**Table 2.4 Market shares of top 15 solar PV module manufacturers, 2011**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Firms</th>
<th>Market share</th>
<th>Country of origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Suntech Power</td>
<td>5.8</td>
<td>China</td>
</tr>
<tr>
<td>2</td>
<td>First Solar</td>
<td>5.7</td>
<td>USA</td>
</tr>
<tr>
<td>3</td>
<td>Yingli Green Energy</td>
<td>4.8</td>
<td>China</td>
</tr>
<tr>
<td>4</td>
<td>Trina Solar</td>
<td>4.3</td>
<td>China</td>
</tr>
<tr>
<td>5</td>
<td>Canadian Solar</td>
<td>4</td>
<td>Canada</td>
</tr>
<tr>
<td>6</td>
<td>SunPower</td>
<td>2.8</td>
<td>USA</td>
</tr>
<tr>
<td>7</td>
<td>Sharp</td>
<td>2.8</td>
<td>Japan</td>
</tr>
<tr>
<td>8</td>
<td>Tianwei New Energy</td>
<td>2.7</td>
<td>China</td>
</tr>
<tr>
<td>9</td>
<td>LDK Solar</td>
<td>2.5</td>
<td>China</td>
</tr>
<tr>
<td>9</td>
<td>Hanwha-SolarOne</td>
<td>2.5</td>
<td>China</td>
</tr>
<tr>
<td>9</td>
<td>Hareon Solar</td>
<td>2.5</td>
<td>China</td>
</tr>
<tr>
<td>12</td>
<td>JA Solar</td>
<td>2.4</td>
<td>China</td>
</tr>
<tr>
<td>13</td>
<td>Jinko Solar</td>
<td>2.3</td>
<td>China</td>
</tr>
<tr>
<td>14</td>
<td>Kyocera</td>
<td>1.9</td>
<td>Japan</td>
</tr>
<tr>
<td>15</td>
<td>REC</td>
<td>1.9</td>
<td>Norway</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>51</td>
<td></td>
</tr>
</tbody>
</table>

Total Sales => 40GW

*Source: REN21 (2012).*
Most significant players in both the Chinese wind and solar PV industries were only founded in the early or mid-2000s. Compared with incumbents in the USA, Europe and Japan, many Chinese firms had little technological inventories and knowledge specific to those industries. The question then arises: How did China manage to build those industries so quickly? And how did Chinese entrepreneurial firms in those industries develop their competitive advantages in both the domestic and international markets? Let us examine their emergence in light of the LLL framework.

**Linkage**

The linkage strategy of Chinese firms in those industries is reflected in their efforts to partner with others and quickly build the capacity to tap into sources of technological knowledge using licensing, joint ventures and foreign company acquisition, as well as purchase of equipment—leading ultimately to Chinese indigenous innovation. In the wind power industry, Chinese wind turbine manufacturers formed linkages with foreign partners to enable technology transfer from companies in a handful of countries as early wind turbine innovators including Denmark, The Netherlands, Germany and the USA (Lewis, 2007, 2011). The channels of forming linkages include joint R&D, mergers and acquisitions (M&As) licensing (Figure 2.3). Figure 2.3 reveals that some of the Chinese wind power firms have embedded themselves in the global learning networks of wind turbine technologies. For example, Goldwind, the largest Chinese wind power company, started its wind turbine manufacturing based on a licence to the 600 kW turbine from Jacobs, a small German firm, and the 750 kW turbine from German firm REPower. The company was engaged in R&D collaboration on the 1.2 MW turbine technology with the German firm Vensys, resulting in joint development of the innovative Permanent Magnet Direct Drive (PMDD) technology (see below). Vensys was subsequently acquired by Goldwind and became a subsidiary focusing on R&D. By doing so, the company has been able to access technologies of other foreign companies such as Enerwind, CKD NOVE Energo, Eozen, IMPSA, and REGen Powertech; and has eventually transformed itself from being an importer of foreign technologies to being an indigenous innovator.³

Another Chinese wind turbine manufacturer, Sinovel worked closely with Windtec (a subsidiary of AMSC) to develop leading-edge 3 MW and 5 MW turbines (bypassing the kilowatt stage), and by 2010 it had supplied all 34 offshore turbines to the Donghai Bridge project with its own MW-power machines. Since then, Sinovel has internationalized rapidly, opening sales and production points in several countries including the USA, Brazil, Sweden, Turkey, India and South Africa. In the USA, Sinovel won a contract to supply a 1.5 MW turbine for a pumping station in Charleston, Boston. However, in 2012, Sinovel and Windtec fell out; Sinovel has subsequently been embroiled in an IPR infringement suit with Windtec.

Ming Yang is a private-sector firm that launched into the wind turbine manufacturing industry relatively late in 2006, based in Zhongshan in the southern Guangdong province (Pearl River Delta). Previously a relatively small manufacturer of electrical transmission and distribution equipment, the company became the first Chinese wind turbine exporter to the US market in just two years. Since 2010, it has been listed on the NY Stock Exchange—the first Chinese wind power company to do so. It has collaborated with the German firm Aerodyn Energiesysteme to jointly develop turbines which have won German technical quality certification. Ming Yang has leapfrogged to the lead technology-wise, through its alliance with Aerodyn, and now offers 1.5 MW three-blade turbines and 2.5 MW as well as 3.0 MW Super Compact Drive (SCD) advanced two-blade turbines, while it has announced that larger 5 and 6 MW turbines are due for release in 2013, and an even larger 12 MW model is said to be under development.
Ming Yang has established a strong manufacturing base and associated supply chain cluster at Zhongshan.

Similarly, PV manufacturers in China have also largely built on foreign technologies initially. De la Tour et al. (2011) studied the international technology transfers to the Chinese solar PV and found that, in contrast to the wind power industry, the Chinese solar PV firms rarely utilized licensing in accessing technology. Instead, imports of manufacturing equipment and labour mobility are identified as two main channels through which Chinese solar PV firms have

Figure 2.3 Wind power technology transfer networks
Source: Based on Lewis (2011, p. 297).
acquired the necessary technologies and skills at the initial stage of the development (ibid.). For the latter, for example, Chinese diaspora and foreigners make up a large number of the boards and management of most large Chinese PV companies.

Chinese solar PV firms seem to have taken a more aggressive approach to acquire technologies from overseas by actively engaging into technology-seeking type of FDI activities. For example, Suntech, the largest solar PV manufacturer in the world until its partial implosion in 2012, launched a number of downstream and upstream acquisitions, in order to acquire foreign strategic assets to complement the manufacturing and design, as summarized in Table 2.5. It is through such linkages that Suntech, Canadian Solar and other Chinese PV firms were able to leverage knowhow, technologies and market access.

**Table 2.5 FDI activities of Suntech up to 2012**

- In March 2008, the company acquired an 11.7% equity interest in Hoku Scientific (a Nasdaq-listed company based in Idaho, US) for a total consideration of approximately $20 million
- In March 2008, the company acquired a total of 14.0% equity interest in Nitol Solar for a total consideration of approximately $100 million. Nitol Solar is a privately held company incorporated in the Jersey Islands and is in the process of operating a polysilicon manufacturing facility near Irkutsk, Russia
- Acquisition of Suntech Japan (formerly MSK) which is a leading manufacturer of BIPV systems based in Japan
- Invested in Global Solar Fund, S.C.A, Sicar, or GSF, an investment fund created to make investments in private companies that own or develop projects in the solar energy sector
- Acquisition of E1 Solutions, Inc., a commercial PV systems integration company based in the United States, now part of Suntech
- Acquisition of KSL-Kuttler Automation Systems GmbH, or KSL-Kuttler, a leading Germany-based manufacturer of automation systems for the printed circuit board industry
- Acquisition of a majority interest in CSG Solar AG, or CSG Solar, a German company engaged in developing, producing and marketing PV cells on the basis of crystalline silicon on glass technology

Leverage

Formation of linkages with foreign companies may provide latecomer firms with the opportunities to participate into global supply chains; but that will not guarantee the conversion of the opportunities into the companies’ capabilities. A number of leverage strategies have been adopted by Chinese wind and solar PV companies to consolidate technological, financial and institutional opportunities.

In the wind power industry, Lewis (2007) observes that, facing great technological barriers by leading wind turbine companies, Chinese companies such as Goldwind managed to establish licensing agreements with second-tier foreign companies in the industry. Those smaller companies are more likely to share their technologies because ‘they have less to lose in terms of international competition, and more to gain in license fees’ (Lewis 2007: 226).

In the Chinese PV solar industries, companies such as LDK Solar, Hanergy and Giga Solar have all utilized typical latecomer strategies to focus on a dominant technology (in this case, on crystalline silicon for LDK and Giga Solar and on CIGS thin-film technology for Hanergy), and were able to develop advantages based on standardization, mass production and cost reduction, utilizing the largest possible market for their product, namely, the global market. In this, Chinese
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solar PV firms like Suntech and LDK Solar have been very successful—if over-stretched financially, which is currently a major source of concern for them.

In order to leverage financial resources, a large proportion of Chinese companies in those two industries have launched IPOs (initial public offerings) on stock markets soon after they were founded to raise expansion capital; this is a phenomenon not commonly seen in traditional industries. By the end of 2011, no fewer than 11 Chinese PV companies had been listed on the stock exchanges in the USA, 8 companies were listed on Hong Kong stock exchanges and 14 companies were listed on stock exchanges in China (Greenpeace, 2012)—no doubt the concerns over global warming played a role in facilitating this process.

The Chinese government has provided strong support in the industrial development of the two industries. One policy that the Chinese wind companies have particularly benefited from is concerned with the support and requirement of the government for local content. China required 70% of the turbine content in concession wind power projects to be made locally (Lewis, 2007). In order to meet this requirement, foreign companies wishing to access the market had to choose to set up manufacturing subsidiaries in China rather than export products. During this process, technology diffusion took place and local competitors were able to absorb and localize the technologies. The strategy was discontinued after vigorous foreign protest was mounted—but after it had achieved its intended outcome.

Learning

These processes of L&L have been repeated over and over again, with the companies gaining efficiency and effectiveness with each iteration—best described as a process of learning. For example, in the case of the Chinese wind power firm Ming Yang, after its initial resource leveraging forays into international markets, the company was confident enough to invest in knowledge acquisitions. The company began to tap into global knowledge networks through establishing R&D centres in both Denmark (near Vestas) and in the USA. In 2012 Ming Yang announced a strategic partnership with India’s Reliance group to develop wind turbines for the Indian market and beyond into SE Asia. This South-South pattern of joint development is surely one of the characteristics of the ‘emerging’ MNEs from emerging markets. Ming Yang now has R&D centres in both Denmark and the USA, demonstrating its capacity to leverage knowledge resources from the developed world.

The aim of the repeated application of L&L strategies is to raise the technological capabilities within firms, so that they approach the technological frontier, in a process described memorably by Kim (1997) as moving ‘from imitation to innovation’. This is clearly seen in the case of PMDD (Permanent Magnet Direct Drive) technology, as introduced by Goldwind, based on its joint venture with Vensys. PMDD is an advanced form of turbine traction that dispenses with gearing, and thereby provides more a reliable operation as well as greater efficiency (Sun and Yang, 2013). Goldwind turbines are now exclusively PMDD machines, both 1.5 MW and 2.5 MW. The innovative technology was developed jointly with the firm Vensys, which started as a partner and eventually became a subsidiary of Goldwind. So this is a clear case of LLL—a link is made by Goldwind with Vensys, which is then consolidated into a permanent arrangement; knowhow and technology are leveraged from the link, and assimilated within Goldwind; and finally the technology is transformed into world-cutting edge in a process of learning.

Conclusion

The fundamental reason why LLL matches the strategies of latecomers (as illustrated here in the case of the international expansion of Chinese wind power and solar PV firms) is that it is a
strategic framework, based on the notion of resource leverage. It is formulated in terms of the actual practices of firms as they deal with uncertainty, disequilibrium and market dynamics. By contrast, the traditional OLI framework is based on micro-economic reasoning, where the (hidden) assumptions are that firms encounter each other in conditions of equilibrium and where they comply with economic assumptions such as marginal pricing, full information and universal, free access to technology. It is worth emphasizing the point that these conditions are rarely (if ever) found in real-world circumstances in international business. We stress these differences, because in our view an approach to internationalization strategy should be based on strategic reasoning. Obviously micro-economic principles are important, but they are not the whole story.

Notes

1 A recent case from the Harvard Business School (Vietor, 2012) examines China’s successes in wind power, solar PV and lithium-ion batteries, in each of which sectors it leads the world, and concludes:

The government of China, its renewable industries, its engineers and its workers have labored incredibly hard during the past decade to replace carbon-fuels and to build industries that are globally competitive. In wind, solar and electric vehicles, the country’s manufacturers now lead the United States and Europe in the global market place . . . China is now a major exporter of solar cells and modules, of towers and lattice masts for wind projects, and of lithium-ion batteries. Its firms have begun exporting wind turbines and electric vehicles—the first signs of successful industrial policy. As Wen Jiabao has pushed China to move up the value-chain in exports, it is clear that renewable energy technologies will be at the leading edge.

(ibid.: 10)

2 Specifically in the wind power sector, the international political economy scholar Joanne Lewis comments:

It took firms in China, India and South Korea less than 10 years to go from having no wind turbine manufacturing experience to having the ability to manufacture complete wind turbine systems that are state-of-the-art and either already available or soon to be available on the global market.

(2011: 301)

3 Since then, Goldwind has been nominated twice by MIT’s Technology Review magazine as one of ‘The 50 Most Innovative Companies in the World’ in 2011 and 2012.

Bibliography

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