6 Risk and the Dynamics of Globalization

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Reprinted from: *The Future of the Multinational Company*; Birkinshaw, Ghoshal, Markides, Stopford, Yip (eds); John Wiley and Sons, Ltd. (2003); **6**, 76-85

Introduction

This chapter outlines how risk and the various mechanisms firms employ to address risk convey competitive advantages to globally integrated or locally embedded firms and, thus, shape the global landscape of an industry. This is illustrated through a multi-level perspective on a single industry – electrical power including generation, transmission, and distribution.

Following this introduction, the second section briefly reviews the principles of risk and competitive advantage, the third presents a stylized view of the global dynamics of the electrical power industry both in terms of which firms are represented in various countries and which practices are adopted in various countries, and the fourth section focuses on risk as a factor favouring global integration and local embeddedness as a complement to the more traditional scale and learning drivers of globalization and localization.

Risk and Competitive Advantage

While there are many dimensions along which one can classify risk, only one, to list them from 'inside' to 'outside', corresponds to the fundamental responses to these risks. Figure 6.1 presents such a classification for a generic set of activities in the electrical power sector, ranging from 'inside' project risks such as construction or operations risk, or enterprise-level integration risks; mezzo-level competitive and institutional risks; and 'outside' risks including country and world-level macro and market risks.[2]

1 I am grateful to my colleagues at the Brattle Group for providing me with a nuanced view of the evolution of the electrical power industry in several continents in recent years. I also have benefited greatly in developing the implications of the comparative advantage perspective on risk from working first with Nalin Kulatilaka and later with Roger Miller.

2 In examining the risks encountered in 60 large engineering projects, Miller and Lessard (2000) found that roughly one-third fell into each of these categories.

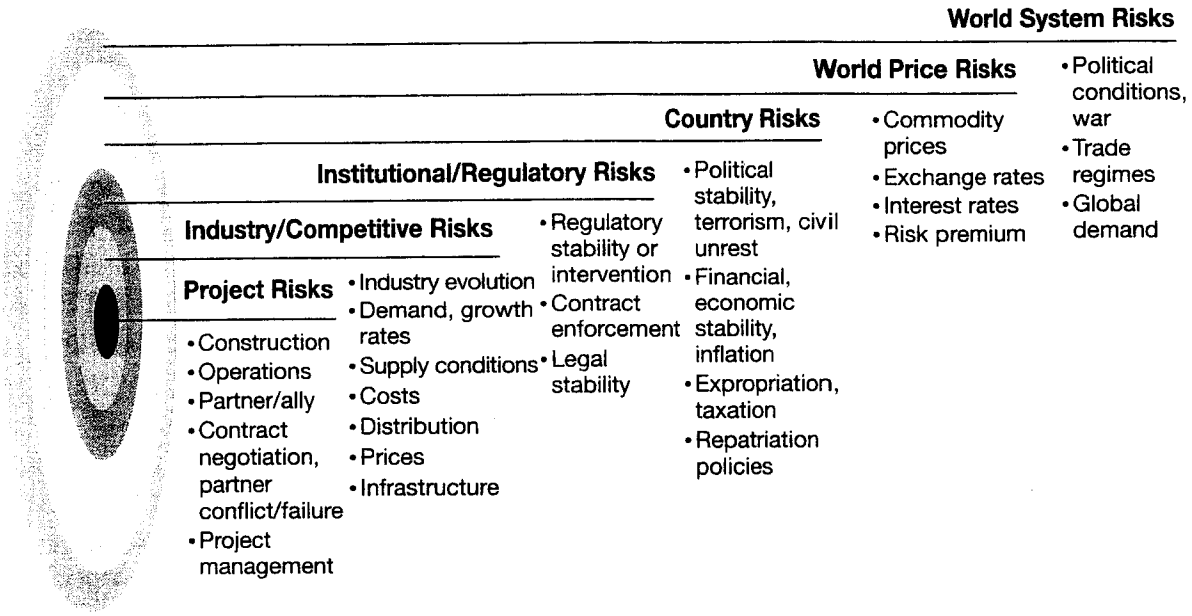

Figure 6.1—Arraying risks from 'inside' to 'outside'.

Regardless of the type of risk, there are only a small number of fundamental possible responses. These include responses that: have the potential actually to change risk drivers and thus alter the stand-alone distribution of cash flows[3] of the affected operation or asset – shaping or mitigating risks; those that have the potential to improve the stand-alone distribution of cash flows of the affected operations conditional on the realization of the risk drivers – real options and real pooling; and those that redistribute risk without affecting the stand-alone distributions of cash flows – financial diversification, hedging and insurance – and thus alter the portfolios of cash flows held by firms or investors.

In an idealized perfect capital market, only the first two categories can add value since individual investors can replicate the latter through financial transactions. Of course, even for publicly traded firms in developed countries these idealized conditions do not hold exactly and it is generally conceded that hedging can add value in the presence of tax asymmetries and agency problems.

For privately held firms as well as firms based in countries with incomplete capital markets, the third category is often important as investors cannot readily reshape their own holdings through financial transactions. It goes without saying that if not selected and managed effectively, all three categories of responses can destroy value.

There is a 'pecking order' of risk management responses to different types of risks. Inside risks of execution or fraud, for example, are best addressed by building an effective organization with properly aligned incentives and other means. Diversification or pooling does not alter the expected loss associated with these

3 I focus on the distributions of cash flows to avoid invoking assumptions regarding the completeness of financial markets required in order to make statements regarding the impacts of these actions on the economic value of assets or operations.

errors and insurance will be expensive (relative to the expected losses) because of the moral hazard involved.

Operational risks associated with irreversibly committing resources in the face of uncertainties associated with costs or demand can often be addressed by creating options to allow a greater range of responses in line with future outcomes. These real options, though, are costly, so only some of them will add value. A variant of the real option is real pooling, whereby a firm is able to apply a fixed asset or a fixed capacity to a variety of different demands, reducing the total capacity required to serve them and thus enhancing the distribution of the cash flows for this set of activities. This is different from, and more effective than, financial diversification that simply reduces portfolio variance by mixing different distributions without altering them.

Mezzo-level risks are often ill defined and dependent on affected parties, governments, or regulators. Transforming them through influence, though, is sometimes possible and, if so, will dominate diversification. In contrast, when risks are specific but outside the control of any of the potential parties, shifting or allocating them using contracts or financial markets is the appropriate solution. When risks are broad, systematic, but not controllable, the only approach is to diversify exposure. In portfolios of projects, residual systematic, uncontrollable risks beyond strategic control have to be embraced.

This correspondence of risk and responses is not only conceptual or theoretical, it also holds in practice. In our study of 60 large engineering projects (Miller and Lessard, 2000), we found a strong and statistically significant relationship between types of risk identified and the mechanisms applied.[4]

The relative ability of different firms to effectively employ these mechanisms amounts to a comparative and competitive advantage in risk management. Thus, taking on a particular risk may actually be a source of value. This comparative advantage, in turn, follows from differences in ability to diversify and/or gain access to financial markets, differential information, and differential influence over outcomes.

This concept of comparative advantage in risk management is illustrated in Figure 6.2, based on the case of an independent power-generating plant being built in Argentina by the Chilean firm ENDESA.[5] ENDESA's strategic advantage in Argentina lies largely in its successful prior experience with privatization: it 'knows more about the future of the Argentine power sector than do Argentines'.

Based on its experience as an operator ENDESA has a clear information and influence advantage over operating risk. In fact, this was the strategic rationale for the investment. However, ENDESA may be at a double disadvantage with respect to demand risk. First, Argentine projects may become too large a part of its overall portfolio; second, as a visible 'foreign' firm, it may be singled out for 'contract renegotiation' should terms prove onerous to Argentine consumers. Therefore, ENDESA will shift these risks both to more diversified international players and to Argentine players with greater legitimate voice within Argentina, such as local strategic investors

4 The specific categories of risk and the strategies for coping with them are provided in Table 6.1, together with the relevant statistics.

5 This example is based on public information regarding ENDESA's investment in Argentina. See Lessard (1996)

Table 6.1—Type of risk and strategies used in response

Risk (Strategy)	*Project (Technical, completion, operational)*	*Market (Demand and supply)*	*Social (Stockholders directly affected)*	*Sovereign (Political, economic changes external to project)*
Information/ understanding	178 (Count)	225	35	20
	38.9 (Row %)	49.1	7.6	4.4
	22.6 (Col. %)	26.2	13.2	13.5
	8.6 (Total %)	10.9	1.7	1.0
Design	108	116	13	17
	42.5	45.7	5.1	6.7
	13.7	13.5	4.9	11.5
	5.2	5.6	0.5	0.8
Performance Incentives (inside)	211	233	8	14
	45.3	50.0	1.7	3.0
	26.8	27.1	3.0	9.5
	10.2	11.3	0.4	0.7
Allocation	176	163	16	12
	48.0	44.4	4.4	3.3
	22.3	19.0	6.0	6.1
	8.5	7.9	0.8	0.6
Transformation/ Mitigation (outside)	115	123	194	85
	22.2	23.8	37.5	16.4
	14.6	14.3	72.9	57.4
	5.6	6.0	9.4	4.1

Notes: Counts are of coded mentions of particular strategies in response to particular risk. Multiple responses noted for many risks. Chi-squire statistic 522.83 with 12^0 of freedom, indicating significance at the 0.00000 level.

Entity / Risk Type	Operator/ Strategic Investor	Local Strategic Investor	Local Portfolio Investor	Local Public Authority	Int'l Portfolio Investor	Int'l Policy Lender
Construction						
Delay	+	+?				
Cost	+	+?				
Operations						
Availability	++					
Staffing cost	+	+				
Demand						
Overall				+	+	
Dispatch		+		+		+
Institutional						
Regulation	+	+	+			
Contract Enforce	+	+	+			
Currency						
Inflation					+	
Exchange Rate					+	
Country						
Macropolitical					+	+
Macrofinancial					+	+
World Market						
Oil Prices					+	
Interest Rates					+	

Figure 6.2—Comparative advantage matrix Power Gen project.

and 'common folk' or, better yet, 'widows and orphans' via pension funds. Ultimately, an independent power-plant project in Argentina is a bet on the viability of the Argentine economic programme.

Examining the electrical power industry is interesting for a variety of reasons. First, it is ubiquitous and firms engaged in the various vertical stages are readily identifiable. Second, it has a discrete beginning, a little more than 120 years ago.[6] Third, the end product/service that it provides is relatively homogenous across countries, which allows price and quality comparisons. Nevertheless, the end product is not traded over long distances and therefore internationalization must take the form of either direct foreign investment or, perhaps, trade in capital goods and services at an upstream level. Finally, it has displayed a fascinating set of ebbs and flows in the degree of globalization, going initially from a locally based industry in lead countries to a quite global industry led by firms from those lead countries to a broadly distributed locally (often state-owned) industry in many countries and back to a mixed picture of private ownership of local continental and global nature. Further, it has very discrete vertical stages, each with its own economics.

Figure 6.3 illustrates the full supply chain for electrical power, ranging at the upstream level from commodity inputs such as hydrocarbons, equipment, and components to the manufacture of large specialized equipment, the provision of engineering services, the provision of software services, the generation of electrical power, the long-distance transmission of electrical power, and finally the distribution of electrical power to the end users.

Illustrative names in the various categories quite clearly make the point regarding globalization. One could argue there are no names associated with hydrocarbons and few names associated with the key components. Nevertheless, the providers of

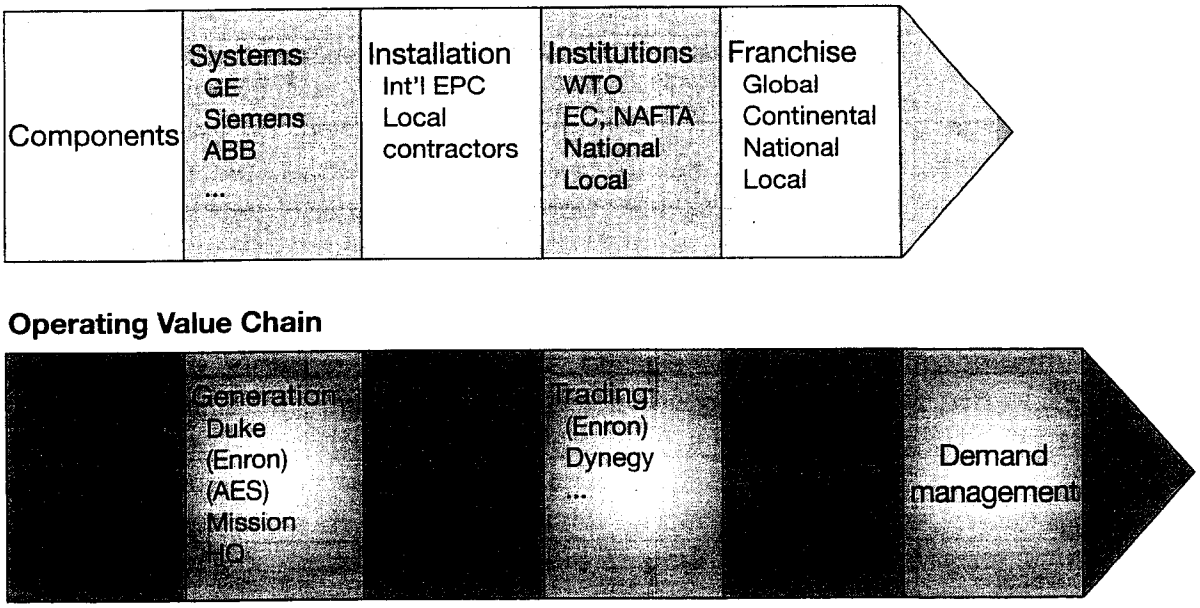

Figure 6.3—The electrical power value chain.

6 Hughes (1983) provides a comprehensive view of the early years of electrification.

large-scale equipment and construction services are highly concentrated in a small set of global firms.[7] Electrical generation, on the other hand, is broadly distributed among private firms, most of a local nature though with some multinationals. Long-distance transmission tends to be in the hands of national players, either state-owned or privately owned. Distribution is a mixed bag of local operations held by continental or global firms, locally owned private operations, and municipal or state-owned firms, locally owned private operations, and municipal or state-owned operations. This chapter focuses on the three downstream stages: generation; transmission; and distribution.

Looking at the standard factors applied to explain the emergence of multinational firms, the combination of benefits of global integration and local embeddedness, it is clear why the picture is both ambiguous and varied across vertical stages. Economies of scale for generation, transmission, and distribution are exhausted regionally given the large losses associated with the long-distance transmission of power. Therefore, these factors are at best neutral with respect to globalization. On the other hand, the strong system economies within a region, especially for transmission and distribution, call very strongly for local embeddedness. Markets, on the other hand, are quite similar though the channels/commercial practices followed at the downstream distribution stage do vary somewhat. Therefore, these factors are weakly positive for globalization but very strong with respect to local embeddedness.

Regulation is a key variable and clearly militates against global ownership of 'quasi-monopolies' such as distribution but could range from negative to strongly positive for generation and transmission. In fact, the impact of regulation requires a much more dynamic interpretation as there is a learning curve/diffusion aspect that favours globalization and an influence/capture motivation that requires local embeddedness. The existence of a technological gradient – an innovation or set of innovations that has not yet fully diffused – appears to be a powerful argument for globalization whereas the ability to tap local markets and resources calls for embeddedness in only a small number of lead markets.

The Ebb and Flow of Globalization

I am currently working on a set of snapshots taken at major intervals that will show there have been substantial changes, even at a highly qualitative level, in these positions. While it is easy to see that the drivers of global integration and local embeddedness of the three different stages are quite different, it is not so obvious why the degree of globalization at each stage has changed so much over time. The simple answer is regulation though that answer turns government behaviour into a *deus ex machina* and begs the question of why regulation systematically shifts one way or another over time.

7 In 2001, only three firms – GE, Alsthom, and Siemens – accounted for more than 80 % of all (large scale) power systems sales (Marsh, 2002).

If one looks more deeply, the ebb and flow of globalization appear to be explained by three factors. The first is the technology gradient, illustrated in Figure 6.4.

When the technology is dynamic and not totally diffused to all markets, it clearly conveys an advantage to lead firms based in lead markets, which tends to push the globalization of the industry. As this technological differential erodes, the push for global integration also erodes.

A second factor is the net-free cash flow position of the asset or system in question. During a period of buildout, electrical power generation, transmission, and distribution are enormously costly and involve large negative cash flows, requiring ready and credible access to capital markets. On the other hand, once a system is built and running, its operating costs are quite low relative to its total recovery and much of the 'fair price' charged is a return on previous capital invested. Therefore one would hypothesize that, depending on the level of free cash flow, the tendency would be to finance one way or the other. One would further expect to see that countries with strong capital markets would emerge as home countries for investment in periods of major buildout and this advantage would erode as net cash flows from operations became more positive.

Therefore, in countries with relatively weak capital markets, one would expect a growth in foreign ownership in periods of buildout, followed by a decline during the 'harvest' period. This brings to mind the fundamental conundrum addressed by Vernon as the 'obsolescing bargain' and elaborated by Moran, Wells, and others over the years.

A third factor is the ideology of regulation. Clearly, there are ebbs and flows in public perceptions of the right way to manage various core activities. While most industries are influenced by the institutional context in which they operate, the role of institutions is especially marked in the case of electrical power.

There are several reasons for this. First, it represents the core infrastructure for any society. Second, it often involves natural monopolies that, in turn, require some form of regulation or other public governance over private activities. Finally, it

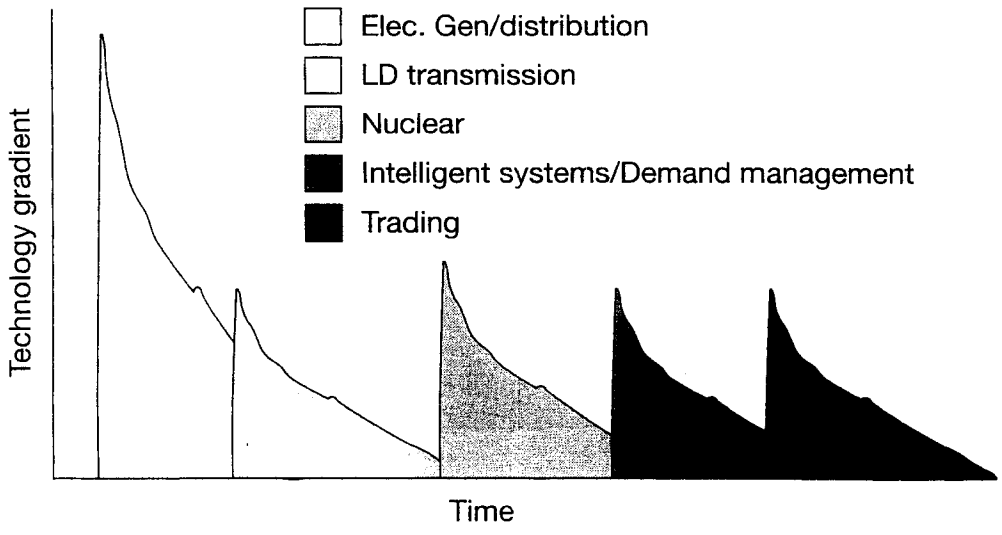

Figure 6.4—Technology gradient over time.

requires very large investments, especially during the rapid buildout phase, that often outstrip the capacity of local private markets for finance.[8]

These institutions, in turn, are dynamic, both reflecting the pendulum between efficiency and abuse as well as the diffusion/demonstration effect of major institutional successes and failures across national borders. Figure 6.5 illustrates the 'regulatory cycle' for electrical power, a cycle that is repeated in similar forms across many other infrastructure industries. The insertions in grey refer to the dominant risks at each stage, which in turn can be linked to the comparative advantage framework.

As a result, we are likely to see three different diffusion patterns over time, sometimes coinciding, sometimes not, that drive the ebb and flow of globalization, technology differentials, capital requirements/net cash flow positions, and ideological patterns. Here we trace each of these through at a highly qualitative and stylized level. A more detailed assessment of each of these stages awaits a future project.

Although I have not yet traced out the ebb and flow of globalization of the electrical power industry over time, the stylized facts are that it had become quite globalized by the early 1900s, reverted to national and often government control between the 1930s and 1950s, and has been slowly reglobalizing beginning in the 1980s, but with a burst in the 1990s with privatization and the demonstration effects of vertical disintegration and deregulation in the UK, New Zealand, China, and the US among others. It is too early to tell if the Enron 'shock' will now send

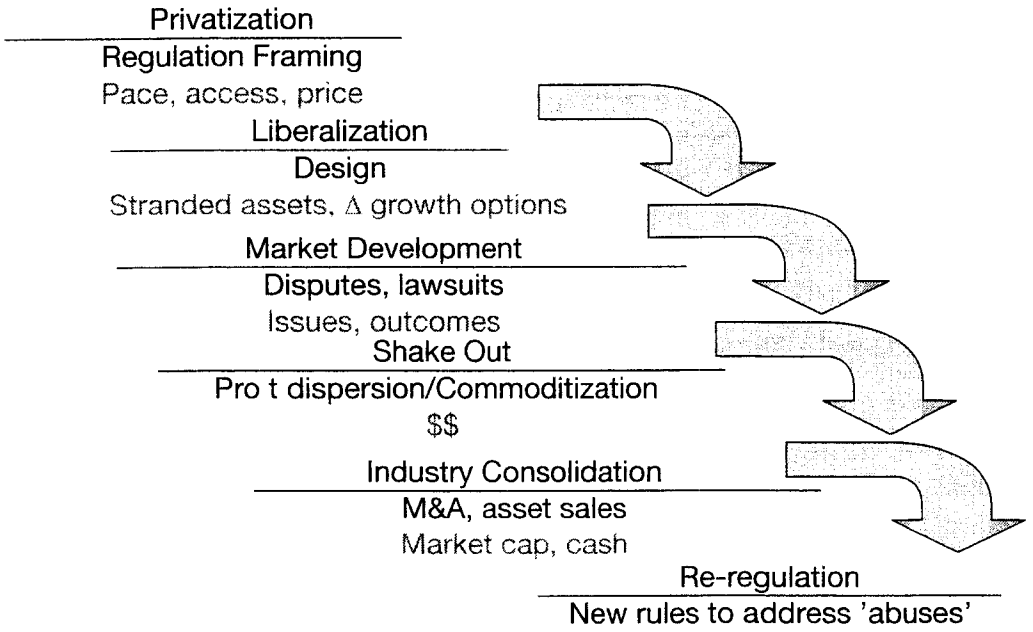

Figure 6.5—The regulatory 'cycle'.

8 It is interesting to note, however, that many of the early systems required the creation of financial systems capable of amassing large capital. Credit Suisse, for example, was created to finance hydro-projects and to this day Electro Watt is a key part of the corporate portfolio despite the fact that few if any synergies remain.

the pendulum in the other direction. These changes have also interacted with the steady erosion of the technological gradient, punctuated and re-established periodically by new innovations.

Risk and Globalization

Risk has been suggested as a major reason for the internationalization or globalization of firms as well as a major obstacle to international investment. While at first glance these may be seen as contradictory views, when the concept of comparative advantage is used to 'unpack' them in terms of the now traditional breakdown of drivers of global integration and drivers for local embeddedness, the story becomes much clearer.

Figure 6.6 illustrates sources of global versus local advantage arising from the types of mechanisms appropriate to the various types of risks.

The management of technical and operational risks requires expertise both in the technology and in organizational design. If the stock of 'undiffused' innovation is large, global integrated firms operating in lead markets (in terms of their technology) will have the advantage. In this case, adding risk to the equation only reinforces the standard arguments for globalization based on 'firm-specific' knowledge-based advantages that can best be exploited through internalization.

As these differentials erode and the technology and management methods become more universally available, this advantage will differ as well. To the extent that the operational risks arise because of local conditions, on the other hand, the advantage is likely to lie with locally based firms unless, of course, globally integrated but locally embedded firms can win on both grounds.

Institutional risks are the most salient in this industry – and not just in emerging markets, as witnessed by the events in California in 2001. Whether these institutions

Risk	Response	Global Advantage	Local Advantage
Technical/Operational	Mitigate	Significant if technology Δ is large	Understand what is appropriate
Institutional	Shape, diversify, mitigate	Breadth, expertise if institutional Δ, friends in high places	Legitimacy, insider knowledge
Macro	Hedge, diversify	Access to financial markets, breadth	None
Market	Hedge, profit from flexibility	Access to financial markets, expertise	Flexibility, ability to offset within portfolio

Figure 6.6—Global vs local advantage in risk bearing.

favour globally integrated firms, locally based firms or locally embedded and globally linked firms is a complex question to which there is no ready answer. If global institutions are at stake, powerful players from major countries will win. If local rules are in play, then local influence will dominate except in colonial or quasi-colonial cases, for example external triad jurisdiction via the IMF, World Bank, or other financial linkages. If ideology and institutional change follow a diffusion pattern internationally, then the ability to carry learning regarding institutional risk from one location to another will reinforce the knowledge-based advantages of the globally integrated firm.

Local ownership, or some other meaningful mechanism for creating local stakeholders, in contrast, is extremely important in all three vertical stages, given the *ex-post* monopoly nature of many of the services provided. Once a concession is granted, once a system for transmission or distribution is built, it tends to be a natural monopoly and it tends to be generating positive cash flows. The argument over who obtains the surpluses and rents becomes the central issue, thus calling for a strong degree of 'local responsiveness' in the traditional sense used by Prahalad and Doz. This is not a question of differentiating the type of kilowatt sold in Canada versus the US. This is the issue of having a local face on the company that wants to raise rates and thereby either 'gouge consumers' or provide its investors with a fair return, depending on one's point of view.

The benefits of flexibility and/or capacity pooling typically extend only to an integrated market that is served by an economically efficient transmission grid. This will be national or continental depending on specific geography and political boundaries. Cross-border ownership does not convey any efficiencies in capital investment relative to local or at least regional ownership. Real options are important in this industry in the form of base load versus peaking capacity, coal versus oil versus gas fired plants, and so on, but most of these options can be constructed and exercised within the continental boundaries.

On the other hand, the potential for risk reduction through diversification may be substantial. However, to the extent that this can be replicated through financial markets, which is likely to be the case for operations in developed countries, such diversification may destroy value. In emerging markets, in contrast, this pure diversification is likely to be valuable since locally based firms cannot match it. But the endogeneity of institutional risks creates a countervailing force. As a result, balance between global integration/diversification and local embeddedness in terms of stakeholders will be desired. Ironically, though, a strengthening of local institutions, and the accompanying increased fluidity of financial flows, could reduce the benefit of global ownership.