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Charting the Diffusion of Power Sector Reforms across the Developing World

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Abstract

Some 25 years have elapsed since international financial institutions espoused a package of power sector reform measures that became known as the Washington Consensus. This package encompassed the establishment of autonomous regulatory entities, the vertical and horizontal unbundling of integrated national monopoly utilities, private sector participation in generation and distribution, and eventually the introduction of competition into power generation and even retail services. Exploiting a unique new data set on the timing and scope of power sector reforms adopted by 88 countries across the developing world over 25 years, this paper seeks to improve understanding of the uptake, diffusion, packaging, and sequencing of power sector reforms, and the extent to which they were affected by the economic and political characteristics of the countries concerned. The analysis focuses on describing the patterns of reform without judging their desirability or evaluating their impact. The paper finds that following rapid diffusion during 1995–2005, the spread of power sector reforms slowed significantly in 2005–15. Only a small minority of developing countries fully implemented the reform model as originally conceived. For the majority, reforms were only selectively adopted according to ease of implementation, often stagnated at an intermediate stage, and were sometimes packaged and sequenced in ways unrelated to the original logic. Country characteristics such as geography, income group, power system size, and political economy all had a significant influence on the uptake of reform. Moreover, a significant number of countries experienced reversals of private sector participation, or were unable to follow through with reform plans that were officially announced. Overall, power sector reform in the developing world lags far behind what was achieved in the developed world during the same time period. Yet, even in the developed world, the full package of reforms does not seem to have been universally adopted.

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Produced by the Research Support Team

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1. Context

During the 1990s, the World Bank, and other international financial Institutions, became prominent advocates of power sector reform in the developing world; in what became known as the "Washington Consensus". According to this view, the main objectives of power sector reform were to improve economic efficiency and attract private sector investment. Although founded largely on economic principles, the reform model also drew heavily on the experience of two pioneering countries that reformed their power sectors during the 1980s: Chile and the United Kingdom.

According to the 1990s view, the power sector reform process should encompass four distinct reform actions. The first is *"regulation"*, which involves the creation of an autonomous regulatory entity to provide some degree of political independence for the sector and hold utilities accountable for their operational and financial performance. The second is "*restructuring"*, which involves steps towards the eventual full vertical and horizontal unbundling of the incumbent state-owned monopoly. The third is *"private sector participation"*, which brings in private management and capital into the sector as a means to boost operational efficiency and investment. The fourth is *"competition"*, which initially allows generators to compete to supply a monopoly utility and eventually allows customers to negotiate their supply contracts directly with power producers and traders supported by a power exchange.

Some 25 years have passed since the earliest power sector reforms, and accumulated developing country experience has shown that the model is much harder to adopt than originally believed. Even advanced reformers, a quarter of all developing countries, have taken many years to fully implement the process. Many others, roughly 35 percent of the sample, have encountered obstacles and even reversals – due to the complex political economy dynamics of the sector – and as a result have only partially adopted sector reforms. A significant number constituting 40 percent of developing countries remain largely unreformed.

It therefore seems timely to update the World Bank's last major global stock-taking of power sector reform uptake in the developing world (Besant-Jones, 2006), by examining recent global trends in power sector reform. While the future of the power sector may look significantly different to the past, due to technological shifts, it remains important to distill the lessons of the standard approach to power sector reform experience to date, so as to better understand the limitations to further uptake.

To that end, this paper aims to answer a number of questions. To what extent have developing countries pursued the 1990s power sector reform model and how far did they get with it? What patterns of power sector reform can we now observe around the world? Is there continuing power sector reform momentum? How have country characteristics influenced the uptake of the different elements of power sector reform, and which types of countries have been able to go furthest with the model? Emerging answers to these questions can be previewed as follows.

Overall, power sector reform in the developing world lags far behind what was implemented in the developed world during the same time period. Closer inspection shows that the most significant differences lie in the area of vertical and horizontal unbundling, which is twice as common in OECD as in developing countries, as well as implementation of wholesale power markets, which is ten times more likely in OECD than developing countries. Nonetheless, full power sector reform has not been universal even in developed countries. The percentage of countries that have implemented some degree of private sector participation in either generation or distribution hovers around 70 percent for *both* developed and developing countries, although the depth of private sector participation tends to be significantly greater

in the OECD countries. However, 17 percent of the OECD countries that introduced a wholesale power market did so without fully vertically unbundling their power sectors.

Following rapid diffusion during the decade 1995-2005 the spread of power sector reforms slowed significantly in the subsequent decade 2005-2015, on almost every dimension of reform. The slowdown is particularly evident in terms of the number of countries establishing regulatory entities or conducting private sector participation in generation or distribution in the later decade. For the majority of countries, reforms were only selectively adopted often according to ease of implementation, and reform programs often stagnated midway. A third to a half of developing countries are at such an intermediate stage, having implemented reforms in some areas but not in others; and in many cases reforms have been halted for over a decade.

Reforms have sometimes been packaged and sequenced in ways unrelated to the original logic. For example, 25 percent of developing countries have allowed for private sector participation without following through on competition, while another 15 percent have gone further on competition then their sector restructuring efforts would prepare them for. Some 13 percent of developing countries have created regulatory entities without having introduced private sector participation to their utilities, while a similar share find themselves in the opposite situation. While the principles of reform suggest that distribution private sector participation should precede private sector participation in generation, the percentage of countries doing so was about the same as those that began by privatizing generation.

Country characteristics such as geography, income group, power system size, and attributes of the political system seem to have had a statistically significant influence on the uptake of reform. One of the largest influences has been system size: countries with installed capacity above 10 GW scored more than twice as high on the reform index as those with systems below 1 GW. Similarly, countries in the middle-income bracket, and those with relatively competitive political dynamics scored much higher than others. Geographic region was also an important driver, with Latin America and the Caribbean standing out as the pioneering region for power sector reform, and the Middle East and North Africa as well as Sub-Saharan Africa starting later and introducing reforms more slowly over the entire period.

Moreover, of the 34 countries still at an early stage of reform, the vast majority fall into one of the categories that have historically found power sector reform challenging to implement: fragile states (14 cases); small systems (31 cases); low income bracket (16 cases); or weak rule of law (32 cases). About 16 of these countries are in Sub-Saharan Africa. In fact, there is not a single large stable middle-income country in this group. This raises questions about the applicability of the classic power sector reform agenda in those countries that currently face some of the greatest power sector challenges.

These patterns of uptake of power sector reform already tell an illuminating story. They illustrate that the full package of Washington consensus reforms has proved challenging to implement in their entirety in a developing country environment, and – though undoubtedly much more widespread – still remain far from universal even in OECD countries.

Finally, it is important to note that the aim of this paper is entirely descriptive as opposed to normative. That is to say that the diffusion of power sector reforms is documented without making any value judgment as to whether or not this was the right policy choice, or attempting to evaluate the associated impacts. A significant cross-country econometric literature on the impacts of reform already exists. See

for example: Gassner et al., 2008[1]; Nagayama, 2010[2]; Erdogdu, 2014[3]; Jamasb et al., 2014[4]; Urpelainen and Yang, 2017.[5] Moreover, an evaluation of the impact of reform would not have been feasible to implement in any meaningful depth given the scope of the data set covering 88 countries over a 25-year period. Rather, the primary contribution of this paper is to provide a much more detailed characterization of the content, timing and sequencing of power sector reform measures than has previously been possible.

The remainder of the paper is organized as follows. Chapter 2 presents the methodology, while Chapters 3 through 6 report the findings on the regulation, restructuring, competition and private sector participation measures of reform, respectively. In Chapter 7 the four dimensions of reform are drawn together to distill the overall findings of the analysis, before concluding in Chapter 8.

2. Methodology

This paper draws on a number of data sources to create an unprecedented time series data set comprising information on which countries adopted which types of power sector reforms at which dates. The database covers 88 developing countries for the period 1995 to 2015. Complementary information for 22 OECD countries is available for a subset of variables and time periods. An important source of data is the RISE (Regulatory Indicators for Sustainable Energy) project,[6] which provides an up to date snapshot of power sector reform globally based on numerous indicators on the power sector structure and institutional arrangements in 2015. A second important source of data is the World Bank's Private Participation in Infrastructure database,[7] which records all developing country transactions involving the private sector going back into the 1990s, and makes it possible to understand how private sector participation has evolved over the same period. Important historic reference points are provided by comparable earlier surveys conducted by Besant-Jones (2006) and ESMAP (1999).

The paper will first individually examine the diffusion of each of the four dimensions of power sector reform: regulation, restructuring, competition and private sector participation. Along each of these four dimensions, a number of stages of reform are identified, which make it possible to examine diffusion trends over time as well as the geographic patterns of uptake. The prevalence of power sector reform in developing countries is compared to that in developed countries over the same time frame.

The final section of the paper turns to drawing out the main conclusions and insights from looking across experiences on all four dimensions of reform. The ways in which different types of reforms are packaged

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[1] Gassner, K., A. Popov, and N. Pushak. 2008a. "Does the private sector deliver on its promises? Evidence from a global study in water and electricity". *Gridlines 44512*. PPIAF, The World Bank, Washington D.C.

[2] Nagayama, H. 2010. "Impacts on investments, and transmission/distribution loss through power sector reforms". *Energy Policy*, 38(7), 3453-3467.

[3] Erdogdu, E. 2014. "Investment, security of supply and sustainability in the aftermath of three decades of power sector reform". *Renewable and Sustainable Energy Reviews*, 31, 1-8.

[4] Jamasb, T., R. Nepal, G Timilsina, and M. Toman. 2014. Energy Sector Reform, Economic Efficiency and Poverty Reduction, Discussion Papers Series 529, School of Economics, University of Queensland, Australia.

[5] Urpelainen, J., & Yang, J. 2017. Policy Reform and the Problem of Private Investment: Evidence from the Power Sector. *Journal of Policy Analysis and Management*, 36(1), 38-64.

[6] *http://rise.esmap.org/*

[7] *https://ppi.worldbank.org/*

and sequenced and their relative prevalence and momentum are carefully considered. Finally, a simple Power Sector Reform Index is introduced as a convenient device for summarizing the extent of power sector reform in each country. The index takes an unweighted average of a country's score on an interval of 0 to 100 for each of the four dimensions of power sector reform.[8] Once again, the index is descriptive rather than normative in nature. A higher score simply denotes that more reform measures were taken, but is not necessarily intended to convey a superior power sector architecture or performance.

Throughout the paper, the sensitivity of reform experiences to initial country characteristics – as of 1995 – is systematically examined. Statistical tests of differences in values between the chosen country groupings outlined below are based on N-1 two-proportion tests for binary variables and ANOVA tests for continuous variables. In the case of more than 2 groups pair-wise tests were carried out, and all pairwise significant variables received the marker. The country characteristics include country income group[9], power system size[10], fragility status[11], and oil exporting status[12], as well as the political economy characteristics[13] of the country.

Income group is known to affect many aspects of a country's economy. In this case, income group is relevant for a number of reasons. It will affect the purchasing power of the population and the prospects for recovering the costs of power supply, which is often an objective of regulation as well as a prerequisite for other reforms such as private sector participation and competition.

Oil exporting countries, due to their abundance of domestic hydrocarbon wealth, are often inclined to subsidize the power sector, sometimes quite substantially. This, in turn, makes it difficult to introduce reforms related to cost recovery, and hence regulation, private sector participation and ultimately competition.

Power system size is expected to be an important factor in restructuring and competition reforms. Effective power market competition is only possible when there are a significant number of generators in the market that are able to act as alternative suppliers of power. The sector has traditionally been characterized by large scale economies in power generation, implying that only larger power systems are able to support the requisite number of generators operating beyond minimum efficient scale; although this reality is shifting with the advent of smaller scale and more modular renewable energy technologies. Furthermore, even when an adequate number of generators can be supported by the market, there may be technological characteristics (e.g. nuclear power) or transmission constraints that prevent generation plants from really competing with each other. Thus, the larger the system becomes, the less likely that such constraints can present an effective limit on competition.

Fragile and conflict-affected states face particular challenges in adopting the ambitious institutional reforms entailed by power sector reform; in particular, their weak governance and institutional capacity combined with their risky policy environments make it challenging to attract private sector participation.

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[8] Details on the construction of the Index can be found in Box 3, Chapter 7.

[9] *World Development Indicators, World Bank*

[10] *Electricity Data, U.S. Energy Information Administration*

[11] *Polity IV Indicator, Center for Systemic Peace*

[12] *Global Energy Statistic Yearbook 2017, Enerdata*

[13] *Center for Systemic Peace and World Governance Indicators, World Bank*

Political economy has an important influence on the feasibility of different types of reforms. There is a wide array of variables that can be used to convey the political characteristics of a country. Two in particular are considered here.

One relevant dimension of political economy is the rule of law, which captures the extent to which the legal framework in a country is followed and effectively enforced. It is evidently an important prerequisite for the success of measures such as regulation, private sector participation and competition. In particular, it measures the perceived extent to which citizens abide by government laws, the quality of property rights, the level of confidence in the judicial system, and the perceived likelihood of crime. Countries with better scores on the rule of law should find it easier to adopt the power sector reform agenda.

Another relevant dimension of political economy is the degree of competition among the country's political elite. At one end of the spectrum, some countries are described as dominant in that their power structure is concentrated around a single dominant individual or group that exercises power in a top down hierarchical manner. Such countries may be able to implement reforms very decisively when they are in the interest of the dominant power group, or conversely may be able to block it completely when interests do not align. At the other end of the spectrum, some countries are described as having a competitive power structure, indicating that there are multiple poles of power or competing groups of elites. Such countries may be more open to electricity sector reforms that essentially distribute political power more widely across the sector, for example by restructuring companies, opening to international private investors or establishing competitive markets. On the other hand, the competitive nature of their political processes may make it more difficult to reach consensus regarding the implementation of reform. The expected impact of political competition on the ease of power sector reform is therefore much more ambiguous than for the rule of law.

3. Regulatory Reform

Regulatory reform is defined as the establishment of an autonomous entity with responsibility for regulatory oversight and with some role in decision-making (Figure 3.1). In any power sector, there are policy-making, regulatory and service provision functions to be fulfilled. In simple terms, policy-making involves charting the strategic direction for the sector, regulation involves overseeing the sector to ensure that the strategic direction is followed and enforced, while service provision involves the actual implementation of that strategic direction. Traditionally, all three functions have often been combined, and mutually confounded, within the line ministry. However, with widespread corporatization of the service provider to form an enterprise distinct from the line ministry, as well as the growing delegation of these activities to the private sector, the need for a clearer regulatory function has been felt. A widely adopted model, drawing heavily on Anglo-Saxon experience, has been to create a regulatory entity dedicated to this purpose. Independence is considered important to isolate the regulator and ultimately the service-provider from short term opportunistic political interference that may jeopardize the achievement of the long-run strategic direction for the sector. Independence, though always relative, has been defined in terms of an institutional existence, governance structure, and budget line that are separate from the line ministry itself. However, in practice, genuine independence has proved difficult to achieve in many political systems and cultures, because governments often find it difficult to relinquish their discretionary powers to control important sources of political patronage such as electricity tariffs, power sector investment plans, and utility employment. The roles of the regulator include setting tariffs

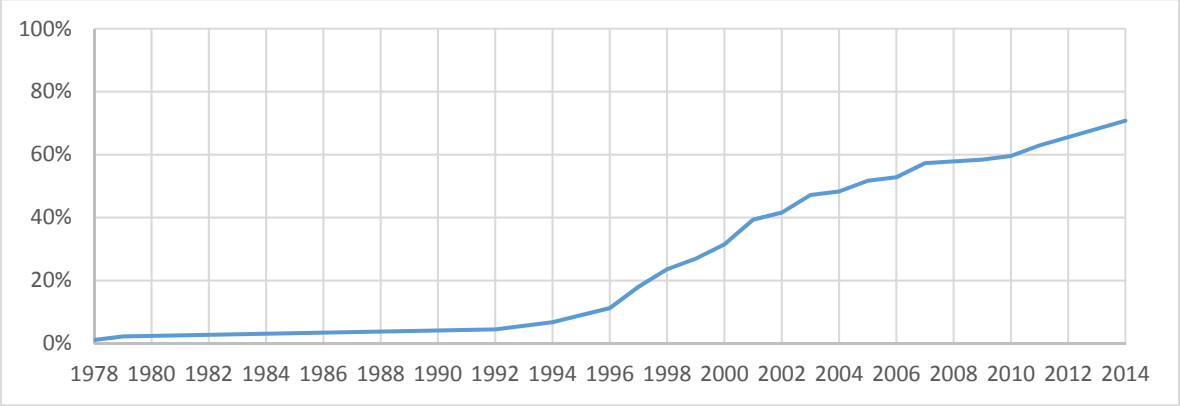
to recover efficient costs, monitoring and enforcing quality of service standards, and overseeing market entry.

Figure 3.1: Definition of regulatory reform

Model classification	Defining characteristics
1. No regulator	There is no entity separate from the line ministry responsible for regulatory oversight of the power utility (-ies)
2. Regulatory entity	A regulatory entity has been created that exists outside of the line ministry and has clearly defined regulatory responsibilities and some degree of decision-making autonomy

Regulatory entities have diffused rapidly across the developing world, yet are still not as prevalent as in the developed world. Regulatory entities existed only in a handful of countries up until the year 1995 (Figure 3.2). During the decade 1995-2005, there was remarkably rapid diffusion of regulatory entities with about 40 percent of developing countries adopting the reform during this period. Uptake continued during the subsequent decade 2005-2015 though at a much slower pace, with an additional 20 percent of developing countries establishing a regulatory entity. As of 2015, 72 percent of developing countries have a regulatory entity, making this by far the most popular and widely adopted of the four major policy recommendations of the Washington consensus. Nevertheless, this still falls considerably short of the 91 percent prevalence of regulatory entities in the developed world (Figure 3.3).

Figure 3.2: Percentage of developing countries establishing regulatory entities over time



Source: Own elaboration based on RISE 2015 database and independent research

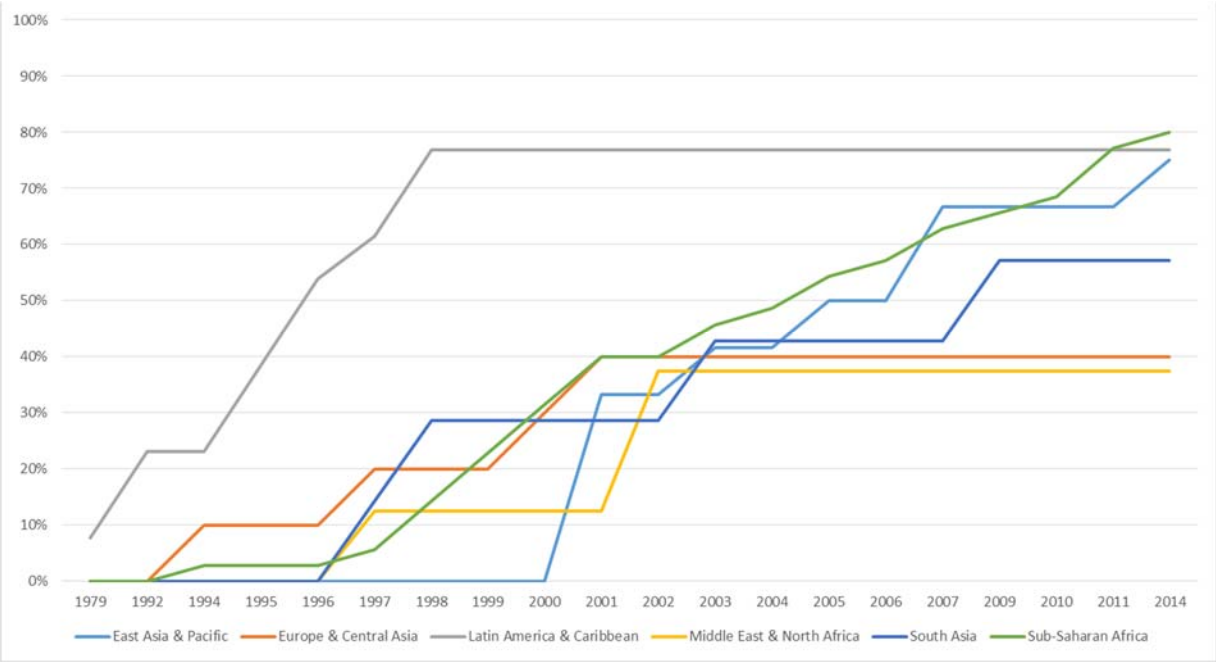
Figure 3.3: Comparison of developed and developing countries on extent of regulatory reform, 2015

Percentage of countries	Developed countries	Developing countries
With regulatory entity	91	72
Without regulatory entity	9	28
	100	100

Source: Own elaboration based on RISE 2015 database
** Differences are statistically significant at the 5% level
* Differences are statistically significant at the 10% level

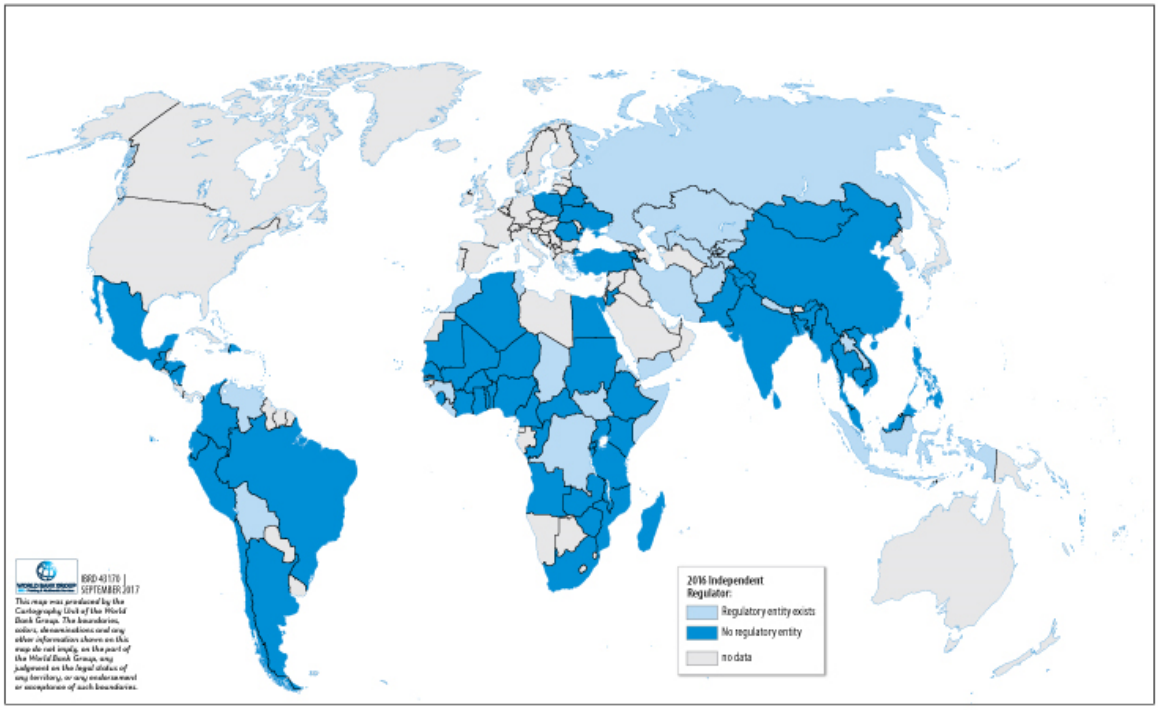
While the Latin America & Caribbean region pioneered regulatory entities, Sub-Saharan Arica and East Asia Pacific have subsequently caught-up with the adoption of this reform. Looking across developing regions, Latin America & Caribbean was clearly the pioneer in the adoption of regulatory entities (Figure 3.4). As early as 1998, 77 percent of Latin America & Caribbean countries had established a regulator, and in fact there have been no further regulators established within the region since that date. The uptake of regulation started a little later in all other developing regions and regulatory entities were introduced at a much slower pace. By 2015, Sub-Saharan Africa and East Asia Pacific had "caught-up" with Latin America & Caribbean, with penetration of regulators climbing to the 70 to 80 percent range. However, in the three other developing regions – South Asia, Middle East and North Africa, and Europe and Central Asia – the momentum around regulatory reform stalled noticeably in the early 2000s, and there has been no further diffusion since that date, leaving regulation confined to a minority of 30 to 40 percent of countries in each of these regions.

Figure 3.4: Percentage of developing countries establishing regulatory entities over time by geographic region



Source: Own elaboration based on RISE 2015 database and independent research

Figure 3.5: Establishment of regulatory entities by country across the developing world as of 2015



Source: Own elaboration based on RISE 2015 database

Figure 3.6: Prevalence of regulatory reform measures across country groupings

Percentage of countries adopted as of 2015	Regulatory Agency	Percentage of countries adopted as of 2015	Regulatory Agency
By income group		**By system size**	
LIC	71	<1GW	68
LMIC	57**	1-5GW	60*
UMIC	100**	5-10GW	100*
By fragility status		10-20GW	56*
FCS	64	>20GW	77
Non-FCS	72	**By rule of law**	
By oil exporting status		High rule of law	62
Importer	78	Low rule of law	69
Exporter	69	**By political economy**	
Total	**72**	Dominant	63
		Intermediate	82
		Competitive	78

Source: Own elaboration based on RISE 2015 database

** Differences are statistically significant at the 5% level

* Differences are statistically significant at the 10% level

There are some notable examples of countries that have eschewed regulatory entities. The map identifies those countries that stand out as non-adopters in each of the regions (Figure 3.5). Within Latin America, Bolivia and the República Bolivariana de Venezuela stand out as countries that do not have regulatory entities; although in Bolivia's case this represents a policy reversal. Other notable standouts are the countries of Central Africa and Central Asia, as well as Afghanistan, the Islamic Republic of Iran and Indonesia.

The penetration of regulatory reforms is particularly high in upper-middle-income countries, as well as in larger systems and certain regions (Figure 3.6). Regulatory entities are universal in upper-middle-income countries, and significantly higher than in the low-income group. By far the largest variation in the prevalence of regulatory entities is across geographic regions, ranging from around 40 percent to 80 percent in different regions. In particular, differences are statistically significant between the Middle East & North Africa and Latin America & Caribbean (at the 10% level), South Asia region and Sub-Saharan Africa (at the 5% level).

4. Restructuring Reforms

Restructuring reform is defined as movement along a spectrum towards full vertical and horizontal unbundling of the sector. The starting point for restructuring reform is typically a vertically integrated national monopoly utility, and the theoretical endpoint a fully restructured sector entailing vertical unbundling of generation, transmission and distribution, as well as horizontal unbundling of the generation and distribution tiers to create multiple companies operating in parallel.

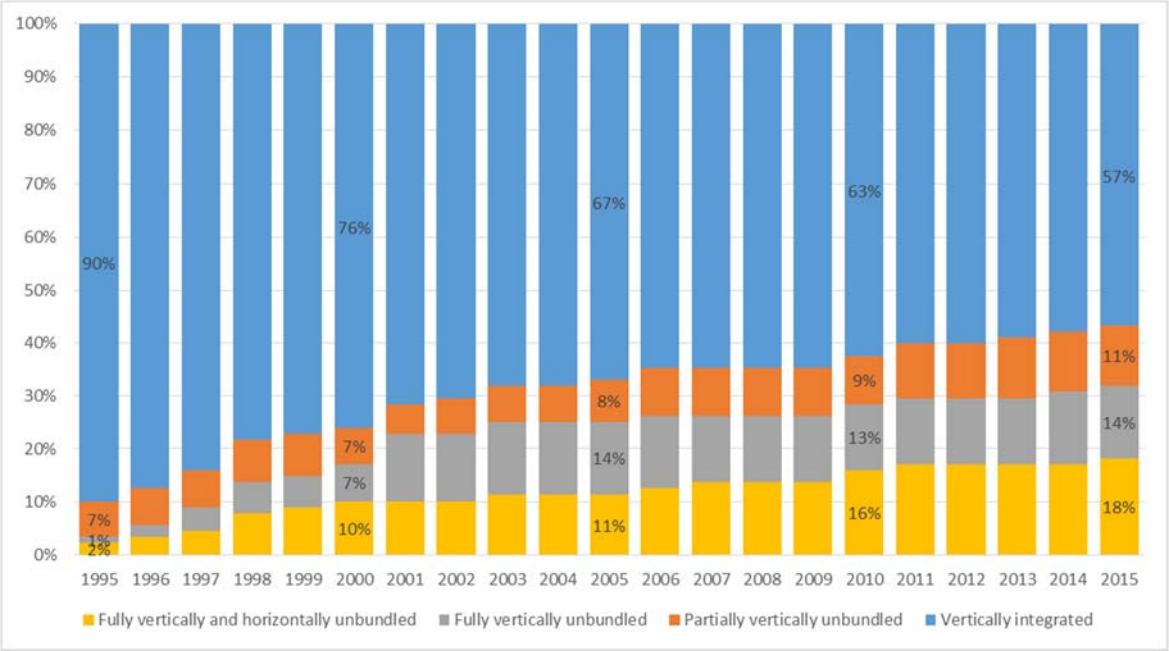
The theoretical rationale for such restructuring is that it paves the way for competition. First, vertical unbundling aims at removing any conflict of interest that may arise when a single utility has more than one function along the electricity supply chain. For example, a transmission company that also engages in generation may have the incentive to prioritize grid access for its own generation capacity as opposed to that of competitors. Second, horizontal unbundling aims at reducing the concentration of market power, particularly relevant for generation. For example, a country that has five or six generation companies of even size is likely to experience stronger competitive pressure in generation than a country that has one large and one small generation company only. However, in countries where the scope for genuine competition may be severely constrained by the scale or technical characteristics of the power sector, the case for unbundling as an enabler of competition may not be compelling. In addition, there may be other reasons to pursue vertical unbundling, related to promoting efficiency gains through greater specialization or improved transparency and accountability of management along the electricity supply chain. It is also sometimes argued that horizontal unbundling can help regulators to compare efficiency across companies. Nevertheless, unbundling is quite a complex process whose costs need to be carefully weighed against the expected benefits, particularly in countries where systems are small and there is a serious risk of losing scale economies, and/or managerial capacity to lead multiple enterprises may be limited.

Figure 4.1: Definition of stages of restructuring reform

Model classification	**Defining characteristics**
1. Vertically Integrated	Generation, transmission and distribution are undertaken by a single vertically integrated entity
2. Partial vertical unbundling	Either generation has been separated while transmission and distribution remain combined, or distribution has been separated while generation and transmission remain combined
3. Full vertical unbundling	Generation, transmission and distribution have each been separated from each other.
4. Full vertical and horizontal unbundling	Generation, transmission and distribution have each been separated from each other, and furthermore generation and/or distribution tiers have been restructured into multiple entities.

In practice, restructuring may happen in a number of phases and take a variety of forms. Hence the survey distinguishes between partial vertical unbundling that entails splitting the vertical supply chain into just two independent entities – which may leave transmission either with generation or with distribution – full vertical unbundling that entails splitting the vertical supply chain into three independent entities – for generation, transmission and distribution – and horizontal unbundling to create multiple entities in the generation and distribution segments. It is also important to clarify that there are degrees of unbundling, usually starting with accounting separation, and going on to encompass functional separation into distinct management areas, legal separation into distinct companies, and ownership separation so that the different companies also have distinct owners. In some countries, for example, utilities are legally unbundled only to be retained under the ownership of a single state-owned holding company, which tends to undermine the impact of the restructuring exercise. For the purposes of the taxonomy used in this paper, unbundling must go as far as legal unbundling in order to be counted at all.

Figure 4.2: Percentage of developing countries adopting some degree of unbundling over time



Source: Own elaboration based on RISE 2015 database and Besant-Jones 2006

While a sizeable minority of developing countries have unbundled their power sectors to some degree, restructuring has not gone anywhere near as far as in the developed world (Figures 4.2 and 4.3). As of 1995, only 10 percent of developing countries had engaged in some degree of unbundling. A further 23 percent of countries unbundled during the decade 1995-2005, but only 10 percent of countries in the subsequent decade 2005-2015, indicating a slowing pace of diffusion. Nevertheless, the prevalence of unbundling is much greater in the developed world (where it affects 74 percent of countries to some degree) than in the developing world (where it affects only 43 percent of countries). And whereas 43 percent of developed countries have attained full vertical and horizontal unbundling of the sector, the same is true for just 18 percent of developing countries. Most of the developed countries that have unbundled their sectors have undertaken full vertical unbundling. Of course, some notable examples of vertically integrated power systems do persist in the developed world, including countries like Japan, Austria and the Republic of Korea. Among the developing countries with full vertical and horizontal unbundling are Argentina, Brazil, India, Nigeria, Peru, and Turkey. One factor that may explain the greater prevalence of unbundling in developed countries is simply the larger scale of their power systems on average.

Figure 4.3: Comparison of developed and developing countries regarding vertical unbundling, 2015

Percentage of countries	Developed countries	Developing countries
• Vertically integrated**	26	57
Some degree of vertical unbundling of which:**	74	43
• Partial vertical unbundling	4	11
• Full vertical unbundling**	26	14
• Full vertical unbundling plus horizontal unbundling in G or D**	43	18
	100	100

Source: Own elaboration based on RISE 2015 database

**** Differences are statistically significant at the 5% level

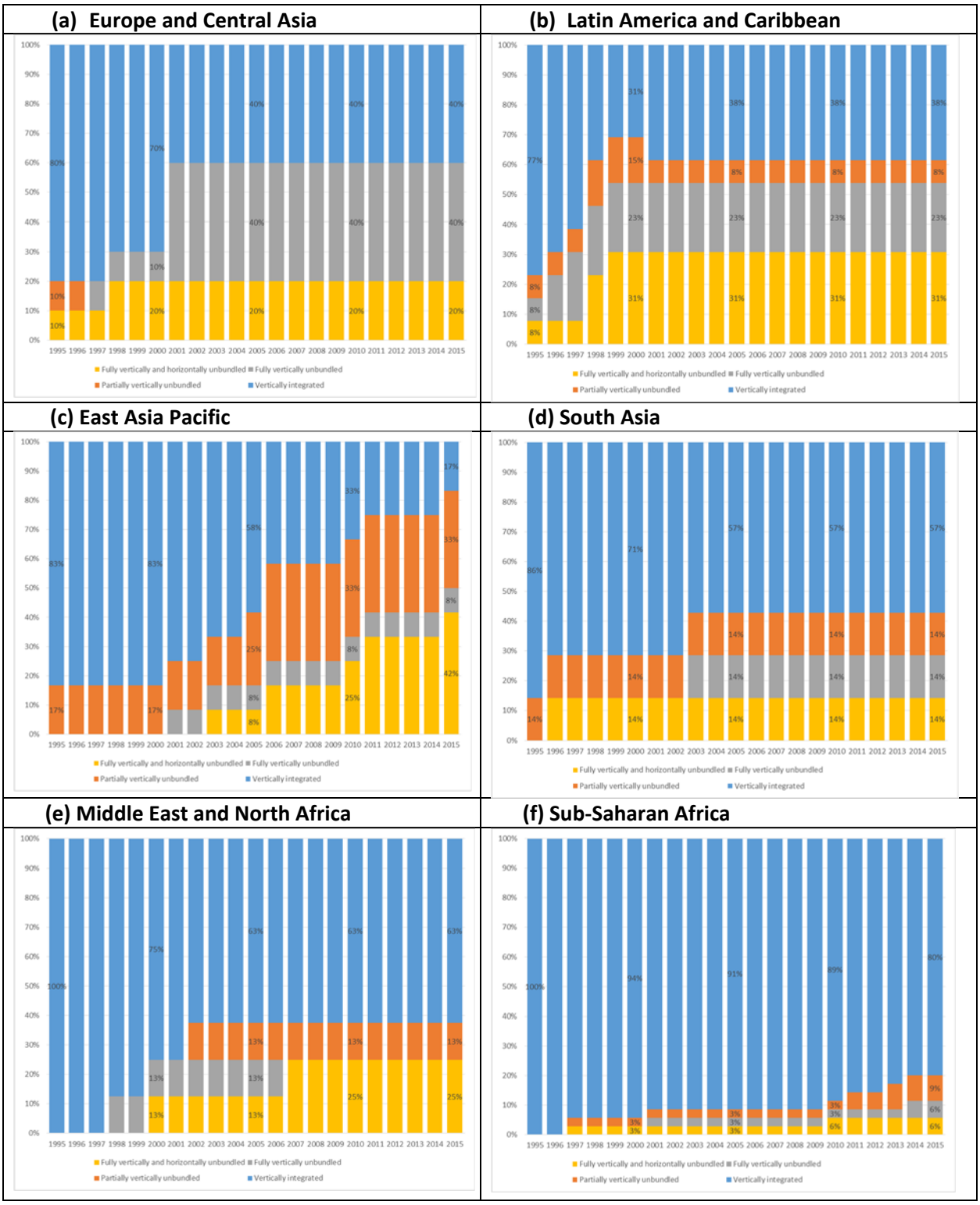
*** Differences are statistically significant at the 10% level

The timing and extent of sector restructuring differs significantly across regions[14] (Figure 4.4). Two regions – Latin America & Caribbean and Europe & Central Asia – were early adopters with some 60 percent of their countries having unbundled to some degree as early as the year 2000, and no further action since that date. Countries that have pursued unbundling have at least introduced full vertical unbundling, and a significant minority of 20-30 percent of countries in these regions have full vertical and horizontal unbundling. While the process of unbundling started later and moved more slowly in the East Asia Pacific region, by 2015 as many as 80 percent of countries had undertaken some degree of unbundling, and as many as 40 percent had full vertical and horizontal unbundling. However, a substantial share of countries has remained at the stage of partial vertical unbundling. By contrast, in South Asia, fewer than half of the countries have embarked on sector unbundling and there has been no further uptake of restructuring reforms since the early 2000s. A similar pattern is evident in the Middle East and North Africa, where barely a third of the countries have undertaken unbundling. In Sub-Saharan Africa, vertically integrated monopolies remain the norm in over 80 percent of the countries. Interestingly, the East Asia and Pacific region (and to a much lesser extent Sub-Saharan Africa) is the only one where momentum on restructuring reforms has actually increased over the last decade 2005-2015. In all other regions, there has been barely any action on restructuring reforms since the early 2000s.

The detailed geographic patterns are somewhat different for restructuring than for regulation (Figure 4.5). As before, Afghanistan, the Islamic Republic of Iran, Indonesia, and the República Bolivariana de Venezuela stand out as countries that have eschewed reform. However, in addition, so have the majority of countries in Africa, whose systems are likely in many cases too small to make unbundling a relevant option.

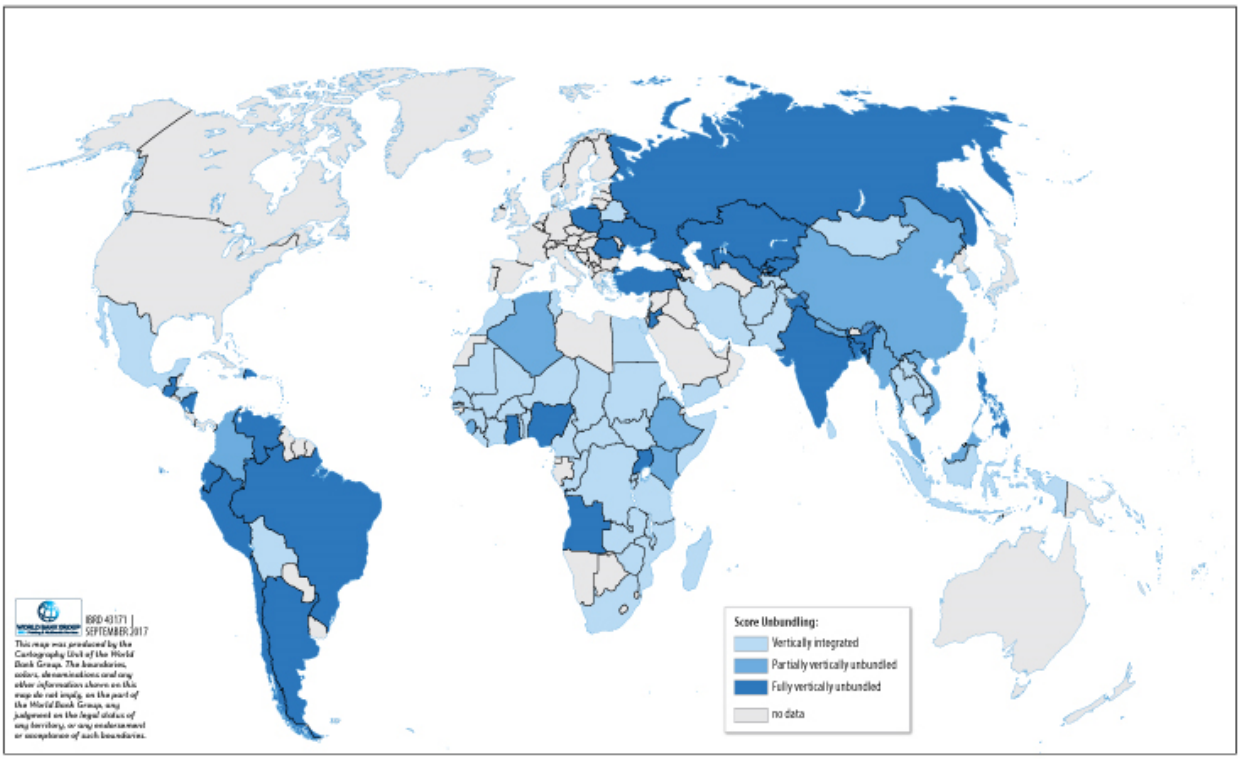
[14] Specifically, with respect to vertical integration/some degree of vertical unbundling the differences are statistically significant between Sub-Saharan Africa and Europe & Central Asia, East Asia & Pacific and Latin America & Caribbean respectively. The percentage of countries that have fully vertically unbundled varies significantly between Europe & Central Asia and Sub-Saharan Africa. The differences are statistically significant for Sub-Saharan Africa and East Asia & Pacific, Latin America & Caribbean and Middle East & North Africa, as well as for East Asia & Pacific and Middle East & North Africa with respect to full vertical unbundling. Partial vertical unbundling does not vary to statistically significant degrees across regions.

Figure 4.4: Percentage of developing countries adopting some degree of vertical unbundling over time and by region



Source: Own elaboration based on RISE 2015 database and Besant-Jones 2006

Figure 4.5: Unbundling index by country across the developing world as of 2015



Source: Own elaboration based on RISE 2015 database

The extent of restructuring reform is closely related to a number of country characteristics (Figure 4.6). In addition to the regional patterns noted above, sector restructuring is closely linked to a number of country characteristics. There is a direct correlation with country income group, such that upper-middle-income countries are much more likely to have implemented at least partial vertical unbundling than low-income countries. A similar effect can be observed against system size: countries with installed generation capacity above five gigawatts are more than twice as likely to have unbundled as small power systems. Similarly, oil exporting countries had a higher likelihood of embarking on restructuring reform than importers. None of the other variables proves to be statistically significant with respect to their influence on unbundling.

Figure 4.6: Prevalence of restructuring reform measures across country groupings

Percentage of countries adopted as of 2015	Vertically integrated	Some degree of vertical unbundling	Of which:			
			Partial vertical unbundling	Full vertical unbundling	Full vertical and horizontal unbundling	
By income group						
LIC	60**	40**	13	4	23*	100
LMIC	50	50	11	7	32	100
UMIC	33**	67**	17	0	50*	100
By system size						
<1GW	69**	31**	10	3	18*	100
1-5GW	50	50	10	5	35*	100
5-10GW	20**	80**	20	0	60*	100
10-20GW	67**	33**	11	11	11**	100
>20GW	23**	77**	23	8	46*	100
By political economy						
Dominant	55	45	18*	3	24**	100
Intermediate	52	48	18*	6	24	100
Competitive	44	56	4*	4	48**	100
By rule of law						
High rule of law	61	39	0*	8	31	100
Low rule of law	54	46	15*	4	27	100
By fragility status						
FCS	50	50	17	2	31	100
Non-FCS	58	42	9	7	26	100
By oil-exporting status						
Importer	36**	64**	15	7	42	100
Exporter	50**	50**	19	6	25	100
Total	**57**	**43**	**11**	**14**	**18**	**100**

Source: Own elaboration based on RISE 2015 database

**** Differences are statistically significant at the 5% level

* Differences are statistically significant at the 10% level

Once embarked on a restructuring reform, only about half the countries seem likely to pursue it to the fullest extent of vertical and horizontal unbundling. Figure 4.7 illustrates the evolution of countries adopting different degrees of restructuring in 2005 and looking at the extent of their further progress on restructuring reform ten years later, by 2015. Just over half the countries simply retained a vertically integrated structure over this period with no movement on reform. Among those embarking on restructuring reform since 2005, about half went all the way to full vertical and horizontal unbundling, while the other half remained in an intermediate stage. None of the countries that had undertaken partial vertical unbundling by 2005 took this any further during the following decade. By contrast, the majority of countries that had reached full vertical unbundling in 2005 went on to introduce horizontal unbundling during the following decade. The evidence suggests that taking preliminary steps towards unbundling is no guarantee that the process will be completed. However, countries are unlikely to undo restructuring

reforms once these have been undertaken: only 2 percent of countries indicate a policy reversal in the lower triangular portion of the table. In particular, Kazakhstan went from being fully vertically and horizontally unbundled in 2005 to just fully vertically unbundled in 2015, while the República Bolivariana de Venezuela's level of unbundling changed from fully vertically unbundled to vertically integrated in that time period.

Figure 4.7: Evolution of restructuring reforms from 2005 to 2015[15]

2015 State of Restructuring

2005 State of Restructuring

Percentage of countries	Vertically integrated	Partial vertical unbundling	Full vertical unbundling	Full vertical and horizontal unbundling	
Vertically integrated	54.5**	4.5	2.3	6.8	68.2
Partial vertical unbundling	0.0*	8.0	0.0	0.0	8.0
Full vertical unbundling	1.1**	0.0	3.4	9.1	13.6
Full vertical and horizontal unbundling	0.0**	0.0	1.1	9.1	10.2
	55.7	12.5	6.8	25.0	100.0

Source: Own elaboration based on RISE 2015 database

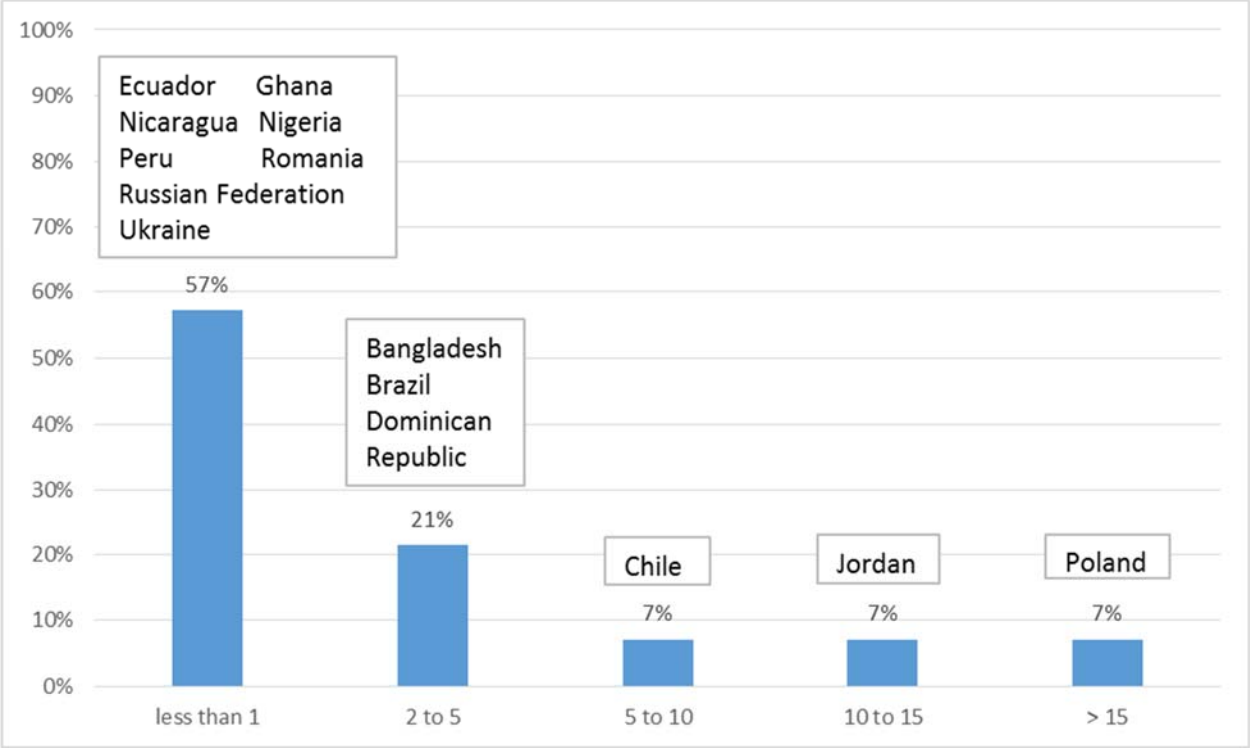
** Differences are statistically significant at the 5% level

* Differences are statistically significant at the 10% level

Countries that have proceeded to the final stages of restructuring reform did so rapidly (Figure 4.8). A large majority (78 percent) of the 14 countries that were fully vertically and horizontally unbundled as of 2015 completed the process within five years of embarking on restructuring reforms. In almost three-quarters of these cases, countries skipped partial vertical unbundling and proceeded directly to full vertical and horizontal unbundling. At the other extreme, 14 percent took over 10 years to reach full vertical and horizontal unbundling.

[15]For each row, the 2015 share of countries in each of the column categories is compared. A single significance marker in a row shows that the particular share was statistically significantly different from all other values in the row. More than one marker highlights all the values that were statistically significantly different from one another.

Figure 4.8: Time elapsed between partial vertical unbundling and full vertical and horizontal unbundling (years)



5. Competition Reforms

The purpose of competition is to promote efficiency and innovation by creating competitive pressures among service providers. When multiple companies compete simultaneously among themselves for consumers, a market discipline is created resulting in the pressure to keep costs down to efficient levels and to improve and innovate with regard to service quality. Due to large economies of scale, many power sector activities have traditionally been considered natural monopolies, meaning that it would be inefficient to have more than one supplier, although this perception is beginning to shift with the arrival of smaller scale renewable technologies. Even there, it is still possible to get different companies to compete for the right to supply the market on a monopoly basis for a certain period of time. In larger power systems that support a considerable number of generation plants, it is feasible to have direct head-to-head competition through the adoption of a wholesale power market.

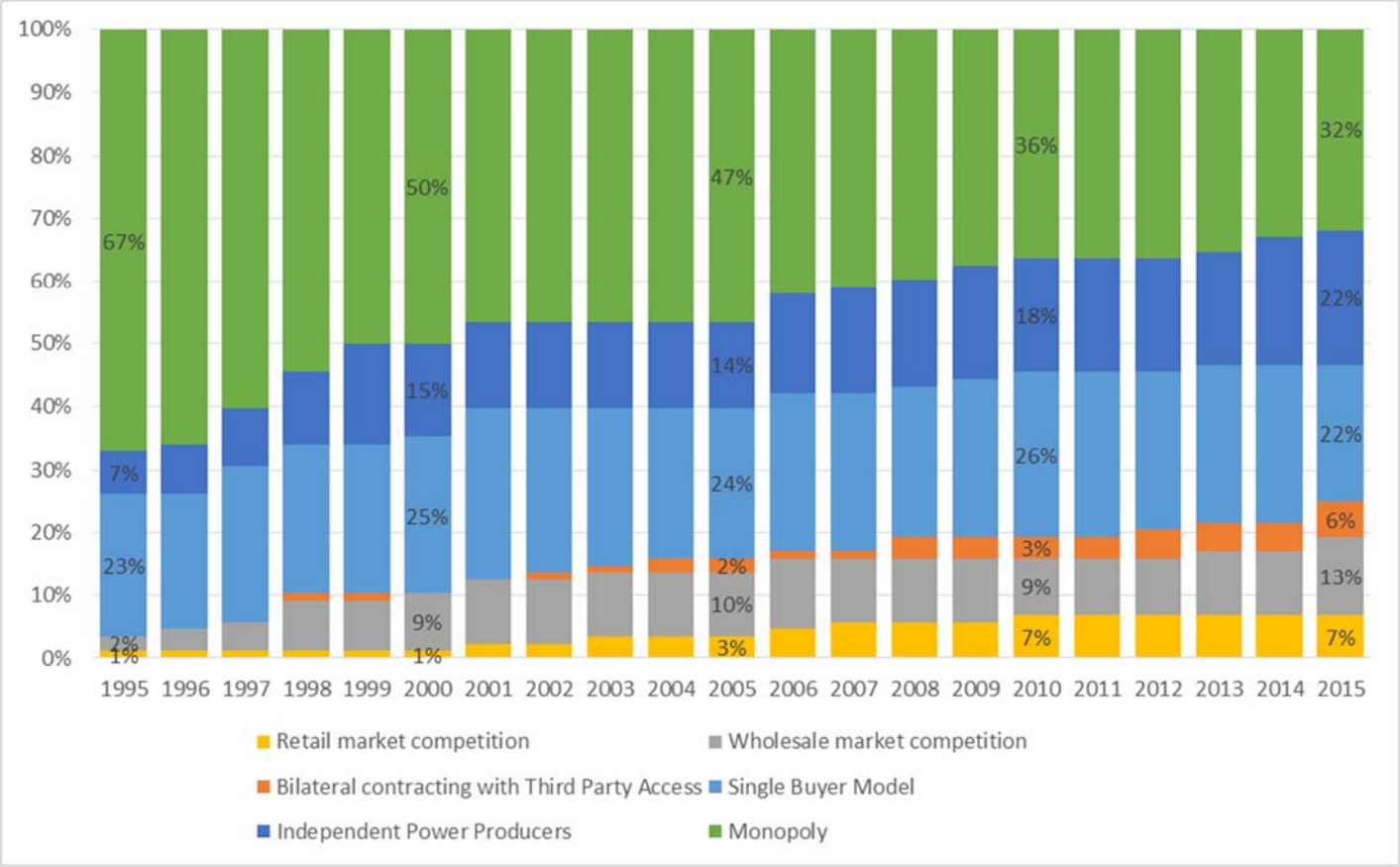
Figure 5.1: Definition of stages of competition reform

Model classification	Sector structure characteristics
1. Monopoly	A single company has responsibility for generation, transmission, distribution and retail sales
2. Independent Power Producers	As above, but in addition private independent power producers (IPPs) are allowed to compete for the right to generate power
3. Single Buyer Model	A single wholesale power trader, which may be: (i) a transmission entity, (ii) a distribution entity or (iii) a combined transmission and distribution/retail entity, as long as it has no direct interest in generation. The single wholesale power trader purchases power from all generators, and sells to all distributors as well as any large wholesale customers.
4. Bilateral contracting with Third Party Access	A transmission operator or some other entity acts as a single buyer of power for the majority of retail customers, while allowing large customers to purchase power directly from various generators, by wheeling power through the grid on a non-discriminatory basis
5. Wholesale market competition	Power market of multiple generation companies selling directly to multiple distribution companies and other large customers, supported by an independent system operator and market operator. Small customers can buy only from their local distributor.
6. Retail market competition	As above, but allowing all customers – large and small – to purchase power directly from retail companies, entailing prior vertical unbundling of distribution and retail companies, with distribution companies providing open access wheeling services to numerous power retailers

Competition reform is defined as movement along a spectrum from complete monopoly to full retail competition and takes place in a number of distinct stages (Figure 5.1). The first reform step involves opening competition for the right to build and operate new generation plants supported by long term power purchase agreements with the monopoly utility. The second stage involves the creation of a single buyer entity that has a monopoly on the sale of power to end users, but which a number of generation companies compete to supply. The only real difference between this and the earlier stage is that the single buyer model typically involves a prior restructuring exercise to separate generation from transmission and distribution, so that the single buyer avoids the conflict of interest entailed by holding its own generation assets. The third stage, which should be preceded by full vertical unbundling of the power sector, allows direct bilateral contracting of power between generators and large customers (such as distribution companies or major industries), and is made possible by the principle of non-discriminatory Third Party Access to the national grid. The fourth stage moves beyond bilateral contracting by creating a wholesale power market or exchange that typically allows both spot purchases and longer term contracts, and may

include markets for ancillary services, such as spinning reserves. The demand-side of the wholesale market is initially confined only to distribution companies and large customers, but in the fifth and final stage may be opened to all customers in the form of retail competition. The latter entails further vertical unbundling of distribution and retail functions, so that distribution utilities act rather like transmission utilities, primarily as providers of wheeling services, and all commercial activities are conducted by retail companies that do not own network infrastructure. The distinction between wholesale and retail competition is a little blurred, since a number of countries have legislated retail competition without vertical unbundling of distribution and retail activities, and the actual thresholds for retail competition vary across countries. The description of competition measures in this chapter is exclusively based on the existence of a legal provision to support a particular stage of competition; no judgement is made about the actual functioning of competition in each market.

Figure 5.2: Percentage of developing countries adopting varying degrees of competition over time



Source: Own elaboration based on RISE 2015 database and Besant-Jones 2006

As of 1995, just over 30 percent of developing countries had pursued some degree of competition reform, and this doubled to around 70 percent in the 20 years to 2015 (Figure 5.2). The proportion of countries applying a Single Buyer Model remained fairly constant at about 20-25 percent throughout this period. However, the share of countries allowing Independent Power Producers grew steeply, as did the prevalence of various forms of competition in the market. By 2015, countries introducing competition

were quite evenly divided between Independent Power Producers, the Single Buyer Model and various forms of competition in the market. Of these, wholesale power markets are the most prevalent and can be found in more than 10 percent of countries.

Nonetheless, power sector competition has spread far wider and gone much deeper in the developed world than in the developing world (Figure 5.3). Whereas about 70 percent of developing countries have implemented some degree of competition, this falls well short of the developed world where competition is almost universal, affecting 96 percent of countries (Figure 5.3). Not only is competition more widespread in the developed world, but it has also been introduced in more advanced forms. The percentage of developed countries with some form of power market, at almost 80 percent, is around four times as high as the percentage of developing countries, which stands at just 20 percent. While the proportion of developed countries practicing more modest forms of competition, such as Independent Power Producers and the Single Buyer Model, is only 17 percent, the share is more than twice as high among developing countries at 41 percent. One possible interpretation is that developing countries are simply moving more slowly in implementing power sector reforms. An alternative view is that they have settled into an intermediate stage of reform, without any interest in going further.

The vast majority of developed countries that have introduced full retail competition are EU members and their evolution towards power markets is driven by EU Directives. Indeed, the only developed countries outside of the EU membership that have established full retail competition for electricity have been Australia, Canada, the Russian Federation, Switzerland and the United States. In the developing world, there are just a dozen countries that have introduced retail competition for electricity; although this may not always be fully operative. They are concentrated in Latin America (Argentina, Brazil, Chile, Guatemala, Peru) and Eastern Europe (Kazakhstan, Romania, Russia, Turkey, Ukraine), as well as Asia (India, Philippines).

Figure 5.3: Comparison of developed and developing countries regarding extent of competition as of 2015

Percentage of countries	Developed countries	Developing countries
Monopoly**	4	30
Some degree of competition of which:	96	70
• Independent Power Producers	13	22
• Single Buyer Model*	4	19
• Bilateral contracting with Third Party Access	0	6
• Wholesale market competition	13	8
• Retail market competition**	66	15
	100	100

Source: Own elaboration based on RISE 2015 database

** Differences are statistically significant at the 5% level

* Differences are statistically significant at the 10% level

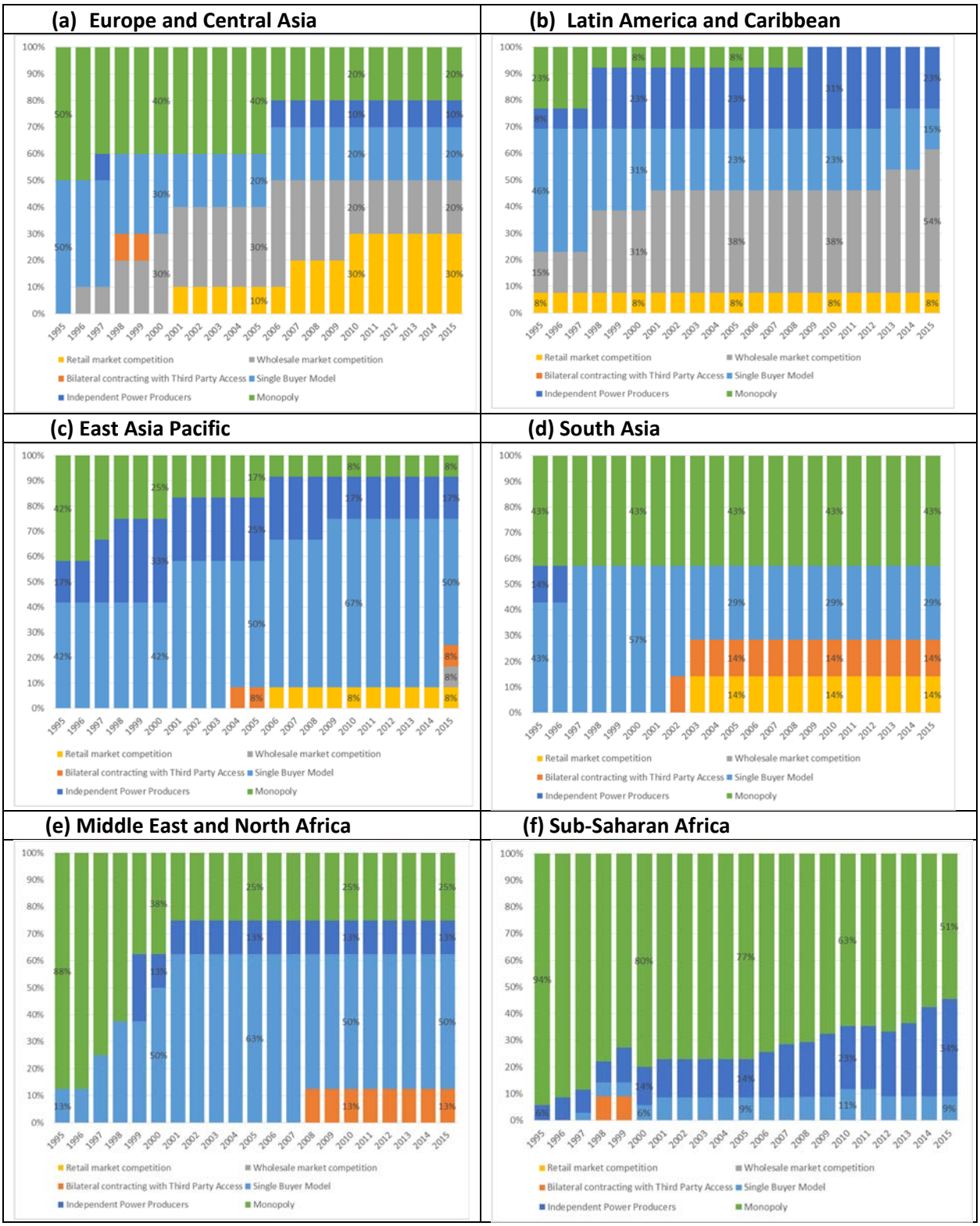
By far the earliest and deepest efforts to introduce competition occurred in Latin America & Caribbean as well as Europe, where a majority of countries currently have power markets (Figure 5.4). In these regions, the vast majority of countries had already begun the journey towards competition as of 2005, with close to half of the countries in both regions already having established a power market. During the decade

2005 to 2015, the share of countries with power markets in both regions rose slightly towards 60 percent; and in the case of Europe & Central Asia the form of competition shifted in many countries from wholesale to retail, reflecting adoption of European Union policy frameworks. Despite the predominance of power markets in these regions, there still remain a solid core of around 30 percent of countries that have remained at the earlier stages of competition with a Single Buyer Model or simply allowing Independent Power Producers. While a significant minority, 22 percent, of countries in Europe & Central Asia retained a monopolistic sector in 2015, there are no remaining monopolies in Latin America & Caribbean.

Across Asia, the decade 2005 to 2015 was one of deepening competition in the electricity sector, but with a marked preference for intermediate models rather than full power markets (Figure 5.4). While a majority of countries in South Asia and East Asia Pacific had already begun the competition process by 2005, in almost all cases this had only involved the first stage of Independent Power Producers. During the following decade, there was strong uptake of the Single Buyer Model in about 30 to 50 percent of Asian countries. Overall, as of 2015, about 70 percent of Asian countries are practicing some intermediate form of competition including Independent Power Producers, Single Buyer Model and Third Party Access. Only a minority of countries, less than 30 percent, have gone as far as introducing power markets. Monopolies remain rare in East Asia Pacific, but are still quite prevalent in South Asia.

The story is very different for Africa and the Middle East (Figure 5.4). Neither of these regions has any wholesale power markets. In the Middle East, about 75 percent of countries had undertaken early stages of competition as of 2005, with a preference for Independent Power Producers and the Single Buyer Model. The only further movement on competition that has taken place in any Middle Eastern country during the subsequent decade 2005 to 2015 has been the adoption of bilateral contracting in several countries. Sub-Saharan Africa began in 2005 with a monopolistic power sector in around 75 percent of countries. In the following ten years, the prevalence of monopolistic sectors has dropped markedly towards 50 percent. Among African countries adopting competition, the vast majority have only moved as far as introducing Independent Power Producers, with much more limited adoption of the Single Buyer Model.

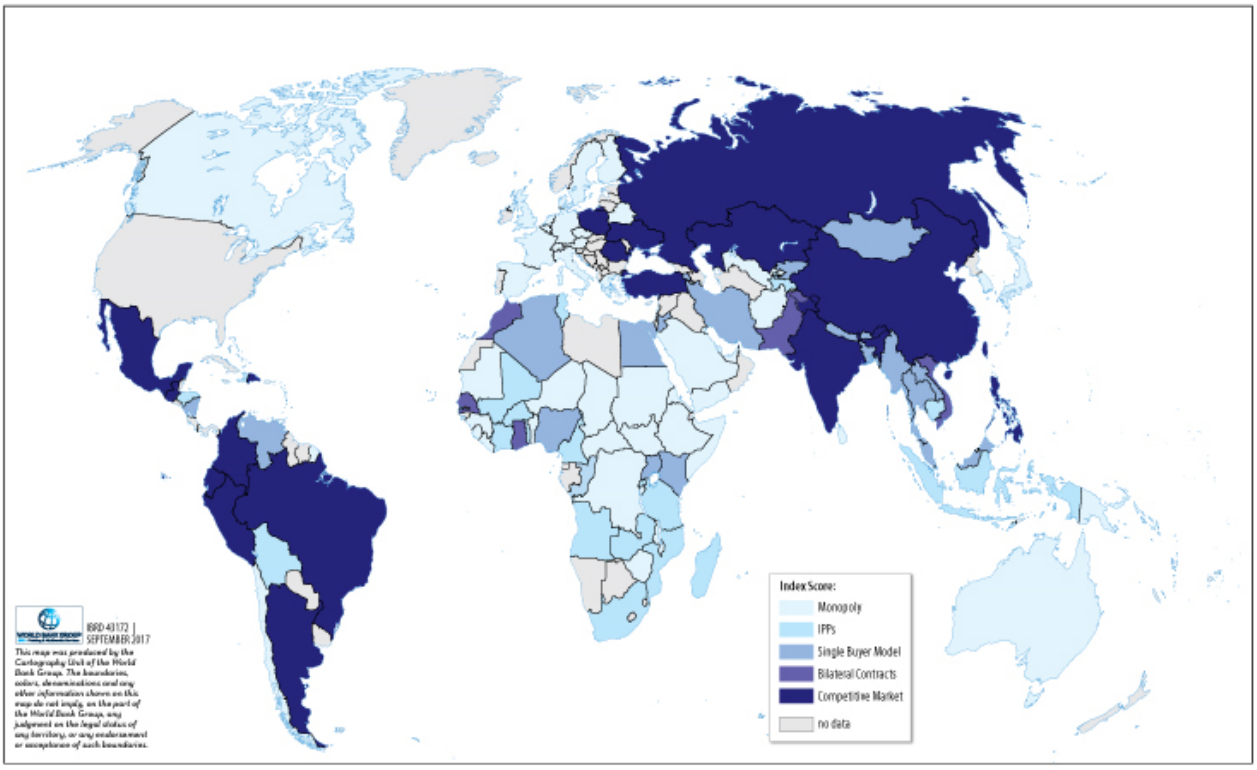
Figure 5.4: Percentage of developing countries adopting varying degrees of competition over time and by region



Overall, it is striking that relatively few of the world's largest emerging economies have introduced full power markets (Figure 5.5). A map of power sector competition for 2015 confirms the prevalence of power markets across Europe & Central Asia as well as in South America, with the notable exceptions of Bolivia and the República Bolivariana de Venezuela. Within southern and eastern Asia, India and the Philippines stand out as two of the few countries that have established power market competition. In addition, in 2015 power markets were conspicuous by their absence in a number of the world's largest emerging economies, including Mexico in Latin America, Indonesia in Asia, as well as the Arab Republic of Egypt and South Africa in Africa.

The extent of power sector competition is strongly correlated with country characteristics (Figure 5.6). Both the willingness to embark on power sector competition, as well as the extent to which competition progresses, are strongly and significantly influenced by a country's income group and power system size, as well as fragility status and rule of law. Whereas around 25 percent of middle-income countries have introduced wholesale power markets, prevalence among low-income countries is only 4 percent. Similarly, while 43 percent of countries with power systems under 1 GW still retain monopolies, the fraction is only 15 percent in countries with 1-5 GW. Non-fragile states are about twice as likely to embark on IPP competition as fragile states. In addition, another factor markedly affects the prevalence of IPPs and Single Buyer Models, even if they do not seem to influence the uptake of stronger forms of competition, namely political economy dynamics. Countries with competitive political systems entailing multiple centers of power are eight times less likely to establish a competitive market as countries whose politics are dominated by a single interest group with strong centralized power.

Figure 5.5: Competition Index by country across the developing world as of 2015



Source: Own elaboration based on RISE 2015

Almost half of developing countries halted power sector competition during the decade 2005 to 2015. In order to understand the extent to which there continues to be momentum around competition in the power sector, Figure 5.7 plots the extent of competition in 2005 against the extent of competition in 2015. A first group of countries – located along the diagonal of the matrix – and comprising nearly half of all countries in the sample adopted no additional reform on competition between 2005 and 2015. It is striking that almost all these countries stopped at the very early stages: either with a monopoly or with Independent Power Producers.

Figure 5.6: Prevalence of competition reform measures across country groupings

Percentage of countries adopted as of 2015	Monopoly	Independent Power Producers	Single Buyer Model	Bilateral contracting with Third Party Access	Wholesale market competition	Retail market competition	
By income group							
LIC	33*	29*	23	9	4**	2	100
LMIC	25*	11*	14	4	24**	22	100
UMIC	0*	17	17	0	27**	39	100
By system size							
<1GW	43*	30*	15*	5*	5	2	100
1-5GW	15*	25	30*	15*	10	5	100
5-10GW	20	0*	40*	0*	0	40	100
10-20GW	33*	11	22	11	11	12	100
>20GW	8*	8*	8*	0*	25	51	100
By political economy							
Dominant	24	29	32**	8	3*	4	100
Intermediate	24	18	24**	6	12	16	100
Competitive	22	17	4**	4	17*	36	100
By rule of law							
High rule of law	31	0**	31	8	0	30	100
Low rule of law	28	26**	18	7	9	12	100
By fragility status							
Non-FCS	29	28*	16	4	9	14	100
FCS	28	14*	23	10	7	6	100
By oil exporting status							
Exporter	20	25	13	6	19	17	100
Importer	12	22	22	12	17	15	100
Total	**30**	**22**	**19**	**6**	**8**	**15**	**100**

Source: Own elaboration based on RISE 2015 database

****** Differences are statistically significant at the 5% level

***** Differences are statistically significant at the 10% level

Some 40 percent of developing countries continued to pursue competition measures during the last decade. A second group of countries – placed in the upper triangle of the matrix – and representing 43 percent of all countries in the sample continued to pursue competition taking one or more reform steps between 2005 and 2015. About half of these countries took only one reform step at the early stages of the process, moving either from Monopoly to Independent Power Producers or from Independent Power Producers to the Single Buyer Model. However, countries that had already launched significant reforms on competition by 2005 had generally completed the process and gone all the way to retail competition by 2015.

Only a handful of countries reversed competition measures. A third group of countries – located in the lower triangle of the matrix – and consisting in less than 8 percent of all countries in the sample had reversed competition reforms between 1995 and 2005. There are in fact only three countries in this category: Albania, Bolivia and Burkina Faso.

Figure 5.7: Evolution of competition reforms from 2005 to 2015

2015 Sector Structure

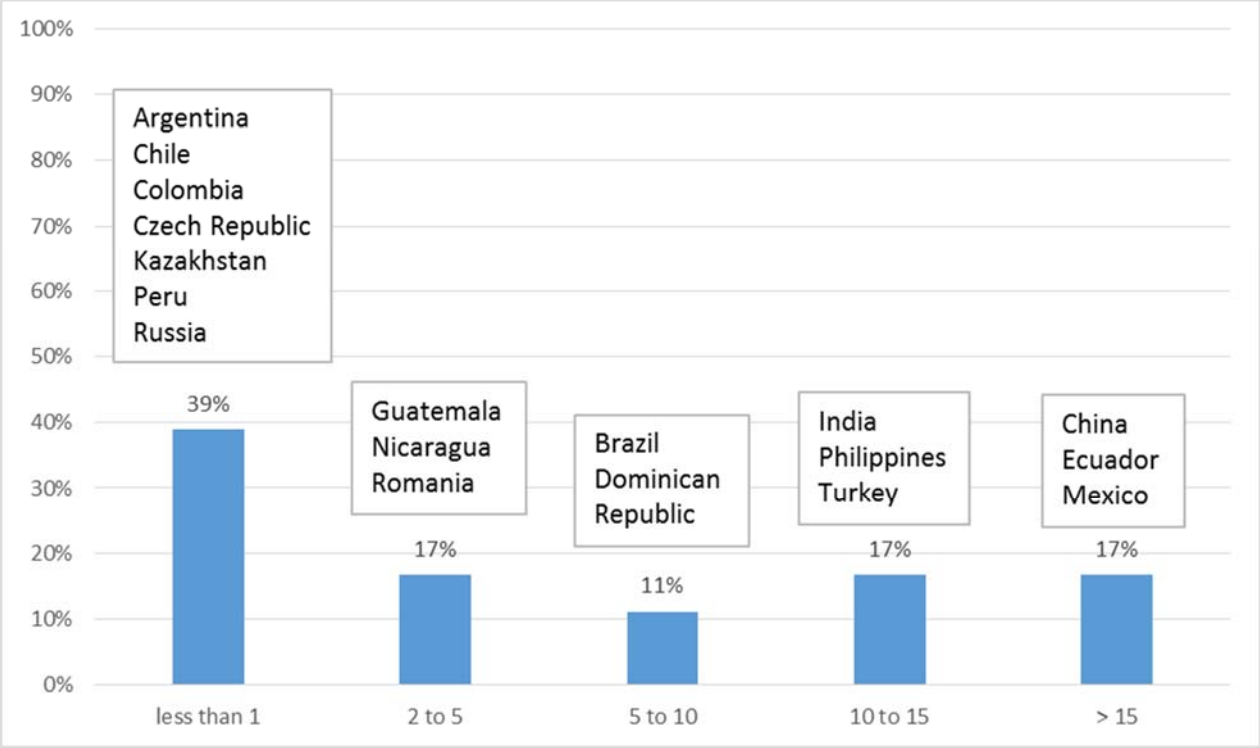
2005 Sector Structure

Percentage of countries	Monopoly	Independent Power Producers	Single Buyer Model	Bilateral contracting with Third Party Access	Wholesale market competition	Retail market competition	
Monopoly	22.5**	12.4	4.5**	1.1**	1.1**	0.0**	41.6
Independent Power Producers	2.2	12.4*	3.4	3.4	1.1	1.1	23.6
Single Buyer Model	0.0	1.1	4.5	0.0	0.0	2.2	7.9
Bilateral contracting with Third Party Access	0.0	0.0	0.0	0.0	1.1	2.2	3.4
Wholesale market competition	0.0	0.0	0.0	0.0	2.2	9.0	11.2
Retail market competition	0.0	0.0	0.0	0.0	4.5	7.9	12.4
	24.7	25.8	12.4	4.5	10.1	22.5	100.0

Source: Own elaboration based on RISE 2015 database
** Differences are statistically significant at the 5% level
* Differences are statistically significant at the 10% level

A majority of countries that reached at least wholesale competition in 2015 took less than five years to do so (Figure 5.8). For over half of the 19 countries that attained competition, the time elapsed between the initial introduction of some competition (the introduction of IPPs) and the establishment of a wholesale power market was up to 5 years. Still, over a third of countries took longer than 10 years to reach wholesale competition after taking their first competition step.

Figure 5.8: Time elapsed between adoption of IPPs and Wholesale Competition (years)



6. Private Sector Participation Reforms

By introducing the profit motive, private sector participation creates incentives for efficiency and allows businesses to be run according to commercial principles. The existence of natural monopoly in the power sector, as well as the strategic nature of the industry, has in the past been used to make the case for public ownership of power utilities. Nevertheless, public utilities are not always managed with sufficient decision-making and financial autonomy to allow for efficient operation. As a result, costs may escalate and quality decline. For this reason, private sector participation has sometimes been put forward as a way to change managerial incentives towards profits, cost control and customer orientation. Private sector participation is strongly linked to the other components of reform. Many of the principles of regulation rely on the regulated company following a profit motive that will make it responsive to regulatory incentives. Similarly, the establishment of a competitive market is typically premised on the existence of commercial incentives to drive competition among market participants.

Private sector participation can be implemented to varying degrees along a number of dimensions. First, the *scope* of private sector participation varies according to the extent of the electricity supply chain affected. Private sector participation may initially be undertaken only in one segment of the electricity supply chain, often generation, but not necessarily in another, such as distribution. Eventually, the private sector may be brought in along the entire electricity supply chain. The analysis here will distinguish between these three cases (Figure 6.1). Second, private sector participation may affect some companies in a particular supply segment, but not all. For example, a country may privatize two of its generation plants, but leave the other three under public ownership. The *coverage* of private sector participation may be gauged for generation according to the percentage of generation capacity that is under private control, and for distribution by the percentage of distribution companies that are under private control. The index does not include transmission, because there is no clear policy prescription in favor of private sector participation, given that the grid is the ultimate natural monopoly and provides many public good services to the system. Box 1 proposes a way of integrating information on both dimensions of private sector participation into an index that provides a measure for the extent of private sector participation in a country. (The index does not, however, consider the instrument used for private sector participation, despite the fact that contractual forms such as concessions arguably represent a lesser degree of private sector participation than full divestiture.)

Figure 6.1: Definition of scope of private sector participation reform

Model classification	**Sector structure characteristics**
1. Public ownership	All generation and distribution companies are under public ownership and management
2A. Some degree of private sector participation in generation only	At least one generation company has been privatized, or there is at least one public-private partnership for power generation, typically an Independent Power Producer. The precise extent of private sector participation in generation can be gauged by calculating the share of installed generation capacity that is under private control. But there is no private sector participation in distribution.
2B. Some degree of private sector participation in distribution only	At least one distribution company has been privatized, or there is at least one public-private partnership for power distribution, typically a management contract or concession. The precise extent of private sector participation in distribution can be gauged by calculating the percentage of distribution companies in the country that are under private control. But there is no private sector participation in generation.
3. Some degree of private sector participation in both generation and distribution	At least one generation company and at least one distribution company has been privatized or has some form of private sector participation.

Preferred modalities of private sector participation vary significantly across the electricity supply chain. This varies from 14 percent in transmission to 63 percent in generation, with distribution falling in between at 40 percent. Almost all modalities of private sector participation – including management

contracts, concessions, Greenfield contracts and divestitures – have been applied to all segments of the energy supply chain; however, their relative prevalence differs significantly. For generation, Greenfield contracts for Independent Power Projects are more than twice as likely to be adopted as divestitures or concessions, while management contracts are barely used at all. For distribution, divestitures and concessions are significantly more prevalent than management or Greenfield contracts. For transmission, divestitures, concessions and Greenfield contracts have been used to a similar extent, while management contracts are rarely adopted.

Figure 6.2: Prevalence of different forms of private sector participation along the electricity supply chain

Percentage of countries with	Generation	Transmission	Distribution	Any of These
Management contracts	2	0*	8*	10
Concessions	18**	5**	16	39
Greenfield contracts (BOT/BOO)	57**	9**	3**	69
Divestiture	29**	7**	25**	61
Any of These	63	14	40	70

Source: Own elaboration based on World Bank's Private Participation in Infrastructure 1990-2015 databases

****** Differences are statistically significant at the 5% level
***** Differences are statistically significant at the 10% level

Box 1: Index for measuring the extent of private sector participation reform in a country

Since there are multiple dimensions to private sector participation reforms, an index is needed to aggregate over all of these dimensions and get a comparative measure of the extent of reform effort in any given country. The table below explains how the scores would be created for the two dimensions of private sector participation reform, namely: scope or how much of the electricity supply chain is affected and coverage or what share of business units at each stage of the electricity supply chain are affected.

Scope	• 50 percent weighting for private sector activity in generation (G) • 50 percent for distribution for private sector activity in distribution (D)
Coverage (c)	• Percentage of generation capacity with private sector participation • Percentage of distribution utilities with private sector participation

Based on these ratings, a summary Private Sector Participation Index can be computed for each country and over time, based on the following formula: where *c* represents the share of the segment that is privatized; *G* is the index for generation; *D* is the index for distribution; *i* indexes the country; and *t* the time period. The index ranges from 0 if no private sector participation reform has taken place to 100 if all generation and distribution companies have experienced private sector participation.

$$Private\ Sector\ Participation\ Index_{it} = 0.5 * {c^G}_{it} + 0.5 * {c^D}_{it}$$

A similar share of developed and developing countries has explored private sector participation, albeit to significantly different degrees (Figure 6.3). Overall, the percentage of countries that have implemented some degree of private sector participation in either generation or distribution hovers around 70 percent for *both* developed and developing countries, with developed countries being only a few percentage points ahead. This is the only dimension of reform for which the uptake has been similar between developed and developing countries. *Yet the extent of private sector participation for those countries that have explored it is markedly higher among developed countries than for developing countries*, with OECD countries receiving a score of 50 and developing countries scoring 33 in the Private Sector Participation Index for generation.

Figure 6.3: Comparison of developed and developing countries regarding private sector participation as of 2015

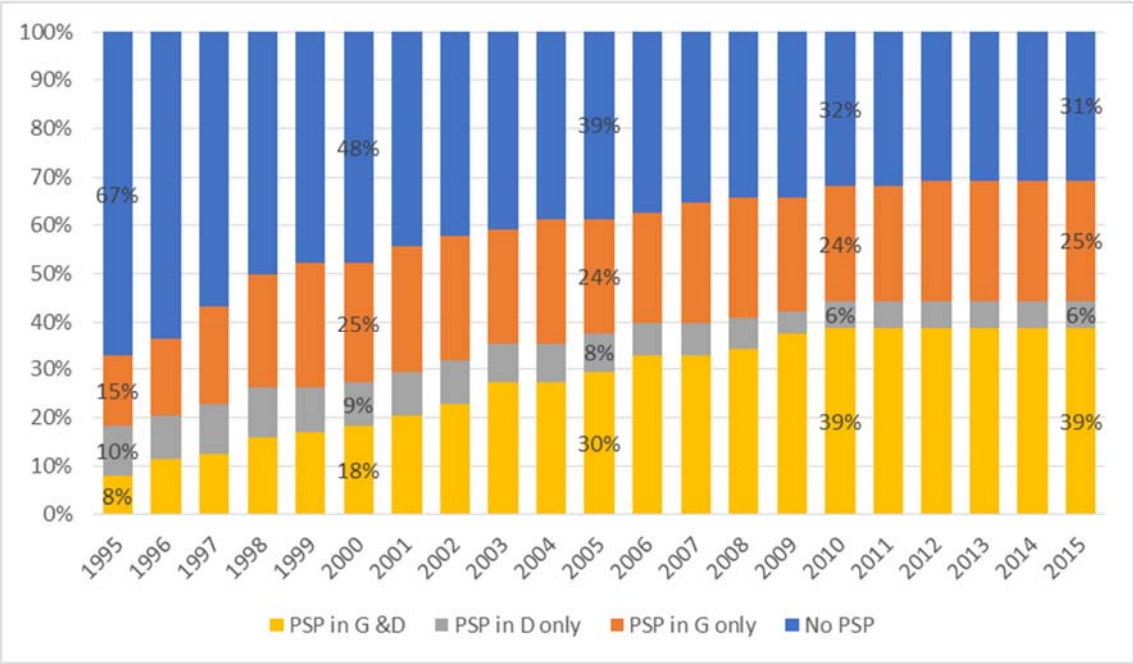
Percentage of countries/Index	Developing Countries	Developed Countries
Percentage of countries with no PSP	31	26
Private Sector Participation Index for		
• Generation	33*	50*
• Distribution	24	Lack of PPI data
• Generation and Distribution	29	

Source: Own elaboration based on RISE 2015, Platts and PPI 1990-2015 databases

** Differences are statistically significant at the 5% level

* Differences are statistically significant at the 10% level

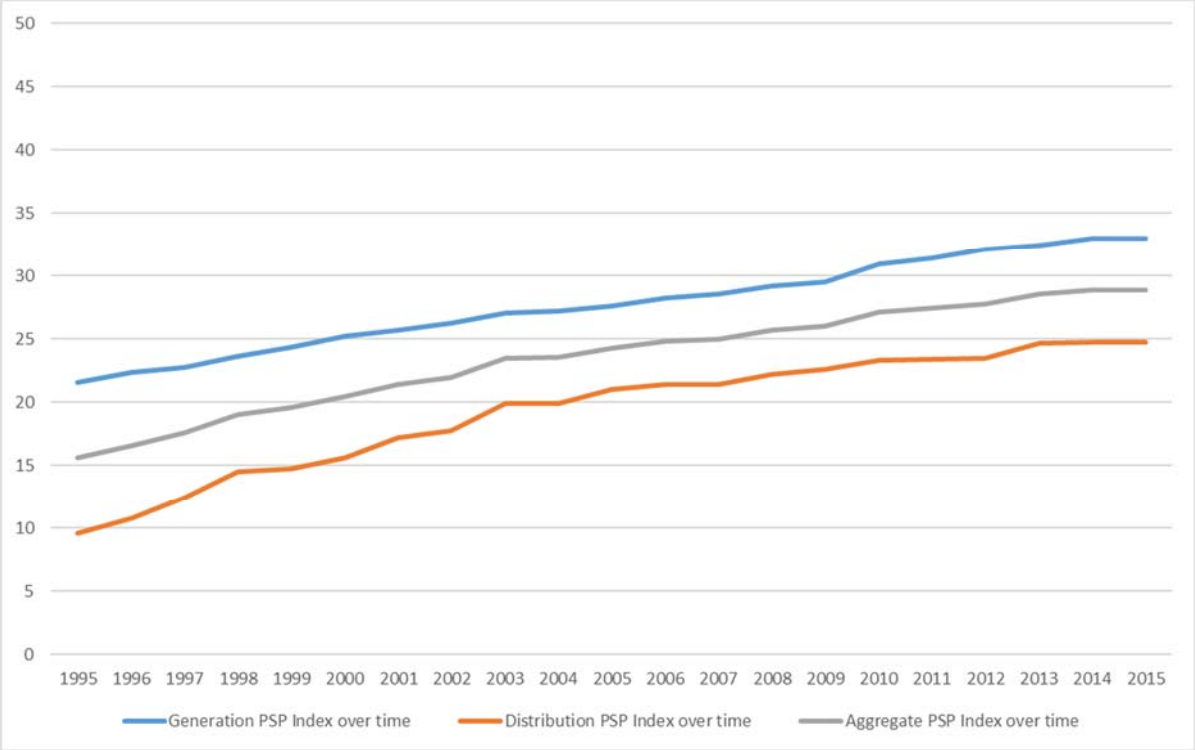
Figure 6.4: Percentage of developing countries adopting some degree of private sector participation over time



Private sector participation reforms began relatively early in the 1990s spreading rapidly to a wide range of countries, but their diffusion has slowed considerably since 2005 (Figure 6.4). From a tiny base in 1990, the number of countries undertaking some form of private sector participation grew very steeply reaching 50 percent by the year 2000. During the subsequent decade, the percentage of countries undertaking such reforms rose more slowly, but had nonetheless climbed to 70 percent by 2010. However, over the last five-year period, 2010 to 2015, there has been no further spread of private sector participation reforms to additional countries. Of the 70 percent of countries undertaking some form of private sector participation, only 40 percent took private sector participation measures affecting both the generation and distribution sectors. Overall, private sector participation in generation was considerably more prevalent, affecting about 65 percent of countries as against only 45 percent for distribution.

Although the majority of countries have undertaken some form of private sector participation, the Private Sector Participation Index highlights that the scope of these efforts is quite limited (recall Box 1). The index runs on a scale from 0 (meaning no country has had any private sector participation in the power sector) to 100 (meaning that all countries have introduced private sector participation throughout the totality of their power sector). Within this range, the average score for private sector participation globally has climbed from around 16 to 28 during the last 20 years. Overall, the generation segment at just under 25 scores 10 percentage points ahead of the distribution segment on the reform index at just under 35, although the two have been evolving in parallel (Figure 6.5). These scores serve to highlight that even in countries undertaking some private sector participation measures the scope of these measures may be quite limited (Figure 6.4).

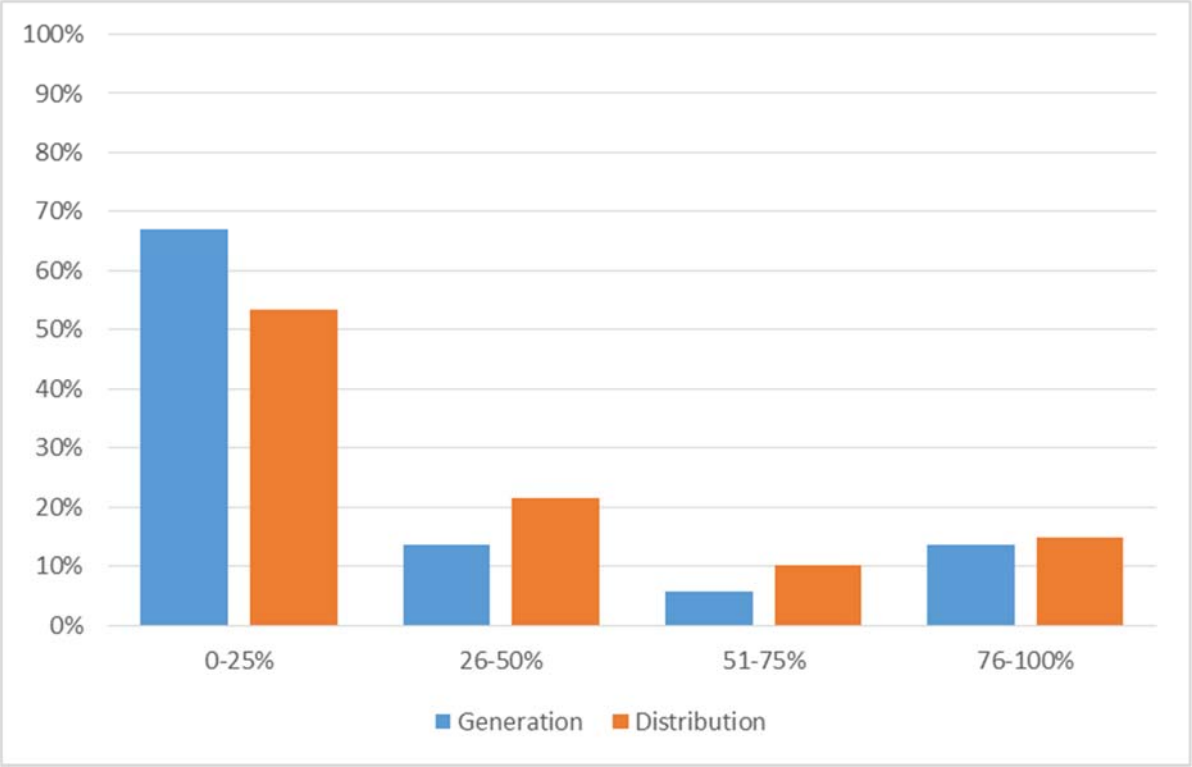
Figure 6.5: Private Sector Participation Index over time, by sub-sector, 1995 - 2015



Source: Own elaboration based on PPI and Platts 1995-2015 databases, and RISE project

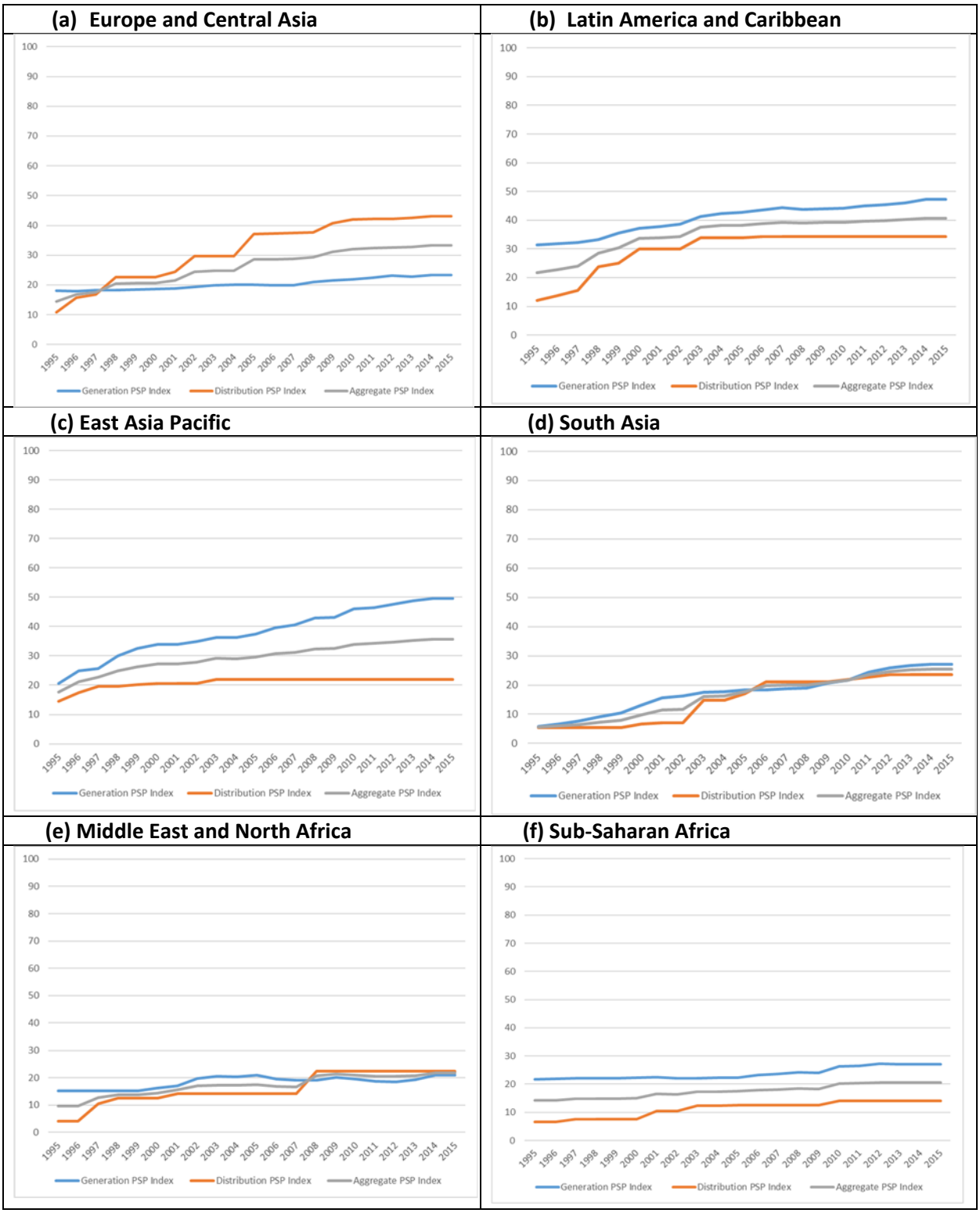
When private sector participation occurs, the vast majority of countries privatize less than a quarter of their generation and distribution sectors (Figure 6.6). Even when countries undertake private sector participation in their power sectors, it is comparatively rare for them to privatize the entirety of their generation and distribution segments, but typically only a small subset of companies. As of 2015, fewer than 20 percent of countries had opened more than 75 percent of their generation or distribution segments to private sector participation. The share of the sector that has welcomed private actors tends to be even lower for distribution than for generation.

Figure 6.6 Frequency distribution of share of PSP in generation (% of MW) and distribution (% of companies), 2015



In all regions but Africa, the vast majority of countries have had some experience with private sector participation, mainly in generation (Figure 6.7). As of 2015, in Latin America & Caribbean, Europe & Central Asia and South Asia the majority of countries have introduced some degree of private sector participation in both generation and distribution. In fact, *all* countries of Latin America & Caribbean have had some degree of private participation in their power sectors, and 70 percent did so in both generation and distribution. In Europe & Central Asia, the pattern is bipolar with 70 percent of countries pursuing private sector participation in both generation and distribution and the remaining 30 percent not pursuing it at all. In East Asia Pacific and Middle East & North Africa, the majority of countries have engaged the private sector only in generation. In Sub-Saharan Africa some 50 percent of countries have not engaged the private sector at all in generation or distribution.

Figure 6.7: Private Sector Participation Index for developing countries over time and by region



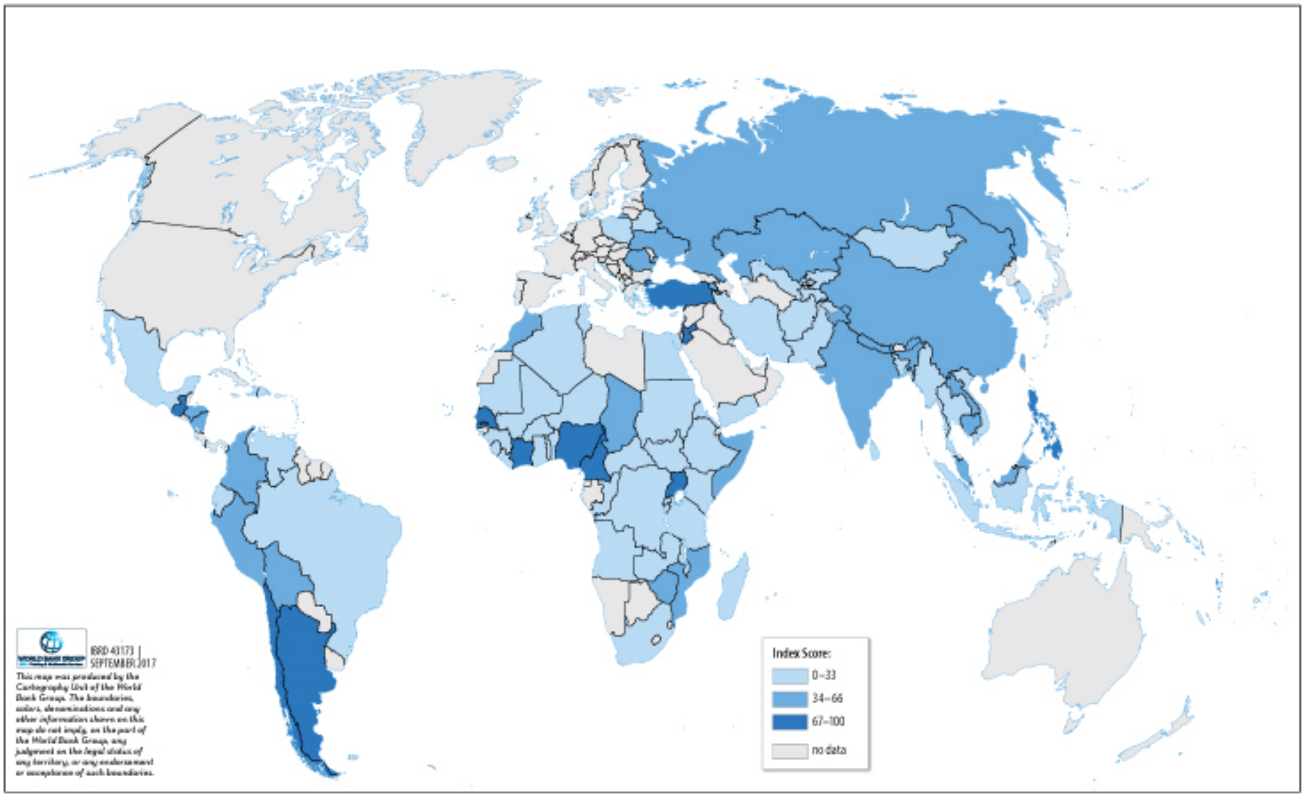
Private sector participation in transmission has been much more limited. Finally, private sector participation in transmission was adopted early in Latin America and had reached 40 percent of countries by 2005, where it has subsequently remained. Starting about five years later than Latin America, South Asia, particularly India, has also seen significant experimentation with private sector participation in transmission. In particular, majority concessions and Greenfield contracts have occurred in Argentina, Bolivia, Brazil, Cambodia, Chile, India, Peru and the Philippines. Minority divestitures and Greenfield contracts have taken place in Bangladesh, Brazil, Colombia, India, Romania and Zambia. In other regions, the level of interest has been much lower and much later, and almost nonexistent in Sub-Saharan Africa and the Middle East and North Africa.

There is a clear geographic concentration of countries that introduced private sector participation in both generation and distribution segments. These include much of South America, Europe & Central Asia, South Asia and East Asia Pacific. Sub-Saharan Africa is the region with the highest prevalence of countries that either did not embark on private sector participation or did so only for distribution or (more commonly) the generation segment. In South East Asia, also, private sector participation has been concentrated in the generation segment in all countries except for the Philippines.

Uptake in private sector participation varies significantly with important country characteristics (Figure 6.9). Lower income groups and smaller systems are almost half as likely as their counterparts to embark on any form of private sector participation. When looking at the nature of private sector participation, again larger power systems and higher income countries score higher on the distribution index, while in the generation segment countries at the ends of the political economy spectrum achieve higher scores than more intermediate systems. Surprisingly, fragile states were associated with greater percentages of private sector participation in the power sector than non-fragile countries, suggesting that overall fragility has not significantly prevented the participation of the private sector in generation.

More than any other reform, private sector participation has proved to be subject to significant reversals, particularly in the distribution segment. Private sector participation in the power sector has been particularly affected by cancellations and reversals triggered either by government or by the private sector itself. Cancellations have affected 40 transactions in 20 developing countries. These reversals have been particularly prevalent in the distribution segment and in the first decade of reform. The largest absolute number of reversals took place in Latin America, but the failure rate has been highest in Sub-Saharan Africa (see Box 2 and Annex 2 for further details).

Figure 6.8: Private Sector Participation Index by country across the developing world as of 2015



Source: Own elaboration based on RISE and PPI 2015 databases

Figure 6.9: Average Private Sector Participation Index by country grouping as of 2015

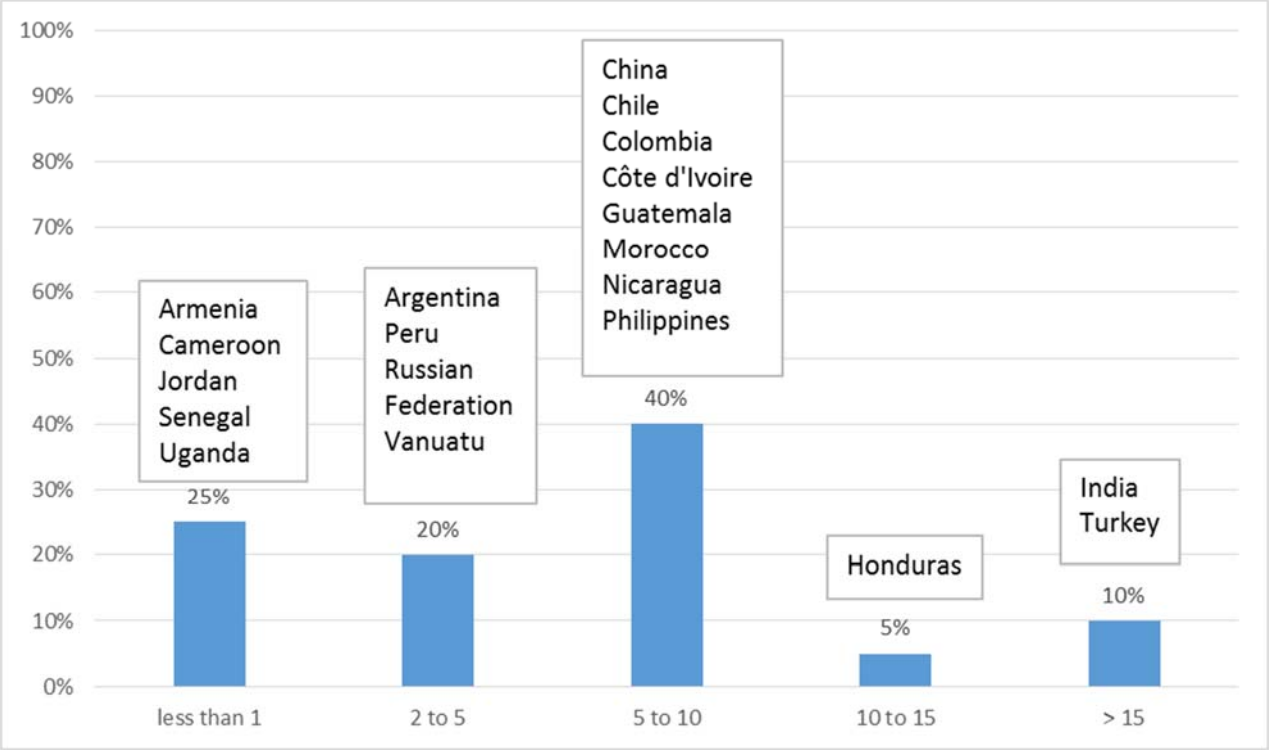
Percentage of countries with/Private Sector Participation Index	No PSP	Generation PSP Index	Distribution PSP Index	Aggregate PSP Index	
By income group					
LIC	37*	32	16**	24*	
LMIC	21*	34	35**	34*	
UMIC	0*	50	43**	47*	
By power system size					
<1GW	45*	29	17*	23	
1-5GW	20*	41	22*	31	
5-10GW	20*	47	33*	40	
10-20GW	11*	32	19*	26	
>20GW	15*	31	49*	40	
By political economy					
Dominant	26	37*	18	27	
Intermediate	24	33*	26	30	
Competitive	22	35*	32	34	
By rule of law					
High rule of law	31	39	38	38	
Low rule of law	30	32	21	27	
By fragility status					
FCS	30	39*	24	31	
Non-FCS	29	27*	23	25	
By oil exporting status					
Importer	25	33	27	35	
Exporter	15	44	37	35	
Total	**31**	**33**	**24**	**19**	

Source: Own elaboration based on RISE 2015, Platts and PPI 1990-2015 databases

****** Differences are statistically significant at the 5% level
***** Differences are statistically significant at the 10% level

In nearly half of all 20 countries that introduced private sector participation, at least 50 percent of their generation and distribution segments spent less than 5 years on the process (Figure 6.10). Another 40 percent of countries took between 5-10 years while only 15 percent took longer than 10 years. The time lapse involved in fully implementing private sector participation seems to be considerably shorter than that found for market competition.

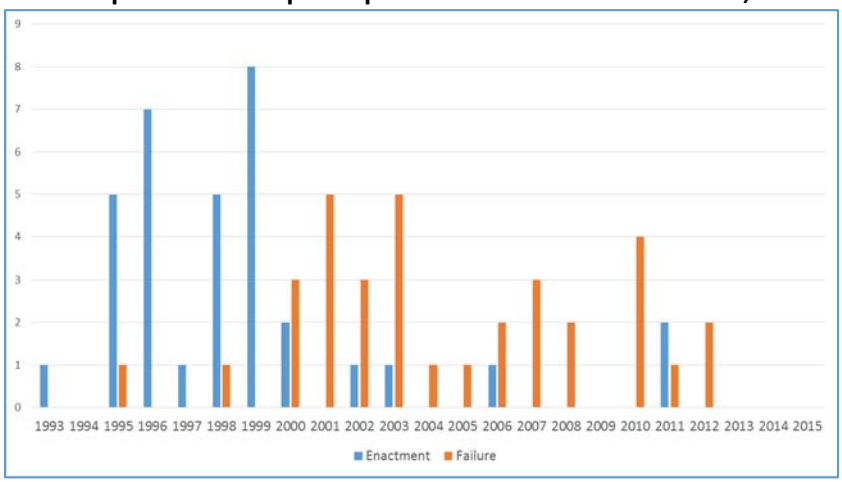
Figure 6.10: Time elapsed between first private sector participation contract and private sector participation in 50% of generation and distribution (years)



Box 2: When Private Sector Participation Fails

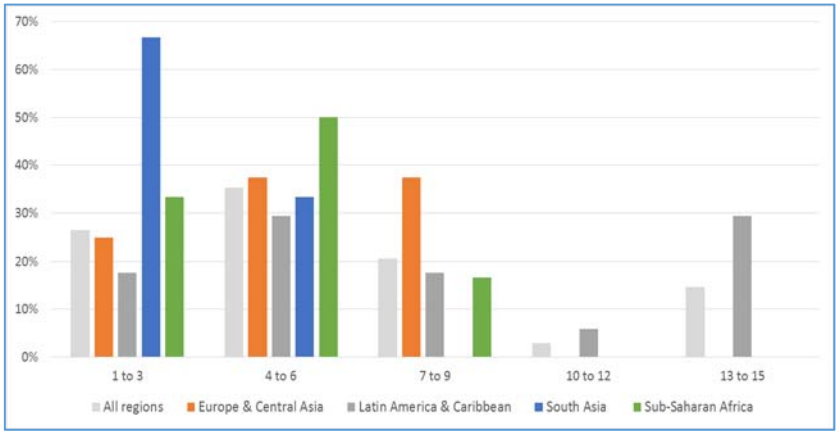
Private sector participation is by no means irreversible. During the last 25 years, some 20 developing countries have undertaken premature cancellation of arrangements for private sector participation, affecting some 40 transactions in all. Details of all identified cancelled private sector participation transactions can be found in the Annex to this paper. The trigger event for the cancellation was typically either a dispute with the private operator, some kind of shock affecting the financial equilibrium of the private operator, or a change of government. The majority of documented cancellations were instigated by government, often in the form of renationalization of divested assets, although a significant number were also prompted by the departure of the private sector due to dissatisfaction with contractual conditions. In addition, there are also many instances of countries announcing private sector participations that were never subsequently implemented. However, these are much harder to trace and it has not been possible to document all of them here.

Number of private sector participation enactments and failures, 1993 - 2015



Those cancellations that took place mainly affected private sector participations that were enacted during 1995-2000, a period during which many private sector participations took place, particularly in the distribution sector. Only three cancellations have been reported for private sector participations conducted since 2005. Cancellations were not immediate, but on average took place 5.8 years after the private sector participation. Hence, the spike in cancellations can be observed during 2000-2005.

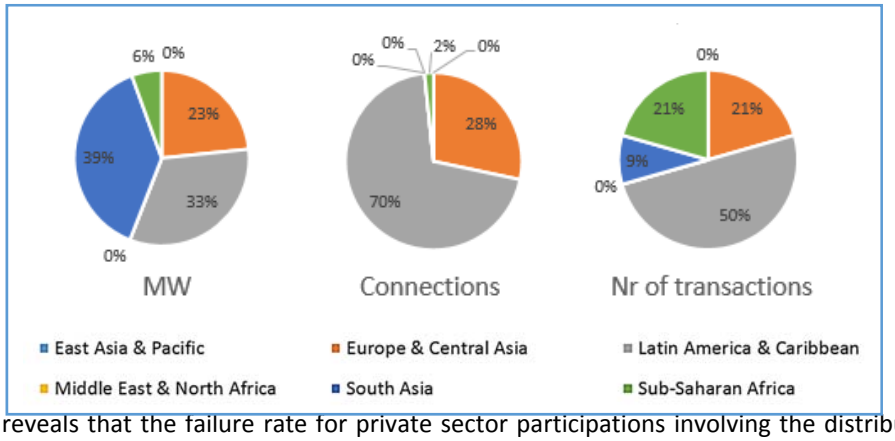
Frequency distribution of years lapsed between private sector participation and failure of private sector participation, by region



About half of the cancellations that have been recorded took place in the Latin America region that was privatizing very rapidly during this period. These included a cluster of cases in Brazil, Dominican Republic and Peru, following a dispute between the government and the private operations in the early 2000s, Argentina following the peso crisis in 2003, and Bolivia in the form of renationalization following an ideological shift of government in 2010. A significant number of cancellations are also reported for Europe and Central Asia – Albania, Kazakhstan and Russia – which were also privatizing rapidly during this period. In Sub-Saharan Africa, many of the early private sector participations saw contracts cancelled (the Comoros, The Gambia, Guinea, Mali, Togo) and divestitures renationalized (Cabo Verde, Senegal). In South Asia, the earliest Indian private sector participation in the state of Orissa encountered difficulties and was renationalized. However, no cancellations are reported in East Asia Pacific or Middle East and North Africa.

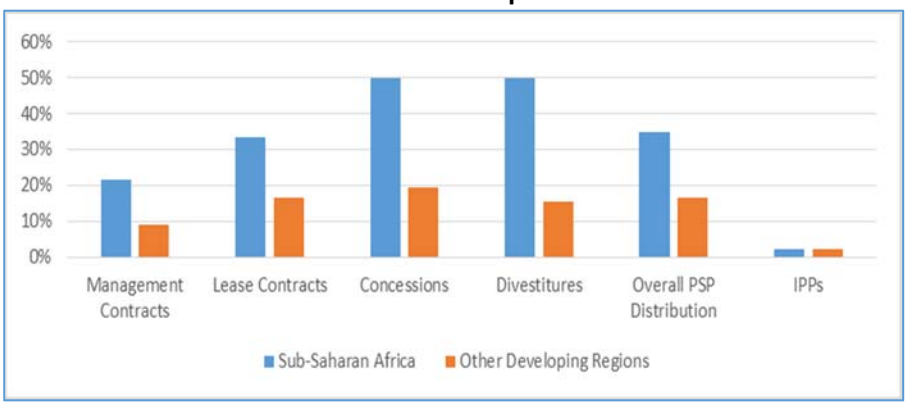
On a megawatts-affected basis, cancellations of generation private sector participations were primarily divided between Latin American and South Asia. On a connections-affected basis, the vast majority of cancellations were in Latin America. Overall cancellations affected over 5,800 MW in installed capacity and over 2.1 million connections.

Percentage of total MW and connections affected by failures of Private Sector Participation in power, 1990 - 2015, by region



Closer analysis reveals that the failure rate for private sector participations involving the distribution sector is much higher than those involving only the generation sector, and doubly so when distribution private sector participation is attempted in Sub-Saharan Africa. Whereas the cancellation rate for IPPs is as low as 1-2 percent of transactions, the equivalent cancellation rate for distribution transactions is an order of magnitude higher, exceeding 30 percent in Sub-Saharan Africa though closer to 15 percent in other developing regions. Among distribution private sector participation modalities, by far the riskiest are divestitures and concessions, which face a 50 percent failure rate in Sub-Saharan Africa or 15-20 percent elsewhere. Lease and management contracts show significantly lower cancellation rates in Sub-Saharan Africa, although the difference is not so significant elsewhere.

Failure Rate of Private Sector Participation in Power 1990-2015



Source: Own elaboration based on World Bank's Private Participation in Infrastructure Database

7. The Overall Reform Picture

The time has come to draw together the analysis of the four strands of reform to look at the overall reform picture. The discussion so far has looked individually at the diffusion of the four main power sector reform measures recommended by the "Washington consensus": regulation, restructuring, competition and private sector participation. This final section draws these four separate strands of analysis together and distills the overall conclusions that emerge from the analysis, stated in the form of a series of concluding messages. Please note that the full set of information on the uptake of reforms in each country covered can be found in Annex 1.

A. Developing country power sector reform lags substantially behind the developed world, where full reform is far from being universal

Since the beginning of the power sector reform process in the early 1990s, developed countries have systematically evolved much further towards the fullest extent of reform across almost all dimensions (Figure 7.1). The developed world is ahead both in the *breadth* of reform, which is to say the percentage of countries embarking on at least some degree of reform, and the *depth* of reform, which is to say the percentage of countries attaining the most complete stage of reform. In terms of the breadth of reform, both for restructuring and competition, the share of countries embarking on these reform processes is about 30 percentage points higher in developed countries than in the developing world. In terms of the depth of reform, the share of developed countries establishing regulatory agencies and completing the full vertical and horizontal unbundling process is about 20 percentage points ahead of developing countries. The contrast is even more pronounced in the case of power markets, where developed countries are about 70 percentage points ahead of the developing world.

The one exception to this pattern is private sector participation, where the prevalence is similar in developing and developed countries, although the depth has gone further in the latter. About 70 percent of countries in *both* the developed and developing worlds have undertaken some degree of private sector participation in either their generation or distribution segments, while about 40 percent of countries in *both* the developed and developing worlds have a private sector presence in both their generation and distribution segments. However, as noted in Section 6, the extent of private sector participation for those countries that have embarked upon it is markedly higher among developed countries than for developing countries, with OECD countries receiving a score of 50 out of 100 in the Private Sector Participation Index for generation, while the equivalent score for developing countries is only 33.

This overall pattern of results is particularly striking for a number of reasons. First, it shows that despite the more challenging investment climate, developing countries have still been able to attract significant levels of private sector participation. Second, it indicates that private sector operation of the power sector is far from being the universal norm, even in the developed world. Third, it is interesting that despite the continued strong presence of public sector operators, and the fact that only about half of the developed countries have power sectors that are fully unbundled, the developed world has nonetheless reached a very high degree of adoption of power markets, which are to a large extent premised on a privatized and unbundled sector structure.

Figure 7.1 Prevalence of the full extent of power sector reforms across developed and developing countries[16]

Percentage of countries	Some degree of reform		Full extent of reform	
	Developing countries	Developed countries	Developing countries	Developed countries
Regulation	Na.	Na.	72	91
Restructuring	44**	79**	20**	44**
Competition	69**	96**	7**	78**
Private sector participation	70	61	39	39

Source: Own elaboration based on RISE 2015 and PPI 1990-2015 databases

****** Differences are statistically significant at the 5% level
***** Differences are statistically significant at the 10% level

B. Developing country power sector reform has been running out of steam over the last decade

The pace of reform, which was particularly rapid during the decade 1995-2005, has slowed considerably during the decade 2005-15. The time series analysis identified 1990 as the baseline year after which earlier reforms in Chile and the United Kingdom began to spread to other parts of the developing world. During the period 1990-95, early reformers experimented primarily with contract-based forms of private sector participation in generation and, to a lesser extent distribution. Divestitures were relatively rare and less than 10 percent of countries had established a regulatory entity by 1995. During the decade 1995 to 2005, there was rapid diffusion of many of the key reform measures, including establishment of regulatory entities, as well as private sector participation or divestiture of generation and distribution. Since 2005, the uptake of these measures slowed down considerably, with the main action during that last decade consisting in the creation of regulatory entities.

These patterns are clearly identifiable when comparing the percentage of countries that adopted certain standard reform measures in the decade 1995-2005 with the percentage of countries that did so during the decade 2005-2015 (Figure 7.2). Along many (though not all) dimensions of reform (including establishment of regulatory agencies and wholesale markets, as well as private sector participation along the energy supply chain), the percentage of countries taking such measures during the earlier decade was significantly higher than during the more recent period; and almost all of these differences are highly statistically significant. This pattern of slowing reform can also be seen graphically in Figures 7.3 and 7.4, which further illustrate that the slowing pace of reform does not reflect saturation, since even the most prevalent reform measures have in no case been adopted in more than 70 percent of developing countries suggesting there would be room for further uptake should additional countries so choose.

[16] "Some degree" of reform is defined as at least partial vertical unbundling, at least introduction of Independent Power Producers, and at least some degree of private sector participation in either generation or distribution. "Full extent" of reform is defined as establishment of a regulator, full vertical and horizontal unbundling, creation of a power market and some degree of private sector participation both for generation and distribution.

Figure 7.2: Comparing speed of diffusion of power sector reform measures across decades

	Percentage of countries implementing reforms in time period:	1995-05	2005-15[17]
Regulation	Creation of regulatory entity **	43	18
Restructuring	At least some degree of restructuring (at least partial vertical unbundling)*	33	17
	Partial vertical unbundling	5	4
	Full vertical unbundling*	20	7
	Full vertical unbundling and horizontal unbundling	8	6
Competition	At least some degree of competition (at least IPPs)*	41	33
	Adoption of Monopoly + IPPs	15	15
	Adoption of Single Buyer Model*	11	4
	Adoption of Third Party Access	5	5
	Creation of wholesale power market **	8	6
	Creation of retail power market	2	3
Private Sector Participation	Private Sector Participation in generation **	34	8
	Private Sector Participation in distribution **	19	7
	Divestiture of generation companies **	17	4
	Divestiture of distribution companies **	12	4
	Private Sector Participation in transmission	6	7
	Divestiture of transmission companies	4	1

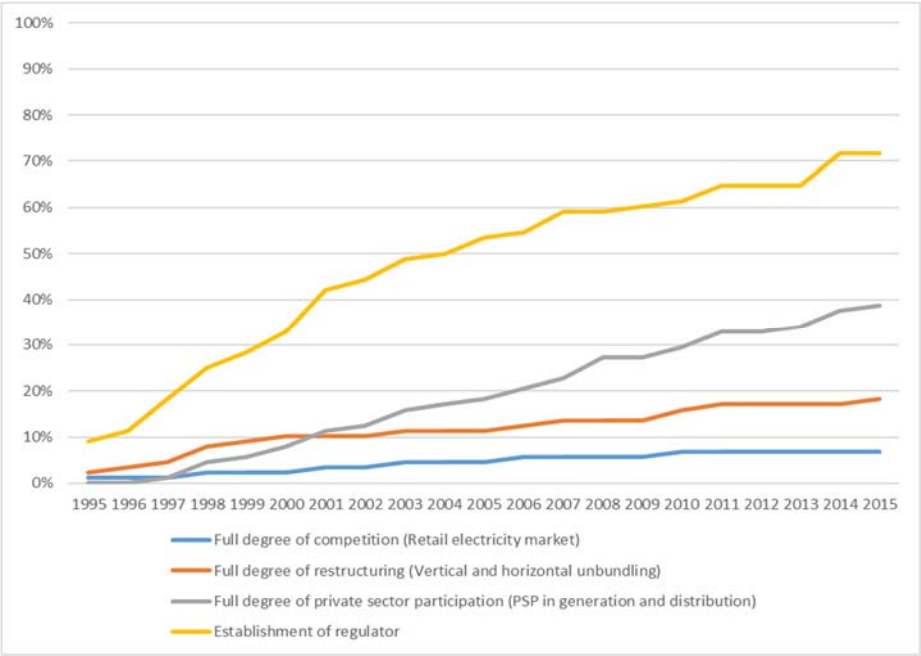
Source: Own elaboration based on RISE 2015 and World Bank PPI 1990-2015 databases

** Differences are statistically significant at the 5% level

* Differences are statistically significant at the 10% level

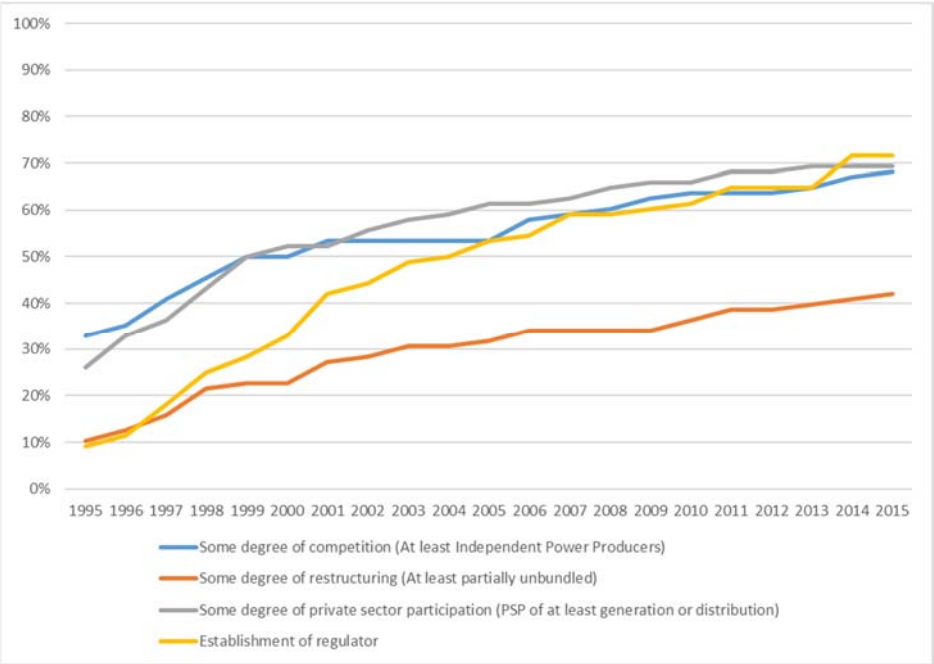
[17] The denominator for these percentages excludes those countries that had already implemented the respective reform in the 1995-2005 period.

Figure 7.3: Comparing speed of diffusion of fullest power sector reform measures over time



Source: Own elaboration based on RISE 2015 and PPI 1990-2015 databases

Figure 7.4: Comparing speed of diffusion of some degree of power sector reform measures over time



Source: Own elaboration based on RISE 2015 and PPI 1990-2015 databases

Disaggregating the data further shows that, across the board, there are pervasive plateau effects. That is to say that once a certain level of penetration is reached for a particular type of reform in a particular region it simply seems to settle at that level for a number of years. This suggests that all the countries interested in reforming in that region have already done so. The level at which the plateau is reached differs across regions and according to the reform measure involved. In general, in Latin America the plateau is reached at the level of at least 80 percent of countries, while in less reform-oriented regions such as Sub-Saharan Africa and the Middle East, the plateau is reached at 40 percent of countries or less depending on the measure.

While a majority of developing countries have taken some measures related to restructuring, competition and private sector participation in their power sectors, only a minority of them have actually gone all the way on any of the dimensions of reform (Figure 7.5). While 70 percent of countries have taken at least one step towards competition, only 20 percent have succeeded in implementing a power market. And while 44 percent of countries have undertaken some measure of restructuring, only 20 percent have completed the full vertical and horizontal unbundling of the sector. As a result, the prevalence of countries with some intermediate stage of reform is much higher than the prevalence of countries that have reformed fully.

Figure 7.5: Prevalence of differing degrees of power sector reform across developing countries

Percentage of countries	Some degree of reform	Full extent of reform
Restructuring	52	20
Competition	70	20
Private sector participation	74	40

Source: Own elaboration based on World Bank RISE 2015 and World Bank's PPI 1990-2015 databases

C. Some elements of the power sector reform agenda have proven far more popular than others

While the various measures associated with the 1990s power sector reform model were originally conceived as a package, it is clear that developing countries have been quite selective in their adoption of these reforms. Some elements of the package have proved much more popular than others. Broadly, the different reform measures can be divided into three groups according to their level of popularity (Figure 7.6).

The most popular group of measures are applied by a majority of 60 to 70 percent of developing countries. Foremost among these is the creation of a regulatory entity. This measure is relatively straightforward in political terms, because it entails adding a new element to the sector rather than changing what is already there. While a regulatory entity could in principle represent a challenge to the political hegemony of the sector, in practice regulators have not always been given sufficient powers to provide such contestability. The next most widespread reform measure was private sector participation in generation, most often through BOTs or Independent Power Projects, although in many cases also through divestiture. Private sector participation in generation has proved less challenging to implement, in part because it can often be applied to new plants, thereby avoiding the need to change institutions that already exist; but also because it involves low levels of employment, is relatively straightforward to operate, is far removed from the customer interface, and lends itself to a simple ring-fenced power purchase arrangement, either with a utility which may already be creditworthy or one whose creditworthiness can be enhanced through some form of state guarantee. Despite the high uptake of these policies, it is relevant to note that a full

third of developing countries, have not been willing or able to undertake even these relatively tractable measures during the 20-year period that they have been widely put forward in policy circles.

The second group of measures are applied by approximately half of developing countries. These include vertical unbundling of the power utility and private sector participation in distribution. Both of these represent a higher degree of disruption to the status quo. In the case of unbundling, the incumbent utility has to be restructured into multiple entities with consequent governance and human resource challenges. In the case of distribution private sector participation, the degree of political sensitivity is quite high since it involves changing the point of interface with the public, and likely imposing stronger payment discipline and higher tariffs, as well as reforming the practices of a larger workforce.

The least popular group of measures are applied by up to 20 percent of developing countries only. It makes sense that the creation of power markets would fall into this group, since its establishment is only relevant in larger power systems, is contingent on the prior adoption of many of the other reform measures, and entails relinquishing a high degree of state influence over the sector. The comparative rarity of private sector participation in transmission partly reflects that this was never in any case a strong policy prescription of the reform model, due to the many public good functions provided by the power grid. Finally, management contracts have not been widely adopted in the power sector, with the exception of Sub-Saharan Africa where experience has been mixed. While they are relatively easy to introduce from a political and technical standpoint, the resulting impacts have been quite limited.

Figure 7.6: Prevalence of different types of power sector reform measures in the developing world

Percentage of developing countries with…	
A regulatory entity	72
Some use of BOT/BOO contracts	69
Some form of private sector participation in generation	63
Some use of divestiture	61
Some degree of vertical unbundling	44
Some form of private participation in distribution	44
Some use of concession contracts	39
A competitive power market	20
Horizontal unbundling in addition to vertical unbundling	20
A Single Buyer Model	18
Some form of private sector participation in transmission	14
Some use of management contracts	10

Source: Own elaboration based on RISE 2015 and PPI 1990-2015 databases

D. Developing countries packaged power sector reforms in ways unrelated to the original logic

Power sector reform measures were originally conceived as a coherent and inter-related package, and it was envisaged that they would be implemented according to a certain logical sequence. Regulation would typically be the starting point, so that the rules and incentives of the sector would be clearly specified, before any changes were made to the institutional actors. This would be followed by unbundling to create the desired sector architecture, which once completed would pave the way for potential changes in ownership. Given that the distribution segment represents the beginning of the payment chain for electricity, it was generally thought that it made sense to begin private sector participation with distribution, so as to improve the operational performance and commercial viability of the sector, and

generate a solid revenue stream that would then provide the basis for remunerating private sector participation in the generation sector. Only after all these elements were in place would it make sense to move towards a wholesale power market, which relies on a multiplicity of actors and a strong set of commercial incentives that would be achieved by prior unbundling and private sector participation measures. However, earlier stages of competition could be introduced along the way, with IPPs being feasible even prior to unbundling and single buyer or third-party access arrangements becoming feasible following unbundling.

The analysis suggests that overall about one-third of developing countries have not observed this packaging. Rather they have adopted different dimensions of reform unevenly and leading to imbalances in their sector structures.

As has been noted, the implementation of reforms was quite selective, and this selectivity was not always informed by taking into account synergies between different combinations of reforms. The following figures 7.7-7.11 cross-tabulate the pattern of uptake for the different dimensions of reform and analyze their mutual coherence. Three situations are possible. In the first case, reforms proceed *pari passu* along the different dimensions and a coherent outcome is achieved; these cases are located in the upper right triangle of the matrix. In the second case, reforms are out of balance in such a way that one dimension of reform has gone further ahead than is really warranted by achievements along a related dimension; these are located along the diagonal. In the third case, reforms are out of balance in such a way that one dimension of reform has not gone far enough to support the extent of reform already enacted on a different dimension; these cases are in the lower triangle of the matrix.

In the case of competition, effective reform entails that competition be preceded by certain other reforms. These include: (i) vertical unbundling that separated out naturally monopolistic elements from those that were potentially competitive; (ii) private sector participation that introduced commercial orientation among the potentially competing players in generation; and (iii) regulation to ensure that these players would continue to act in the public interest.

A first pairwise comparison looks at the balance between competition and restructuring measures (Figure 7.7). The analysis finds that about 15 percent of countries have gone further with competition than their degree of reform on unbundling would prepare them for. As an example, almost 10 percent of countries have introduced power markets before completing sector unbundling. At the same time, a further 15 percent are in the opposite situation of having got further ahead with sector restructuring than they are with their market competition process. As an example, just over 10 percent of countries have effected full vertical and horizontal unbundling of the sector, but still practice a Single Buyer Model when they look structurally prepared for a power market.

A second pairwise comparison looks at the balance between competition and private sector participation measures (Figure 7.8). In this case, about 25 percent of countries have their competition reforms lagging their reform on private sector participation. For example, almost 17 percent of countries have introduced private sector participation in both generation and distribution, yet have not taken their competition measures any further than allowing Independent Power Producers. At the other end of the spectrum, about 7 percent of countries have taken competition further than their degree of private participation would tend to support.

A third pairwise comparison looks at the balance between restructuring and private sector participation measures (Figure 7.9). In 24 percent of countries private sector participation has gone ahead of restructuring reforms. For example, almost 11 percent of countries have private sector participation in a utility that remains vertically integrated. By contrast, only about 6 percent of countries seem to have introduced reform on competition without taking parallel measures to incorporate the private sector.

In the case of regulation (Figure 7.10, 7.11), strictly speaking a regulatory entity is not essential when the sector is organized as a publicly-owned vertically-integrated monopoly. This is because the whole rationale for state ownership is to act in the public interest and there are no wider market relations to be regulated. Moreover, with both the regulator and the public utility reporting directly to the line ministry, it can be difficult for the regulator to exercise authority. Nonetheless, 13 percent of developing countries find themselves in the situation of having created regulators when their utility remains an integrated state-owned monopoly. On the other hand, it is critical to have a regulator once private ownership or operation has been introduced to any part of the sector, and as the reforms of competition continue. However, 13 percent of developing countries find themselves in the situation of lacking regulatory entities despite introducing private sector participation, while 12 percent of developing countries lack regulatory entities despite having commenced along the competition process.

Figure 7.7 – 7.11: Coherence between various reform measures

7.7 Competition and restructuring reform

Percentage of countries	Vertically integrated	Partially vertically unbundled	Fully vertically unbundled	Fully vertically and horizontally unbundled	Total
Monopoly	28.2**	2.4**	0.0	0.0**	30.6
IPPs	22.4**	2.4	1.2	1.2**	27.1
Single Buyer Model	2.4	5.9	0.0	10.6	18.8
Bilateral Contracting with TPA	0.0	0.0	1.2	2.4	3.5
Wholesale market competition	1.2	2.4	0.0	1.2	4.7
Retail market competition	1.2	7.1	1.2	5.9	15.3
Total	55.3	20.0	3.5	21.2	100.0

7.8 Competition and private sector participation reform

Percentage of countries	Monopoly	IPPs	Single Buyer Model	Bilateral Contracting with TPA	Wholesale Competition	Retail Competition	Total
Public	24.7	0.0	2.4	1.2	0.0	0.0	28.2
PSP in Generation Only	3.5	14.1	11.8	0.0	2.4	1.2	32.9
PSP in Generation and Distribution	0.0	16.5	4.7	2.4	2.4	14.1	40.0
Total	28.2	30.6	18.8	3.5	4.7	15.3	100.0

7.9 Restructuring and private sector participation reform

Percentage of countries	Vertically integrated	Partially vertically unbundled	Fully vertically unbundled	Fully vertically and horizontally unbundled	Total
Public	22.9**	2.4*	1.2*	2.4*	28.9
PSP in Generation Only	21.7**	4.8*	1.2*	6.0*	33.7
PSP in Generation and Distribution	10.8	13.3	1.2	13.3	38.6
Total	55.4	20.5	3.6	21.7	100.0

7.10 Regulation and private sector participation reform

Percentage of countries	No regulator	Regulator	Total
Public	16.4	12.5	28.9
PSP in Generation only**	6.8	25.0	31.8
PSP in Distribution only	0.9	1.1	1.9
PSP in Generation and Distribution**	5.0	33.7	38.6
Total	27.7	72.3	100.0

7.11 Regulation and competition reform

Percentage of countries	No regulator	Regulator	Total
Monopoly	15.9	13.6	29.5
Independent Power Producer**	7.2	22.3	29.5
Single Buyer Model*	2.3	15.9	18.2
Bilateral contracting + TPA	0.0	3.4	3.4
Wholesale market competition	0.0	4.5	4.5
Retail market competition*	2.3	12.5	14.8
Total	27.7	72.3	100.0

**** Differences are statistically significant at the 5% level

* Differences are statistically significant at the 10% level

E. Developing countries sequenced power sector reforms in ways unrelated to the original logic

The anomalies in reform packaging observed above suggest that developing countries may not have been sequencing reform according to the original concept. This typically counseled introducing regulation prior to undertaking any private sector participation in either generation or distribution, so that the framework for oversight of the private company was established ahead of any transaction. This is logical since the quality of the regulatory framework could be expected to affect the overall value of the private sector participation transaction. In addition, the conceptual framework suggests that it makes most economic and financial sense to introduce the private sector into distribution ahead of generation. The reason is that improving the commercial and financial performance of the distribution sector is usually the only way to ensure the financial solvency of the entire electricity supply chain, since cash flows originate with customers at the retail end and are passed up the chain to eventually finance investments in the generation sector. By commencing private sector participation at the distribution end, a strong cash flow would be generated facilitating subsequent private finance of generation. Nevertheless, in practice, distribution private sector participation tends to be more difficult than generation both politically and in terms of attracting market interest.

An analysis of the prevalence of different sequences of reform measures sheds light on this issue (Figure 7.12). What is clearest is that there is no dominant sequence of reform measures that has been followed across countries; rather all possible permutations can be found. Overall, 34 percent of countries introduced regulation before undertaking any private sector participation in generation or distribution, but were outnumbered by the 52 percent of countries that did things the other way around. Similarly, some 20 percent of countries introduced private sector participation into distribution ahead of generation, but were greatly outnumbered by the 40 percent of countries that started with generation instead.

Figure 7.12: Overview of sequence of reform measures on 4 dimensions of reform

Percentage of countries introducing	First	Second	Third	Last	Not at all
Regulation	34	17	6	15	28
Restructuring (At least partial vertical unbundling	17	19	9	7	48
Competition (At least wholesale competition)	2	3	5	10	80
Private sector participation in generation	35	17	2	8	38
Private sector participation in distribution	17	8	3	16	56

F. Developing country power sector reform is stuck at an intermediate stage in many cases, and announced reforms are not always fully implemented

To get an overall picture of the extent of the reform status in each country, an aggregated Power Sector Reform Index is constructed. This is based on a simple scoring methodology detailed in Box 3, giving each country a single score on a scale of 0 to 100. *It is important to reiterate that the index is intended to be descriptive, that is documenting the diffusion and uptake of reforms, rather than normative, that is evaluating countries according to how far they have gone in adopting reforms.* Countries may have perfectly good reasons for not pursuing reforms that may not be applicable to their circumstances. For example, a wholesale electricity market would not make sense for a small island state. Individual country scores for 88 developing countries are reported in Figure 7.14 and range all the way from 0 to 100. Aggregate scores are reported over time in Figure 7.13, which highlights the slowdown in the adoption of reforms after 2000.

The index identifies five developing countries (or about 6 percent of the total) that have not taken any measures towards power sector reform. They tend to be conflict affected states mainly in Africa, such as Eritrea, Guinea, Liberia, Solomon Islands and South Sudan.

At the other extreme are the 5 countries with scores above 90 percent. They are mainly large middle-income countries in Latin America & Caribbean, notably Argentina, Guatemala, Peru, the Philippines and Turkey.

Overall, the median score on the power sector reform index is just short of halfway at 43, and three-quarters of developing countries score below 72 on the index. This illustrates clearly how the bulk of developing countries find themselves at the early or intermediate stage of the power sector reform agenda.

Developed countries on average score higher on the reform index than developing ones (Figure 7.16). It is instructive to compare the frequency distribution of reform scores between developed and developing countries. The distribution for the developed countries has a strong modal value in the 80-90 bracket, unlike the distribution for developing countries which is relatively flat. The median score for the 20 developed countries at 77 is accordingly significantly higher than the corresponding score of 37 for the 88 developing countries. Nevertheless, it is also striking that there are stark outliers in the developed country group, with Kuwait and Japan scoring under 40 on the index.

Countries that score high values on the index undertook reforms at differing speeds (Figure 7.17). To understand the time periods needed to accomplish major reforms, attention is confined to those countries that completed the bulk of the reform agenda by introducing a regulatory entity, undertaking full vertical and horizontal unbundling, introducing a wholesale power market and privatizing at least 50 percent of their generation and distribution sectors. Of the relatively small group of 8 in this category, reforms in Latin America were enacted relatively rapidly in no more than five years, with Peru taking 3 years, Argentina 4 years, and Guatemala 5 years. Reforms in the Europe and Asia region took substantially longer, in the 10-20 year range: 12 years in Turkey, 13 years in India, 15 years in the Philippines, 16 years in Romania, and 18 years in Ukraine.

For a sample of 15 case study countries, an Announced Reform Index is computed by recalculating the Power Sector Reform Index based on official announcements or policy commitments rather than actual policy enactments. The results in Box 4 reveal varying gaps between a country's reform announcements and delivery. In some cases, reforms can be delayed for several years, and the divergence between announced reforms and those actually implemented can amount to as much as 50 points on the reform index. Political regime changes, union opposition and disputes among private players are some of the reasons for the observed discrepancy.

Box 3: Power Sector Reform Index

In order to aggregate across the four dimensions of power sector reform considered in this study, a simple Power Sector Reform Index is constructed. The index gives each country a score on an interval of 0 to 100 on each dimension of power sector reform. The scores are based on giving equal weight to each step on each dimension of the reform continuum (see tabulation below). The average of the four 0-100 scores is used to provide an overall summary of the extent of reform, although it would also be feasible to weight the four differently according to their relative difficulty and importance.

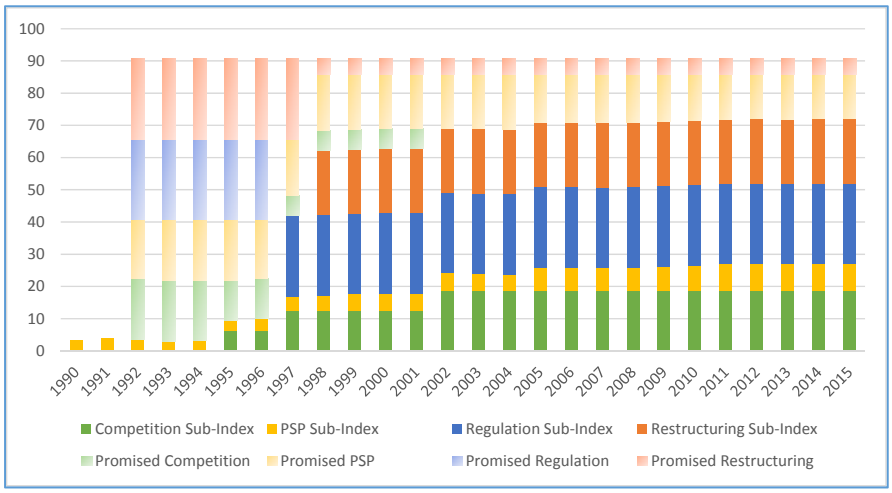
Regulation	No regulator = 0		Regulator = 100		
Restructuring	Vertically integrated = 0	Partial vertical unbundling = 33	Full vertical unbundling = 67	Vertical & horizontal unbundling = 100	
Competition	Monopoly = 0	IPPs = 25	Single Buyer Model = 50	Bilateral Contracts = 75	Competitive market = 100
Private Sector Participation	0.5*(Percentage of generation capacity with private sector participation) + 0.5*(Percentage of distribution utilities with private sector participation)				

Box 4: Delivering on Reform Announcements

Announced reforms are by no means always implemented, and adoption can occur significantly delayed after the passing of a law or a formal official commitment to implement reforms. Reasons for such delays include political regime changes, union opposition to reforms and disagreements between parties or private consortiums. A detailed comparison between reforms announced and reforms actually enacted for 15 country cases over a 25-year period helps to shed light on two issues: first, the extent to which countries enact sudden 'big bang' reforms versus gradual or incremental reforms over time; and second, the extent to which countries follow through on implementation of reform announcements.

Pakistan is an example of a country that undertook a comprehensive package of reforms, although these were implemented only after some delay. Full reforms on restructuring, private sector participation and establishment of a regulatory entity were announced in 1992, yet – as a result of political regime changes – only a fraction of the announced measures had actually been implemented four years later. This delay was followed by a period of bold reforms, with the power sector reform index increasing from 10 to 69 within a six-year period. However, since the introduction of private sector participation in distribution in 2005, no further reforms were enacted (other than increases in private sector participation in generation). In particular, announced reforms on unbundling K-Electric and expanding private sector participation to other distribution utilities have not been followed through.

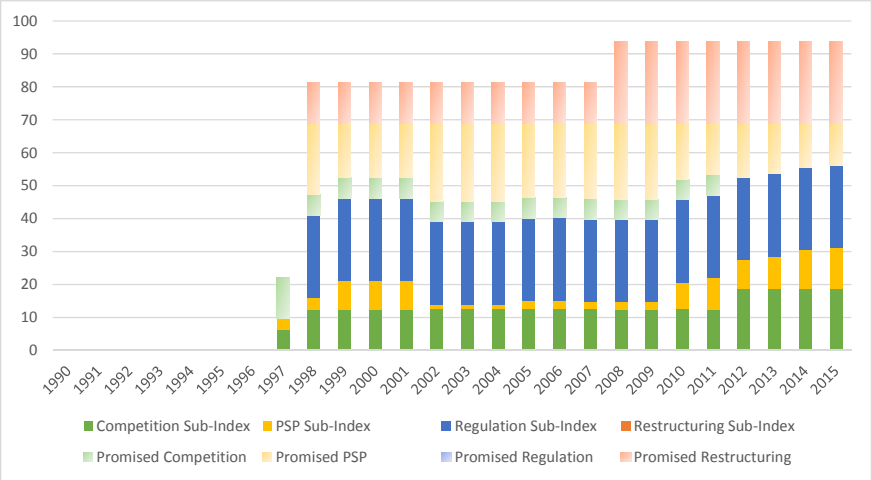
Reforms announced and implemented in Pakistan



On the other end of the spectrum, Senegal's reform has been much more gradual and falls substantially short of what was originally announced. Reforms began with some Independent Power Projects in the late 1990s, followed by the establishment of a regulatory agency in 1998. Private sector participation in the power utility, Senelec, was reversed after two years in 2001 following union opposition to reforms and a change of government, and a second attempt to concession the company proved unsuccessful. Further, reforms for vertically unbundling Senelec that had been passed by law in 1998, have yet to be implemented. As of 2015, Senegal's score on the power sector reform index was 56, whereas if it had implemented all the announced reforms the score would have been 93.

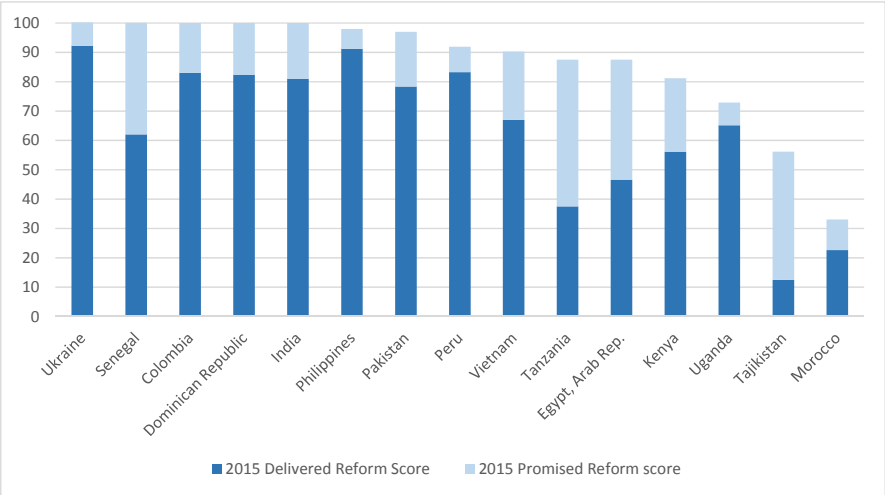
Box 4 continued:

Reforms announced and implemented in Senegal



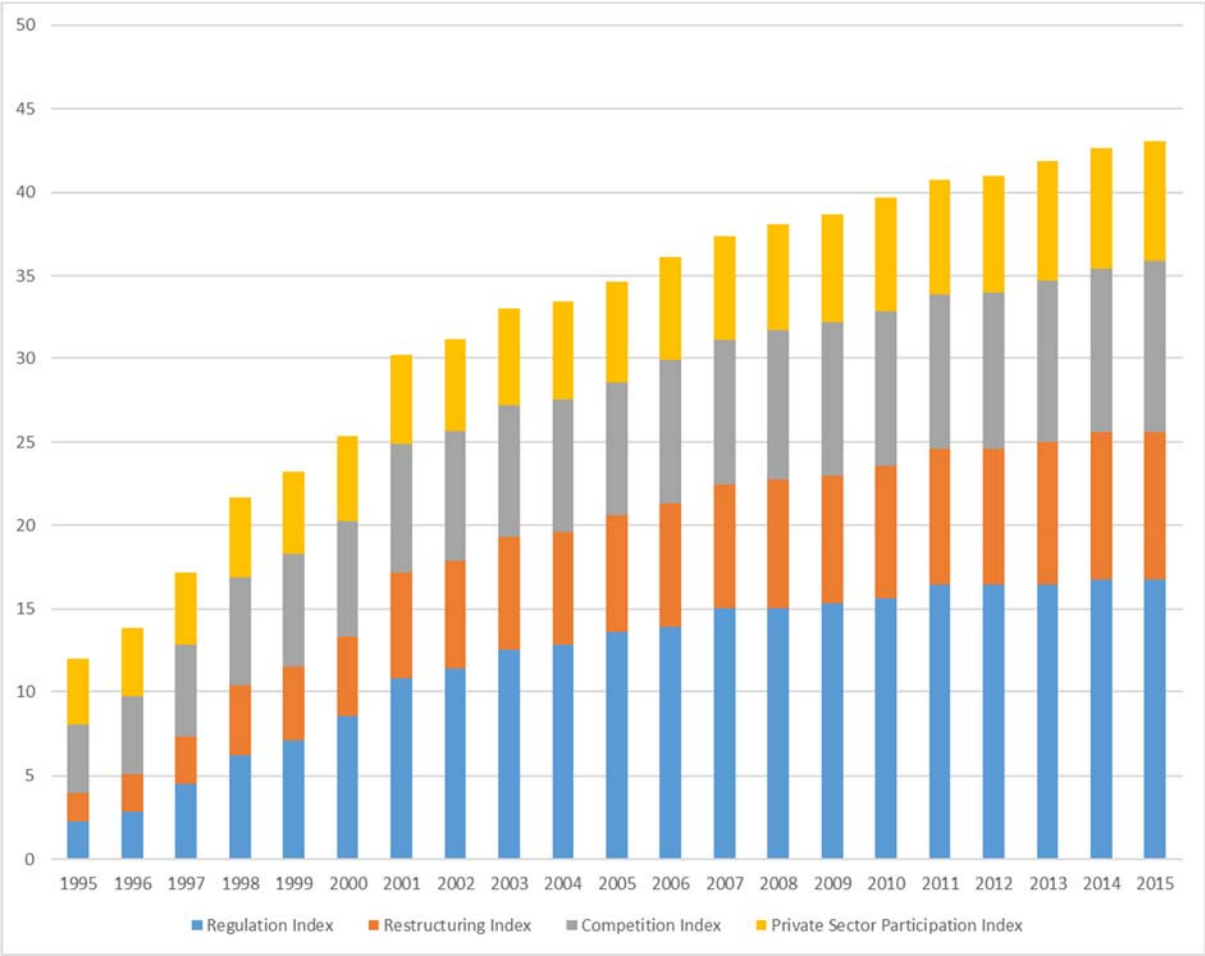
Overall, looking across the 15 case study countries, by 2015 the gap between announcement and delivery of reforms led to Power Sector Reform Index scores that were between 10 and 50 points below where they would have been had all announced reforms been fully implemented. The smallest gaps were found in Ukraine, Peru and Uganda, while the largest gaps were found in Tajikistan and Tanzania.

Reforms announced and implemented in 15 case study countries



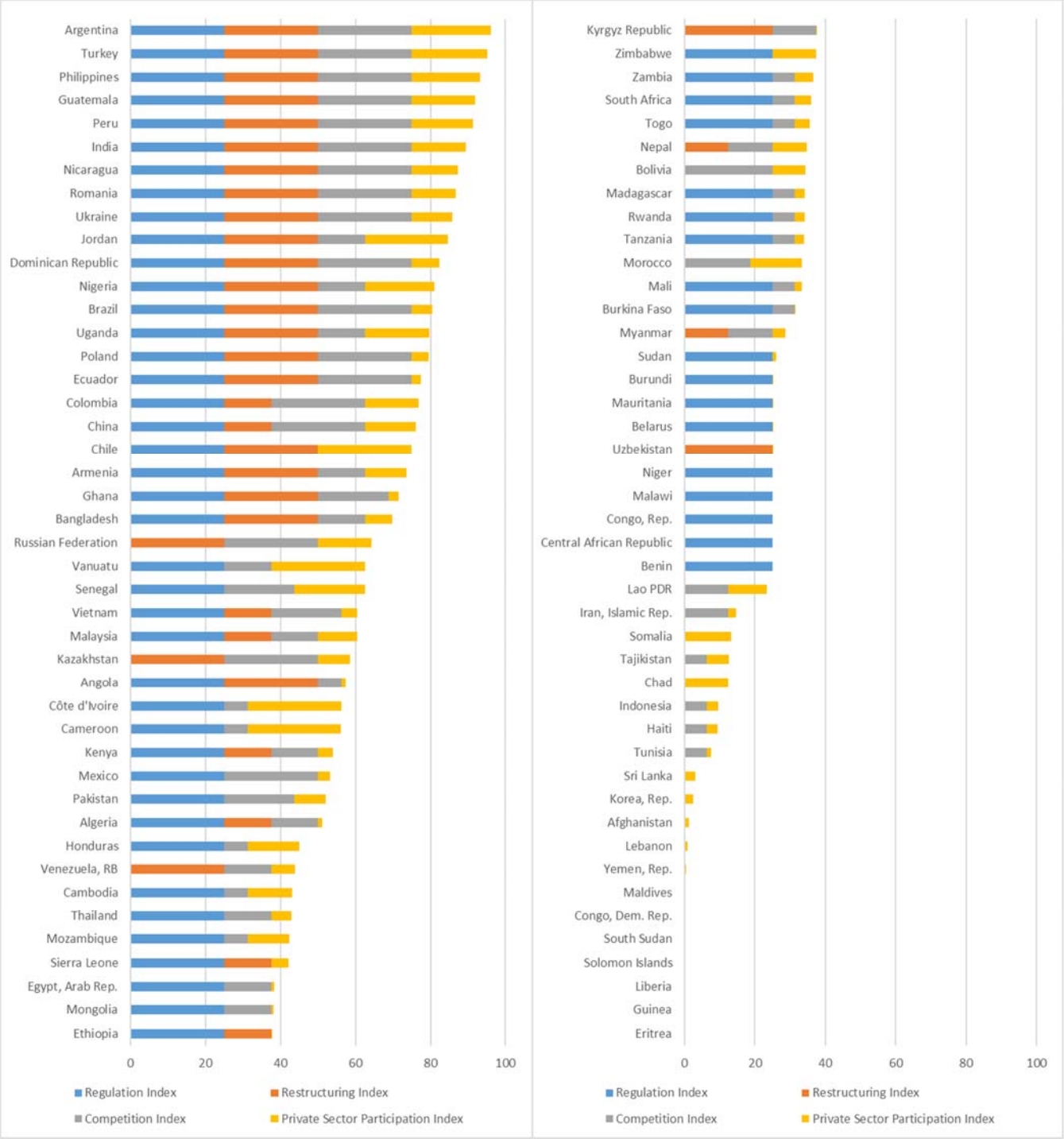
Source: Elaboration based on PPI 1990-2015 database, RISE and Rethinking Power Sector Reform Data

Figure 7.13: Aggregate score on Power Sector Reform Index by year and sub-index



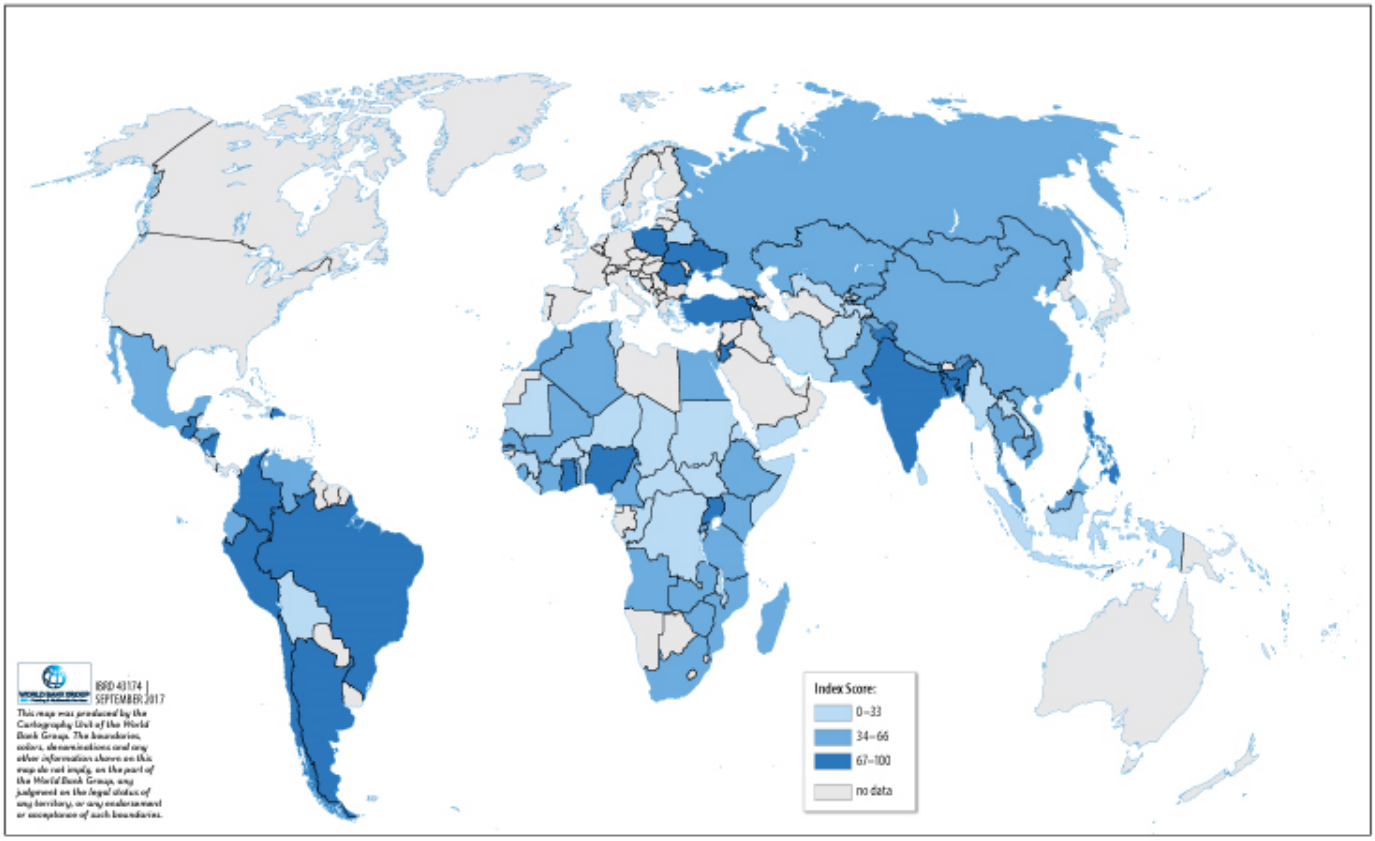
Source: Own elaboration based on RISE 2015, PPI 1990-2015 databases and industry data

Figure 7.14: Scores on Power Sector Reform Index (0,100) for 88 developing countries, by sub-index



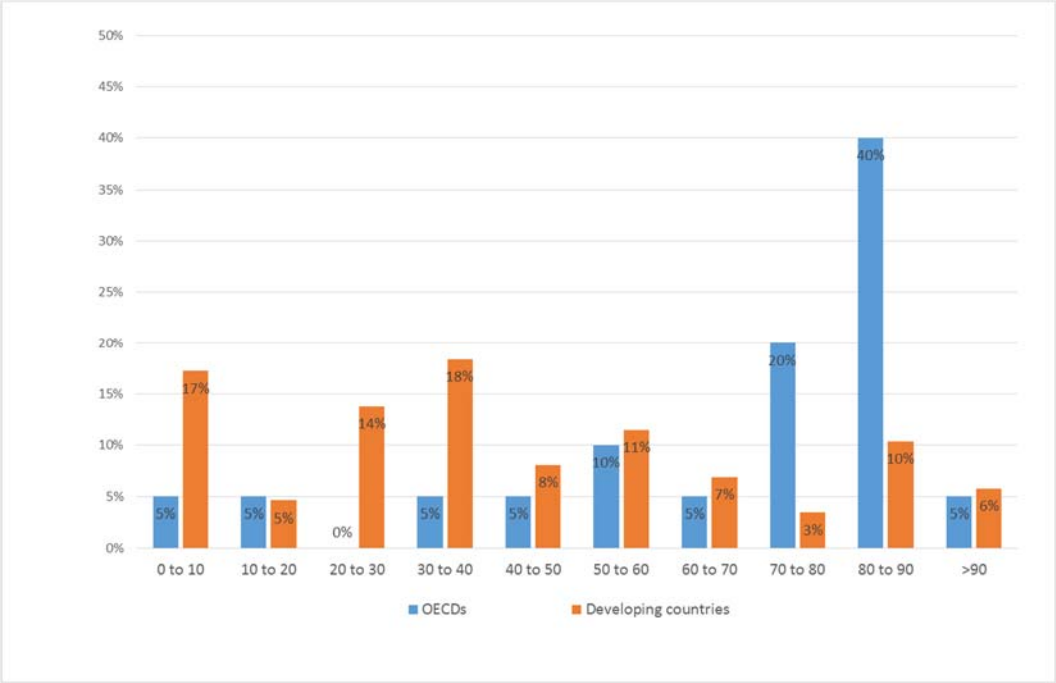
Source: Own elaboration based on RISE 2015, PPI 1990-2015 databases and industry data

Figure 7.15: Aggregate score on Power Sector Reform Index across the developing world as of 2015



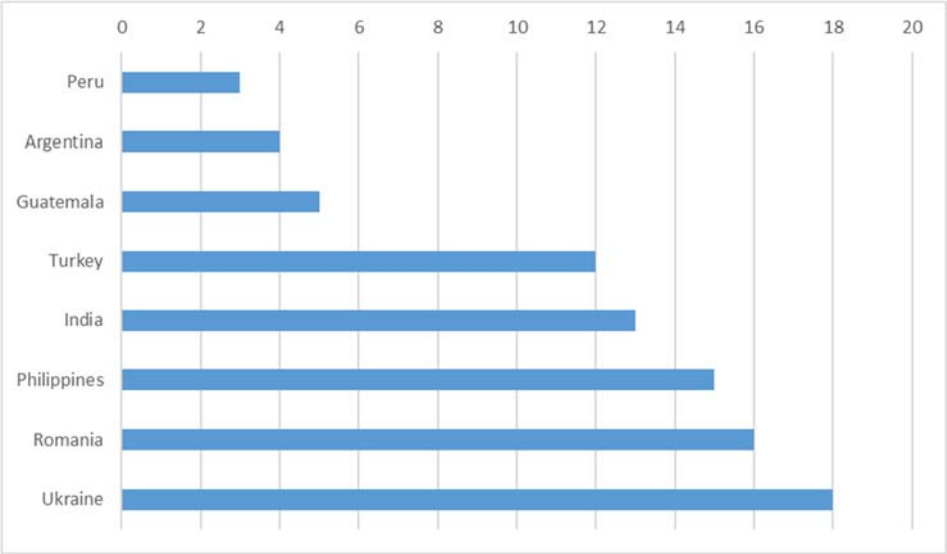
Source: Own elaboration based on RISE 2015, PPI 1990-2015 databases and industry data

Figure 7.16: Frequency distribution of Power Sector Reform Index scores, OECD and developing countries, 2015[18]



Source: Own elaboration based on RISE 2015, PPI 1990-2015 databases and industry data

Figure 7.17: Time elapsed between first step of reform and full extent of reform (years)



Source: Own elaboration based on RISE 2015, PPI 1990-2015 databases and industry data

[18] Index excludes Germany, Spain and the United Kingdom.

G. The uptake of reforms is substantially affected by country characteristics

The uptake of various different sector reform measures is closely related to the characteristics of countries, in terms of their geography, income level, power system size, and political economy. As a general rule, reform uptake is much stronger in Latin America and Caribbean and Europe and Central Asia, than it is in the Middle East and Africa. There is typically also a strong positive effect between a country's income group and the prevalence of reform, and an even stronger positive effect with the physical size of the power system. There is some weaker evidence that oil importers go further with their reforms than oil exporters. In terms of political variables, uptake of all reforms but competition increase for a political system that is based on competition between multiple poles of power rather than one that is dominantly hierarchical. The size and statistical significance of these effects vary according to the dimension of reform (Figure 7.18).

In the case of regulation, the effects are quite small, perhaps reflecting the fact that regulation is a relatively easy reform to adopt. The strongest and only statistically significant differences observed are income groups. In particular, the prevalence of regulatory agencies is highest for the upper-middle-income group. Furthermore, the leading geographic group, Latin America and Caribbean, was 48 percentage points more likely to have introduced reforms on regulation that the lagging group, the Middle East and North Africa. Interestingly, region does not have a statistically significant influence on the prevalence of regulation.

In the case of restructuring, there are some very large effects, particularly across regions, and according to income group, power system size and net oil trade status. The gap on unbundling between the leading region, Europe and Central Asia, and the lagging region, Sub-Saharan Africa, is as much as 60 percentage points, and statistically significant. Moreover, being a higher income country, an oil importing state, or a country with a large power system above 10 gigawatts, can all add between 14 and 46 percentage points to the probability of unbundling the power sector.

In the case of competition, the largest statistically significant differential is again across geographic regions. The gap between the leading region, Latin America and Caribbean, and the lagging region, Middle East and North Africa, is as much as 74 percentage points. It is also striking that countries with competitive political systems are not necessarily more likely to countenance competitive power markets. Being a country with a large power system adds around 50 percentage points to the likelihood of undertaking power system competition. The size effect is particularly stark in the case of wholesale power markets. There are simply no cases of countries with national power systems under a gigawatt of capacity having adopted wholesale power markets; which makes sense given that their systems are too small to support enough generators for a competitive market to be meaningful. Among countries with large systems in excess of 10 gigawatts, around 50 percent have a wholesale power market, and this is more than twice the ratio for smaller systems in the one to five gigawatt range.

In the case of private sector participation, the gap between the leading region, Latin America and Caribbean, and the lagging region, Sub-Saharan Africa, is 43 percentage points. Countries in higher income groupings are more likely to have private sector participation by a differential of 23 percentage points. Again, being a country with a large power system also adds around 30 percentage points to the likelihood of undertaking power system private sector participation. By and large there are no signs of convergence between countries in different size groupings. Thus, the differences in the uptake of private sector participation in these countries are becoming increasingly pronounced over time. Countries with system

sizes above a gigawatt are twice as likely to have private sector participation in generation as those with smaller systems. In the case of distribution, the threshold is higher and it is only in systems larger than five gigawatts that the probability of private sector participation doubles relative to countries with smaller system sizes.

Such pronounced differences in reform uptake across country groupings over a 20-year period of intensive policy effort suggest that country characteristics seriously constrain the applicability of the standard power sector reform model in certain environments. The fact that regional variations are the largest of any observed suggests that either some of the other effects are aggregated and accentuated by geography (for example, the concentration of small, low-income, fragile countries in Africa) or that there are some additional region-specific drivers that are not being picked up elsewhere, including perhaps "bandwagon" or "domino" effects within regions. On just about every type of reform measure, Latin America has been the pioneering region, while the Middle East and North Africa region has systematically lagged on reform (Figure 7.19). For other regions, however, the pattern tends to vary depending on the nature of the reform measure.

Finally, Figure 7.20 reports the average Power Sector Reform index score for countries of different characteristics. This confirms the picture that came through in the analysis of the individual dimensions of reform. Countries with higher income levels and large power systems score approximately twice as high on the Power Sector Reform Index as the rest, more competitive political economies and higher degrees of rule of law co-move with slightly higher scores on the Index. A similar discrepancy is observed between countries in Latin America and Caribbean and those in the Middle East & North Africa.

Figure 7.18: Summary of how country characteristics influence uptake of reform measures[19]

Percentage point difference between lowest and highest adoption rates	Regulation	Restructuring	Competition	Private sector participation
Across geographic regions	48	60**	74**	43
Increasing income group	31**	27**	33*	23*
Increasing power system size	9	46**	35*	30*
Non-fragile state	8	12	1	(6)
Oil importer	9	14**	(8)	0
Increasing rule of law	(7)	(7)	3	11
Increasingly competitive political system	15	11	(2)	7

****** Differences are statistically significant at the 5 level

***** Differences are statistically significant at the 10 level

[19] Tests are between the two extreme categories in each country grouping.

Figure 7.19: Power Sector Reform Index over time and by region

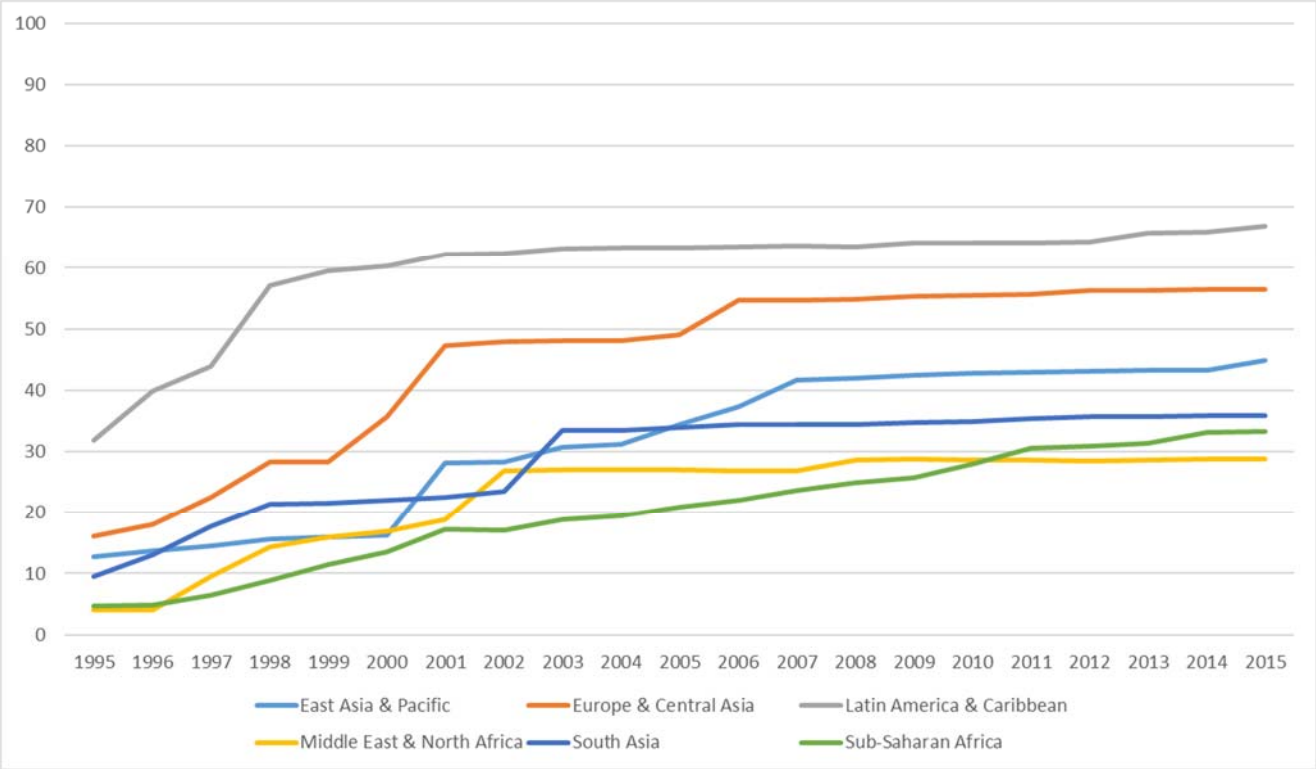
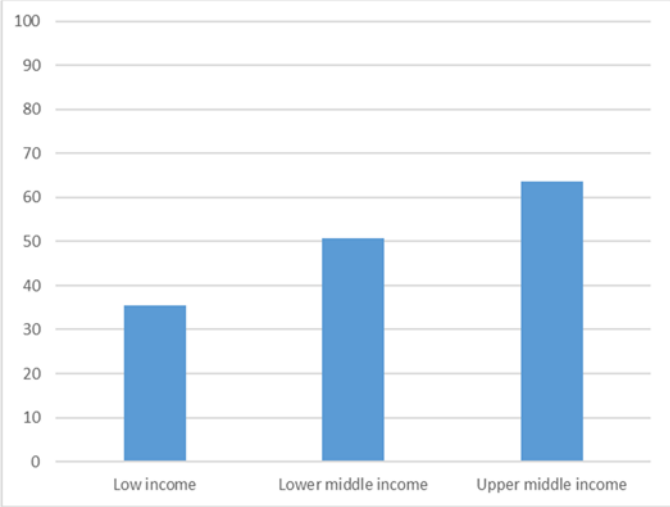
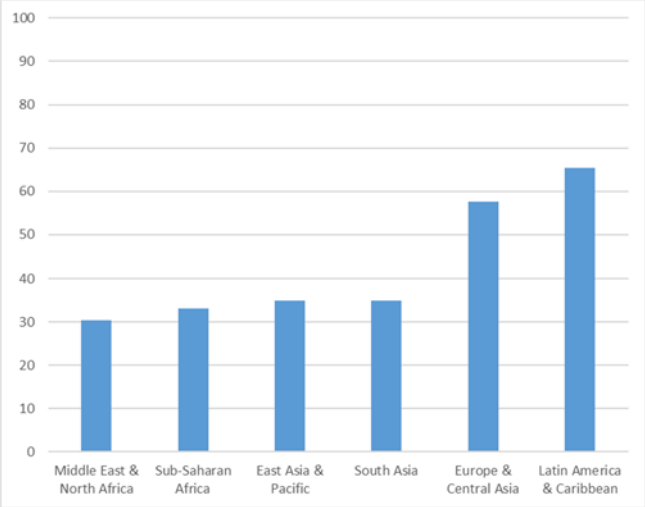


Figure 7.20: Variations in Power Sector Reform Index Score by country characteristics

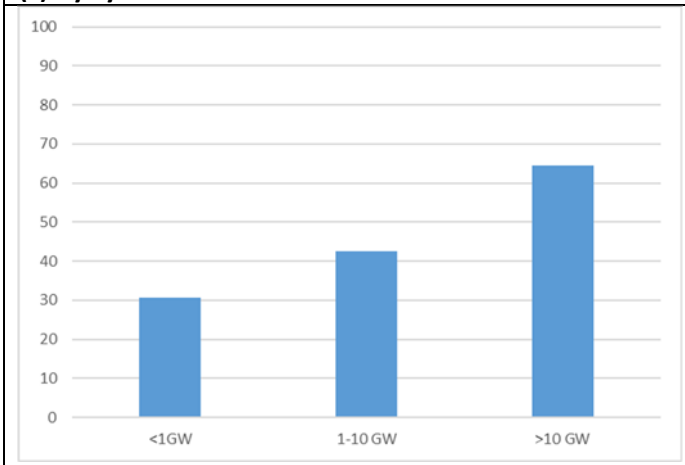
(a) By income group**



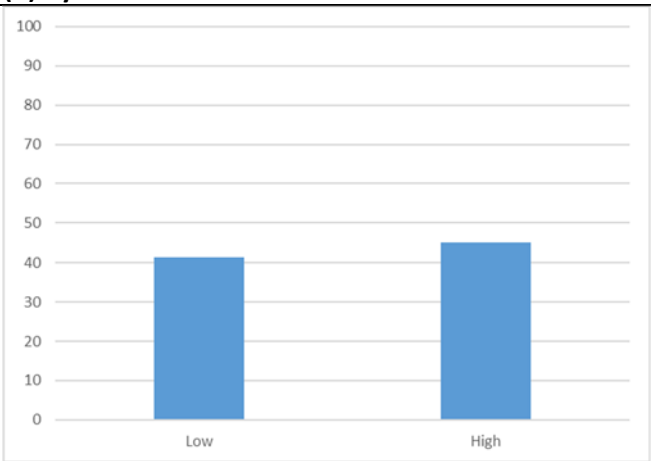
(b) By region**



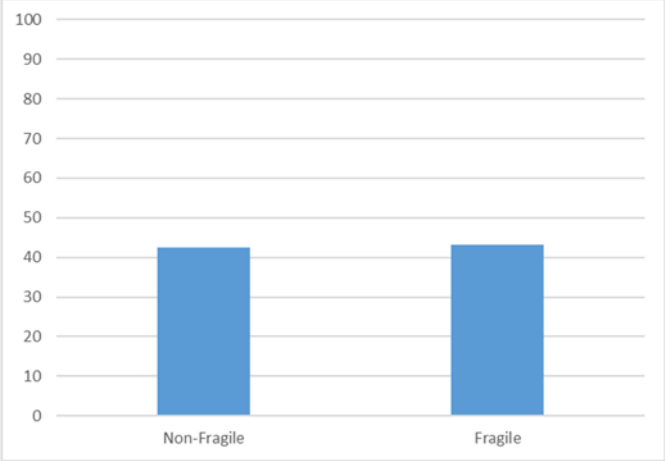
(c) By system size**



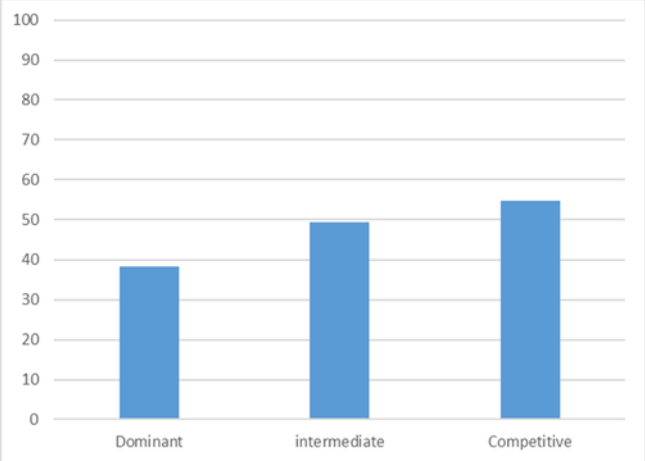
(d) By rule of law



(e) By fragility status



(f) By political economy*



** Differences are statistically significant at the 5 level

* Differences are statistically significant at the 10 level

8. Conclusion

Some 25 years have elapsed since the Washington Consensus on power sector reform began to promote among developing countries a reform agenda. This agenda encompassed the establishment of regulatory entities, the vertical and horizontal unbundling of vertically integrated national monopoly utilities, private sector participation in generation and distribution, and the introduction of competitive markets for power generation. Exploiting a unique new data set on the timing and scope of power sector reforms adopted by 88 countries across the developing world, this paper seeks to improve our understanding of the uptake, diffusion, duration, packaging and sequencing of power sector reforms, and the extent to which they were affected by the economic and political characteristics of the countries concerned.

Overall, power sector reform in the developing world lags far behind what was implemented in the developed world during the same time period. The median score for OECD countries on a Power Sector Reform Index developed in this paper was 77, compared to 37 for developing countries. Closer inspection shows that the most significant differences lie in the area of vertical and horizontal unbundling, which is twice as common in OECD as in developing countries, as well as implementation of wholesale power markets, which is ten times more likely in OECD than developing countries. Nonetheless, even among OECD countries that have introduced wholesale power markets, no country has fully privatized its sector. Moreover, 17 percent of the OECD countries that introduced a wholesale power market did so without fully vertically unbundling their power sectors; this percentage was twice as high for developing countries that reached the same stage of competition.

The paper finds that following rapid diffusion during the decade 1995-2005 the spread of power sector reforms slowed significantly in the subsequent decade 2005-2015, on almost every dimension of reform. The overall score for the Power Sector Reform Index in developing countries climbed 23 points from 12 to 35 in 1995-2005, but only 8 points to 43 in 2015. The slowdown is particularly evident in terms of the number of countries establishing regulatory entities or conducting private sector participation in generation or distribution in the later decade.

The one reform that does seem to have been almost universally adopted in the developing world by 2015 was the introduction of Independent Power Producers in the generation segment. This has now been done in 96 percent of developing countries. However, most other reforms come nowhere close to having been so widely adopted. For example, only 72 percent of developing countries had established a regulatory entity by 2015, only 44 percent had undertaken vertical unbundling, and a mere 7 percent had established a wholesale power market. Overall, 12 percent of developing countries in 2015 were still operating with vertically integrated state-owned monopoly enterprises.

Only a small minority of developing countries were able to fully implement the reform model as originally conceived. A mere half dozen developing countries (Argentina, Guatemala, India, Peru, the Philippines and Turkey) scored above 90 percent on the Power Sector Reform Index, indicating that almost all possible reform measures were taken. The time taken to implement such an extensive program of reform has varied widely across countries, and was typically much faster in Latin America than elsewhere, ranging from only 3 years in Peru to around 15 years in the Philippines.

Yet for the majority of countries, reforms were only selectively adopted, often according to ease of implementation, and reform programs often stagnated midway. A third to half of developing countries

find themselves in such an intermediate stage of reform, having partially implemented reforms in some areas but not in others, and in many cases reforms have been halted for over a decade. A number of countries have even experienced reform reversals undoing private sector participations in 18 countries, competition measures in three countries, and utility restructuring measures in two countries.

Furthermore, reforms have sometimes been packaged and sequenced in ways unrelated to the original logic. For example, 25 percent of developing countries have allowed for private sector participation without following through on competition, while another 15 percent have gone further on competition than their sector restructuring efforts would prepare them for. Some 13 percent of developing countries have created regulatory entities without having introduced private sector participation to their utilities, while a similar share find themselves in the opposite situation. While the principles of reform suggest that distribution private sector participation should precede the private sector participation in generation, the percentage of countries doing so was about the same as those that began by privatizing generation.

Country characteristics such as geography, income group, power system size, and attributes of the political system seem to have had a statistically significant influence on the uptake of reform. One of the largest influences has been system size: countries with installed capacity above 10 GW scored more than twice as high on the reform index as those with systems below 1 GW. Similarly, countries in the middle-income bracket, and those with relatively competitive political economies also scored much higher than others. Geographic region was also an important driver, with two distinct groupings. Latin America and the Caribbean stands out as the pioneering region for power sector reform, starting earlier and introducing more reforms than any other. However, over time, Europe and Central Asia has caught up to a substantial extent. On the other hand, Middle East and North Africa, Sub-Saharan Africa, as well as South Asia and East Asia and Pacific started from further behind and introduced reforms more slowly over the entire period.

Moreover, of the 34 countries (scoring under 33) that are still at an early stage of power sector reform, the vast majority fall into one of the categories of countries facing wider socioeconomic challenges that will make power sector reform challenging: Fragile states (14 cases), small systems (31 cases), low income bracket (16 cases), or weak rule of law (32 cases). 16 of these countries are in Sub-Saharan Africa. In fact, there is not a single large stable middle-income country in this group. This raises questions about the applicability of the classic power sector reform agenda in those countries that currently remain most in need of sector reform.

In summary, these patterns of uptake of power sector reform illustrate that while the Washington consensus reforms have become commonplace across the OECD, they remain very challenging to implement in their entirety in a developing country environment. Policy prescriptions for power sector reform diffused rapidly around the world during the decade 1995-2005 and experienced significant uptake in stable middle-income countries characterized by large power systems. However, even among this group, only a handful of countries were able to fully implement the reform model as originally envisaged, and typically over a lengthy period. A much larger group of countries implemented reforms selectively (typically emphasizing regulation and IPPs) and often ended up at an intermediate stage of reform, often without the impetus to introduce further reform. In addition, a significant minority of countries barely got started with reform and do not appear to present suitable conditions for doing so.

Annex 1A: Overview of Developing Country Level Scores in the Power Sector Reform Index, 1990–2015

Country	Scores Over Time			Scores on Different Dimensions of Reform, 2015			
	1995	2005	2015	Regulation	Restructuring	Competition	Private sector participation
Afghanistan	0	0	1	0	0	0	1
Algeria	0	63	51	25	12.5	12.5	1
Angola	0	0	57	25	25	6.25	1
Argentina	99	99	96	25	25	25	21
Armenia	34	81	74	25	25	12.5	11
Bangladesh	16	79	70	25	25	12.5	7
Belarus	0	31	25	25	0	0	0
Benin	0	0	25	25	0	0	0
Bolivia	2	10	34	0	0	25	9
Brazil	16	95	81	25	25	25	6
Burkina Faso	0	8	31	25	0	6.25	0
Burundi	0	0	25	25	0	0	0
Cambodia	0	41	43	25	0	6.25	12
Cameroon	3	37	56	25	0	6.25	25
Central African Republic	0	31	25	25	0	0	0
Chad	3	3	13	0	0	0	13
Chile	53	69	75	25	25	0	25
China	32	66	76	25	12.5	25	14
Colombia	80	82	77	25	12.5	25	14
Congo, Dem. Rep.	0	0	0	0	0	0	0
Congo, Rep.	0	31	25	25	0	0	0
Côte d'Ivoire	14	45	56	25	0	6.25	25
Dominican Republic	17	96	82	25	25	25	7
Ecuador	16	79	77	25	25	25	2
Egypt, Arab Rep.	0	47	38	25	0	12.5	1
Eritrea	0	0	0	0	0	0	0
Ethiopia	0	0	38	25	12.5	0	0
Ghana	0	39	72	25	25	18.75	3
Guatemala	17	98	92	25	25	25	17
Guinea	0	0	0	0	0	0	0
Haiti	0	1	9	0	0	6.25	3
Honduras	40	42	45	25	0	6.25	14
India	17	96	89	25	25	25	14
Indonesia	8	8	10	0	0	6.25	3
Iran, Islamic Rep.	16	16	15	0	0	12.5	2
Jordan	4	82	85	25	25	12.5	22
Kazakhstan	17	65	59	0	25	25	9
Kenya	0	32	54	25	12.5	12.5	4
Korea, Rep.	0	0	2	0	0	0	2
Kyrgyz Republic	16	47	38	0	25	12.5	0
Lao PDR	16	17	23	0	0	12.5	11
Lebanon	0	0	1	0	0	0	1
Liberia	0	0	0	0	0	0	0
Madagascar	0	31	34	25	0	6.25	3
Malawi	0	0	25	25	0	0	0
Malaysia	33	65	60	25	12.5	12.5	10
Maldives	0	0	0	0	0	0	0
Mali	0	32	33	25	0	6.25	2
Mauritania	0	31	25	25	0	0	0
Mexico	31	40	53	25	0	25	3

Country	Scores Over Time			Scores on Different Dimensions of Reform, 2015			
	1995	2005	2015	Regulation	Restructuring	Competition	Private sector participation
Mongolia	0	47	38	25	0	12.5	1
Morocco	1	19	33	0	0	18.75	15
Mozambique	3	34	42	25	0	6.25	11
Myanmar	0	0	29	0	12.5	12.5	4
Nepal	31	33	35	0	12.5	12.5	10
Nicaragua	48	81	87	25	25	25	12
Niger	0	31	25	25	0	0	0
Nigeria	1	40	81	25	25	12.5	18
Pakistan	9	56	52	25	0	18.75	8
Peru	65	97	91	25	25	25	16
Philippines	11	90	93	25	25	25	18
Poland	1	64	80	25	25	25	5
Romania	0	96	87	25	25	25	12
Russian Federation	3	3	64	0	25	25	14
Rwanda	0	31	34	25	0	6.25	3
Senegal	3	50	63	25	0	18.75	19
Sierra Leone	0	0	42	25	12.5	0	5
Solomon Islands	0	0	0	0	0	0	0
Somalia	3	3	13	0	0	0	13
South Africa	32	32	36	25	0	6.25	5
South Sudan	0	0	0	0	0	0	0
Sri Lanka	0	1	3	0	0	0	3
Sudan	0	1	26	25	0	0	1
Tajikistan	0	1	13	0	0	6.25	6
Tanzania	8	40	34	25	0	6.25	3
Thailand	16	16	43	25	0	12.5	5
Togo	0	31	36	25	0	6.25	4
Tunisia	0	8	8	0	0	6.25	1
Turkey	17	97	95	25	25	25	20
Uganda	3	82	80	25	25	12.5	17
Ukraine	79	96	86	25	25	25	11
Uzbekistan	0	31	25	0	25	0	0
Vanuatu	22	22	63	25	0	12.5	25
Venezuela, RB	16	48	44	0	25	12.5	6
Vietnam	0	55	61	25	12.5	18.75	4
Yemen, Rep.	0	0	0	0	0	0	0
Zambia	0	33	37	25	0	6.25	5
Zimbabwe	3	34	37	25	0	0	12

Annex 1B: Overview of Adoption of Washington Consensus Reforms in the Power Sector, 1990 – 2015

Country[20]	Year of establishment of regulatory entity	Restructuring timeline	Competition timeline	Year of 1st IPP	Private generation share (% of installed capacity)	Years of private sector participation in distribution/transmission companies (nr of companies)
Afghanistan	-[21]	-	-	-	9.5	-
Algeria	2002	Partial vertical unbundling in 2002	Single Buyer model since 2001	2004	9.6	-
Angola	2007	Full vertical unbundling in 2014	Monopoly plus IPPs model since 2015	-	9.0	-
Argentina	1992	Full vertical unbundling in 1995	Retail Competition model since 1995	1992	69.3	1993 (1), 1995 (4), 1996 (4), 1997 (2)
Armenia	1997	Partial vertical unbundling in 1995 Full vertical unbundling in 1997	Single Buyer model since 1995	-	68.5	2002 (1)
Bangladesh	2003	Full vertical and horizontal unbundling in 1996	Single Buyer model since 1995	1997	42.2	2006 (1)
Belarus	2000	Horizontal unbundling in 1997	-	-	0.1	1995 (1), 2000 (1)
Benin	2009	-	-	-	0.0	-
Bolivia	-	-	Monopoly plus IPPs model since 1998 Wholesale Competition model since 1996	1998	41.5	1995 (1), 2000 (1)
Brazil	1997	Horizontal unbundling in 1995 Full vertical unbundling in 1998	Single Buyer model in 1995 Wholesale Competition model since 1998	1993	44.1	-
Burkina Faso	2010	-	Monopoly plus IPPs model since 1998	1998	0.8	2001 (1)
Burundi	2011	-	-	-	0.4	-
Cambodia	2001	-	Monopoly plus IPPs model since 1997	1997	94.9	-
Cameroon	1998	-	Monopoly plus IPPs model since 2009	-	99.2	1993 (1), 1998 (1)
Central African Republic	2005	-	-	-	0.0	1996 (1), 1997 (2), 1998 (1), 2006 (1)
Chad	-	-	-	-	100.0	-
Chile	1978	Horizontal unbundling in 1982 Partial vertical unbundling in 1995 Full vertical unbundling in 2000	-	1992	99.5	1993 (1), 1998 (1)
China	2003	Partial vertical unbundling in 1995 Horizontal unbundling in 2003	Single Buyer model since 1995	1992	36.8	1990 (1)
Colombia	1992	Partial vertical unbundling in 1995	Wholesale Competition model since 1995	1993	69.2	1996 (1), 1997 (2), 1998 (1), 2006 (1)
Congo, Dem. Rep.	-	-	-	-	0.0	-
Congo, Rep.	2003	-	-	-	0.0	-
Côte d'Ivoire	1998	-	Monopoly plus IPPs model since 1995	1994	100.0	1990 (1)

[20] For a full list of the market players (regulatory entity, wholesale market and transmission system operators) please refer to the RISE project on rise.esmap.org

[21] "-" denotes no reform

Country[20]	Year of establishment of regulatory entity	Restructuring timeline	Competition timeline	Year of 1st IPP	Private generation share (% of installed capacity)	Years of private sector participation in distribution/transmission companies (nr of companies)
Dominican Republic	1998	Partial vertical and horizontal unbundling in 1998 Full vertical unbundling in 2001	Single Buyer model in 1995 Wholesale Competition model since 2001	1994	59.1	1998 (1), 1999 (1)
Ecuador	1998	Full vertical and horizontal unbundling in 1998	Single Buyer model in 1995 Wholesale Competition model since 2015	1992	19.8	-
Egypt, Arab Rep.	1997	Horizontal unbundling in 2000	Monopoly plus IPPs model in 1999 Single Buyer model since 2000	1999	6.6	-
Eritrea	-	-	-	-	0.0	2003 (1)
Ethiopia	2014	Partial vertical unbundling in 2013	-	-	2.2	1993 (1), 1995 (5), 2001 (1), 2003 (1) 2006 (1)
Ghana	2000	Full vertical and horizontal unbundling in 2008	Monopoly plus IPPs model in 1999 Bilateral Contracts model since 2008	1999	22.4	1995 (1), 1997 (1), 1998 (1)
Guatemala	1996	Full vertical unbundling in 1997	Single Buyer model in 1995 Wholesale Competition model since 1998	1994	68.9	1998 (1), 1999 (1)
Guinea	-	-	-	-	0.0	-
Haiti	-	-	Monopoly plus IPPs model since 1995	2009	25.1	-
Honduras	1995	-	Monopoly plus IPPs model since 1995	1994	60.3	2003 (1)
India	1998	Full vertical unbundling in 2003	Single Buyer model in 1995 Bilateral Contracts model in 2003 Wholesale Competition model since 2003	1991	33.3	1993 (1), 1995 (5), 2001 (1), 2003 (1) 2006 (1)
Indonesia	-	-	Monopoly plus IPPs model since 1995	1992	26.8	-
Iran, Islamic Rep.	-	-	Single Buyer model since 1995	2004	17.4	-
Jordan	2002	Full vertical unbundling in 1998 Horizontal unbundling in 2007	Single Buyer model since 1998	2007	77.2	2008 (2)
Kazakhstan	-	Full vertical and horizontal unbundling in 1998	Single Buyer model in 1995 Wholesale Competition model since 1998	-	34.9	1995 (1), 1997 (1), 1998 (1)
Kenya	2006	Horizontal unbundling in 1996 Partial vertical unbundling in 1997	Monopoly plus IPPs model in 1996 Single Buyer model since 1997	1996	31.3	-
Korea, Rep.	-	-	-	-	19.3	-
Kyrgyz Republic	-	Full vertical unbundling in 2001	Single Buyer model since 1995	-	0.0	-
Lao PDR	-	Horizontal unbundling in 2015	Single Buyer model since 1995	1996	86.3	-
Lebanon	-	-	-	-	6.9	2003 (1)
Liberia	-	-	-	-	0.0	2000 (1)
Madagascar	1999	-	Monopoly plus IPPs model since 2007	2007	23.3	-
Malawi	2007	-	-	-	0.0	-
Malaysia	2001	Partial vertical unbundling in 1995	Single Buyer model since 1995	1993	57.9	2005 (1)
Maldives	-	-	-	-	1.3	1994 (2), 1995 (1), 1996 (1), 1997 (1)

Country[20]	Year of establishment of regulatory entity	Restructuring timeline	Competition timeline	Year of 1st IPP	Private generation share (% of installed capacity)	Years of private sector participation in distribution/transmission companies (nr of companies)
Mali	2000	-	Monopoly plus IPPs model since 2014	-	16.5	1995 (1), 2003 (1)
Mauritania	2001	-	-	-	0.1	-
Mexico	1995	-	Monopoly plus IPPs model in 1998 Wholesale Competition model since 2013	1998	25.3	2005 (3)
Mongolia	2001	-	Single Buyer model since 2001	2012	4.8	1993 (14), 2007 (6)
Morocco	-	-	Single Buyer model in 1997 Bilateral Contracts model since 2008	1997	36.8	1997 (1), 1998 (1), 2001 (2)
Mozambique	2004	Horizontal unbundling in 1998	Monopoly plus IPPs model since 2014	2014	88.6	2010 (1)
Myanmar	-	Partial vertical and horizontal unbundling in 2006	Single Buyer model since 2006	2006	29.5	-
Nepal	-	Partial vertical unbundling in 1995	Single Buyer model since 1995	1994	28.5	2003 (1)
Nicaragua	1979	Full vertical and horizontal unbundling in 1999	Single Buyer model since 1995	1996	49.2	1995 (1)
Niger	1999	-	-	-	0.0	-
Nigeria	2005	Full vertical unbundling in 2010 Full horizontal unbundling in 2013	Monopoly plus IPPs model in 2001 Single Buyer model since 2010	2001	47.7	2013 (11)
Pakistan	1997	-	Monopoly plus IPPs model in 1995 Single Buyer model in 1997 Bilateral Contracts model since 2002	1992	49.6	2005 (1)
Peru	1996	Full vertical and horizontal unbundling in 1995	Wholesale Competition model since 1995	1996	80.3	2002 (1)
Philippines	2001	Full vertical unbundling in 2001	Monopoly plus IPPs model in 1995 Single Buyer model in 2001 Bilateral Contracts model in 2004 Wholesale Competition model in 2006 Retail Competition model since 2006	1992	79.9	2003 (1)
Poland	1997	Horizontal unbundling in 1997 Full vertical unbundling in 2013	Wholesale Competition model since 1995	-	36.7	-
Romania	2000	Full vertical and horizontal unbundling in 2000	Monopoly plus IPPs model in 1997 Bilateral Contracts model in 1998 Wholesale Competition model in 2000 Retail Competition model since 2007	2009	14.8	2005 (3)
Russian Federation	-	Horizontal unbundling in 2005 Full vertical unbundling in 2006	Wholesale Competition model since 2006	-	19.2	1996 (1), 2009 (3), 2010 (5), 2011 (1), 2013 (9)
Rwanda	2001	-	Monopoly plus IPPs model since 2010	2010	22.4	2003 (2), 2005 (1)

Country[20]	Year of establishment of regulatory entity	Restructuring timeline	Competition timeline	Year of 1st IPP	Private generation share (% of installed capacity)	Years of private sector participation in distribution/transmission companies (nr of companies)
Senegal	1998	-	Monopoly plus IPPs model in 1997 Single Buyer model in 1998 Bilateral Contracts model since 2012	1997	100.0	2010 (1)
Sierra Leone	2011	Partial vertical unbundling in 2011	-	-	37.5	1994 (1)
Solomon Islands	-	-	-	-	0.0	1998 (1)
Somalia	-	-	-	-	5.2	-
South Africa	1994	Horizontal unbundling in 1995	Monopoly plus IPPs model since 2006	2006	4.2	1995 (1)
South Sudan	-	-	-	-	0.0	1997 (1)
Sri Lanka	2002	-	-	1995	25.0	-
Sudan	2011	-	-	-	7.6	-
Tajikistan	-	Horizontal unbundling in 2002	Monopoly plus IPPs model in 2006	2006	16.9	2002 (1)
Tanzania	2001	-	Monopoly plus IPPs model in 1995	1994	21.3	-
Thailand	2007	-	Single Buyer model in 1995	1993	43.7	-
Togo	2000	-	Monopoly plus IPPs model in 2008	2008	34.7	-
Tunisia	-	-	Monopoly plus IPPs model in 1999	1999	10.1	-
Turkey	2001	Full vertical unbundling in 2001	Single Buyer model in 1995 Retail Competition model in 2001	1990	66.8	1996 (1), 2009 (3), 2010 (5), 2011 (1), 2013 (9)
Uganda	1999	Full vertical unbundling in 2001	Monopoly plus IPPs model in 1999 Single Buyer model in 2001	2007	63.0	2003 (2), 2005 (1)
Ukraine	1994	Full vertical and horizontal unbundling in 1995	Single Buyer model in 1995 Wholesale Competition model in 1996 Retail Competition model in 2010	2011	12.7	1998 (6), 2001 (6), 2006 (1), 2008 (1), 2010 (3)
Uzbekistan	-	Full vertical unbundling in 2001	-	-	0.0	-
Vanuatu	2007	Horizontal unbundling in 2011	Single Buyer model in 1995	2009	100.0	1994 (1)
Venezuela, RB	-	Full vertical unbundling in 1996, reversed in 2007	Single Buyer model in 1995	-	0.9	1998 (1)
Vietnam	2005	Partial vertical unbundling in 2005 Horizontal unbundling in 2010	Monopoly plus IPPs model in 1998 Single Buyer model in 2009 Bilateral Contracts model in 2015	1997	34.1	-
Yemen, Rep.	-	-	-	-	3.5	-
Zambia	1997	-	Monopoly plus IPPs model in 2013	-	9.8	1997 (1)
Zimbabwe	2003	Horizontal unbundling in 2015	-	-	99.2	-

Annex 2: Overview of Cases of Failed Private Sector Participation in the Power Sector, 1990 - 2015

Country	Date of Policy	Company name(s)	Contract type	Sub-sector	Scope of PSP	Scope unit	Date of PSP Reversal	Form of reversal	Terminating party	Description
Albania	1996	Elbasan Distribution Company	Divestiture	Distribution	41	Nr of connections (1000s)	2003	Na.	Na.	In 2003 the private sector participation in these distribution companies in 1996 was reversed.
	1996	Shkodra Distribution Company	Divestiture	Distribution	38	Nr of connections (1000s)	2003	Na.	Na.	
	1996	Vlore Distribution Company	Divestiture	Distribution	33	Nr of connections (1000s)	2003	Na.	Na.	
Argentina	1996	Empresa de Distribucion de Electricidad de Entre Rios SA	Concession	Distribution	217	Nr of connections (1000s)	2003	Private sector abandonment	Investor	In 2003, the private sector abandoned their investment in the distribution company following a devaluation of the peso and resulting loss of financial equilibrium
	1996	Empresa de Energia de Catamarca	Concession	Distribution	63	Nr of connections (1000s)	2008	Na.	Na.	The province of Catamarca nationalized Edecat in October of 2008.
Bolivia	1995	Empresa de Luz y Fuerza Electrica Cochabamba SA	Divestiture	Distribution	135	Nr of connections (1000s)	2010	Nationalization	Government	In 2010 the distribution company was nationalized as part of a series of
	1995	Empresa Valle Hermoso SA	Divestiture	Generation	289	MW	2010	Renationalization	Government	

Country	Date of Policy	Company name(s)	Contract type	Sub-sector	Scope of PSP	Scope unit	Date of PSP Reversal	Form of reversal	Terminating party	Description
	1995	Empresa Corani SA	Divestiture	Generation	126	MW	2010	Renationalization	Government	nationalizations of public infrastructure providers, following a change of government and resulting ideological shift.
	1995	Empresa Guaracachi SA	Divestiture	Generation	216	MW	2010	Renationalization	Government	
Brazil	2011	Jose de Alencar Thermal Power Plant	Greenfield	Generation	300	MW	2011/2012	Private sector abandonment	Investor	In 2012 Bertin Energia returned its concessions of separate power plants to the government.
	2011	Cacimbaes Thermal Power Plant	Greenfield	Generation	127	MW	2011/2012	Private sector abandonment	Investor	
	1998	Uruguaiana Combined-Cycle Power Plant	Greenfield	Generation	639	MW	2011/2012	Private sector abandonment	Investor	
	1999	Rio Negro Power Plant	Greenfield	Generation	158	MW	2008	Na.	Na.	Na.
Cabo Verde	1999	Electra	Divestiture	Generation, transmission & distribution	35	Nr of connections (1000s)	2006	Private sector abandonment	Investor	In 2006, EDP/AdP abandoned its investment in Electra, following which the company was recapitalized, with the government buying back 51 of the company's shares.
Comoros	1998	Comorienne de l'eau et de l'electricite	Concession	Generation, transmission & distribution	16	MW	2001	Renationalization	Na.	Cancelled due to disagreements over illegal

Country	Date of Policy	Company name(s)	Contract type	Sub-sector	Scope of PSP	Scope unit	Date of PSP Reversal	Form of reversal	Terminating party	Description
										connections and fuel purchasing
Dominican Republic	1999	Empresa de Distribucion Norte (Ede-Norte)	Divestiture	Distribution	Na.	Na.	2003	Renationalization	Government	EdeNorte and Edesur were re-nationalized in 2004 following unresolved disputes between the regulator and the company.
	1999	Empresa de Distribucion Sur (Ede-Sur)	Divestiture	Distribution	Na.	Na.	2003	Renationalization	Government	
Ecuador	2006	CATEG Management Contract	Management contract	Generation & Distribution	400	Nr of connections (1000s)	2007	Cancelled contract	Na.	Na.
Gambia, The	1993	SOGEA Rueil-Malmaison; Management Services Gambia	Lease contract	Generation, transmission & distribution	Na.	Na.	1995	Cancelled contract	Public	Management Services Gambia's management contract was terminated by the government in 1995.
Guinea	1995	Na.	Na.	Na.	Na.	Na.	2000	Cancelled contract	Both	Na.
India	1996	Dabhol LNG-Fired Power Plant	Greenfield	Generation	1444	MW	2001	Private sector abandonment	Both	Ownership of the power plant was transferred to Ratnagiri Gas and Power following disputes over the power purchase agreement terms.

Country	Date of Policy	Company name(s)	Contract type	Sub-sector	Scope of PSP	Scope unit	Date of PSP Reversal	Form of reversal	Terminating party	Description
	1999	Central Electricity Supply Company of Orissa (CESCO)	Divestiture	Distribution	Na.	Na.	2001	Renationalization	Government	CESCO was renationalized by the government following financial difficulties.
Kazakhstan	1996	Almaty Power Consolidated	Divestiture	Generation	1307	MW	2000	Na.	Na.	Planning difficulties resulted in the nationalization of the generation asset in 2000.
	1997	Petropavlovskaya Tets-2	Divestiture	Generation	Na.	Na.	1998	Na.	Na.	Na.
Mali	2000	EDM	Concession	Generation, transmission & distribution	Na.	Nr of connections (1000s)	2005	Renationalization	Government	The concession contract was terminated due to disagreements over tariffs and investment plans.
Peru	1998	Electro Norte	Divestiture	Distribution	140	Nr of connections (1000s)	2001	Renationalization	Government	Following disputes over management fees the government and private investors reached a settlement to return the distribution companies to public ownership.
	1998	Electro Noroeste	Divestiture	Distribution	159	Nr of connections (1000s)	2002	Renationalization	Government	
	1998	Electro Norte Medio	Divestiture	Distribution	140	Nr of connections (1000s)	2002	Renationalization	Government	
	1998	Electro Centro	Divestiture	Distribution	231	Nr of connections (1000s)	2002	Renationalization	Government	
Russian Federation	2002	Tatenergo	Management contract	Generation	24	MW	2004	Na.	Na.	Na.

Country	Date of Policy	Company name(s)	Contract type	Sub-sector	Scope of PSP	Scope unit	Date of PSP Reversal	Form of reversal	Terminating party	Description
	2003	Tomsk Municipal Utility Complex	Lease contract	Distribution	488	Nr of connections (1000s)	2007	Na.	Na.	Na.
Senegal	1999	Societe Nationale d'Electricite du Senegal (SENELEC)	Concession	Generation, transmission & distribution	300	MW	2000	Share buyback	Government	In September 2001, there was a change in government and ideological shift resulting in the buyback of shares to renationalize SENELEC.
Togo	2000	Togo Electricite (CEET)	Concession	Generation & Distribution	Na.	Na.	2006	Contract cancellation	Public	CEET's concession was cancelled in 2006 by the government following disputes over the concessionaire’s investments.
Venezuela, RB	1998	Sistema Electrico de Nueva Esparta (SENECA)	Divestiture	Generation	Na.	Na.	2007	Renationalization	Investor	SENECA was nationalized in 2007, with the 88 share of the private owners were transferred to state-owned entities.