# *Institutional Change in the Energy Regime Complex*

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**Abstract**

The concept of a regime complex has proved fruitful to a burgeoning literature in international relations, but it has also opened up new questions about how and why they develop over time. This paper describes the history of the energy regime complex as it has changed over the past forty years, and interprets this history in light of an interpretive framework of the sources of institutional change. One of the principal contributions is to highlight what Stephen Krasner referred to as a pattern of "punctuated equilibrium," reflecting long periods of stasis followed by rapid bursts of innovation. Although the concept of punctuated equilibrium has been around for some time, this paper is the first to demonstrate the empirical applicability of this concept to international regime complexes. This paper is an empirical investigation into the nature and timing of institutional innovation, and contributes to the eventual development of a dynamic theory of change in regime complexes.

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## *Institutional Change in the Energy Regime Complex*

Increasing globalization and interdependence give rise to a heightened demand for formal organizations and informal networks of state and non-state actors, within a state system characterized by lack of hierarchy and pervasive conflicts of interest.[2] Where conflicts of interest are not severe and especially where power is concentrated, incentives to cooperate can lead to the construction of robust international regimes, such as the international trade regime built around GATT and WTO.[3] But where interests and power are more fragmented, yet incentives for cooperation exist, often what Kal Raustiala and David Victor have called "regime complexes" emerge. In their terms, a regime complex is "an array of partially overlapping and non-hierarchical institutions governing a particular issue area."[4]

The purpose of this paper is to describe the history of the energy regime complex, as it has changed over the past forty years, and to interpret this history in light of a very straightforward explanation of the sources of institutional change, which relies on a conception of politics as reflecting the interests of the actors with the greatest relevant resources, and the strategies they employ. We do not develop a novel general theory nor do we engage in hypothesis-testing. We do engage in theory-guided historical analysis, in which our interpretation of changes in the oil regime complex is structured by a more general understanding of how institutions change in world politics.[5] The advantage of such a disciplined interpretive case study is that, by applying known theories to a new terrain, it forces one to sharpen these theoretical perspectives and it may generate new suggestions for improving the theory.[6]

One of the principal contributions of our historical interpretation of the regime complex for energy is to highlight a pattern of punctuated equilibrium in institutional innovation. A pattern of punctuated equilibrium is characterized both by periods of no significant innovation and periods of great innovation, as opposed to an incremental process of change. This is a pattern that Stephen D. Krasner described some time ago, borrowing the concept from paleontologist

[2] Keohane and Nye 1977/2001, chapters 1-3; Keohane and Nye 2000.
[3] Keohane 1984; Steinberg 2002.
[4] Raustiala and Victor 2004. See also Keohane and Victor, forthcoming.
[5] For a penetrating discussion of related issues in theory-development, see Eckstein 1975. For a systematic discussion of change in formal international organizations, see Shanks, Jacobson and Kaplan 1996.
[6] Odell 2001.

Stephen J. Gould, and we do not claim any theoretical originality with the concept.[7] However, our paper is the first to our knowledge to demonstrate the empirical applicability of this concept to international regime complexes. Krasner himself found little empirical support for the concept, and his work on the development of individual regimes is notably silent on punctuated equilibrium.[8] In the conclusion of our paper, we consider a possible explanation of why the pattern of punctuated equilibrium has not been previously observed.

The first section of this paper briefly sketches our conception – we do not call it a "theory" – of how change in a regime or regime complex takes place. This conception is meant to provide some analytical structure to our historical and institutional account, rather than having been generated independently through either deductive reasoning or induction from other issue-areas.[9] Section II describes in detail institutional change in the energy regime complex. Our principal focus is on oil, which is by far the most important internationally traded source of energy in the contemporary world, but petroleum markets and organizations are closely linked to other energy sources as well, so we retain the broader rubric. Finally, Section III builds on the historical description in Section II to argue that, indeed, the timing of change in the energy regime complex depends on dissatisfaction and shocks, as our interpretive framework claims.

## *I. Changes in Regime Complexes: An Interpretive Framework*

Regimes and regime complexes are subject to change, as new issues arise and configurations of power and interests change.[10] Agents are sometimes motivated to seek institutional change, and sometimes these efforts at institutional innovation, generating major changes in the institutional structure of the regime complex, succeed. Within such complexes, one can distinguish three main types of institutional innovation: the creation of new institutions, the nesting of institutions within others, and the adaptation of existing institutions.[11]

One way of thinking about institutional change is in terms of the demand for and supply of innovation.[12] Demand is created by strong dissatisfaction by policymakers with the outcomes of the regime complex. This dissatisfaction typically stems chiefly from dissatisfaction with the

[7] Krasner, 1984.
[8] Krasner, 1991. Krasner was admirably honest about the (surprising) lack of empirical support for the concept of punctuated equilibrium during his remarks at the Annual Meeting of APSA, 2010, Washington DC, Sept 2010.
[9] See Bates et al 1998.
[10] Keohane and Nye 1977/2001, chapters 4-6.
[11] See Aggarwal 1998; Young 2002; Helfer 2004; Alter and Meunier 2009.
[12] Keohane 1982.

distribution of material benefits that arises from the regime complex, although symbolic issues may sometimes be relevant as well. Unsatisfactory outcomes may be perceived as a result, in part, of ineffective, missing, or inappropriate institutions. As dissatisfaction about outcomes in the issue-area increases, so do opportunities for change in the institutional landscape. Conversely, as the dissatisfaction of a given issue-area decreases, the regime complex is likely to become frozen, retaining the structure that it developed during the previous period.

One natural consequence of strong dissatisfaction is increased demand for policy changes, and sometimes structural changes, within the regime complex. An example of a policy change within a regime complex is a decision by OPEC to supply more oil to global energy markets; an example of change in the institutional structure of the regime complex is the creation of a new institution such as the International Energy Forum. Both become more likely as dissatisfaction with the current state of energy markets increases. Although institutional changes are likely to have more enduring consequences than policy shifts alone, multilateral institutions are hard to change. We therefore expect that major institutional change will typically only occur when dissatisfaction with the status quo is intense.

Our interpretation of dissatisfaction as a driver of changes in regime complexes is consistent with the concept of "satisficing," first developed by Herbert Simon.[13] In the simple form of a satisficing model that we employ here, each actor is either satisfied relative to a reference level, or not. If the actor is satisfied, it persists in its status quo behavior; if it is dissatisfied, it may seek to innovate, depending on the costs of doing so. When actors are willing to accept the status quo, institutional innovation is slow or non-existent. Once dissatisfaction grows strong, however, we expect demands for innovation.

Furthermore, much depends on who is dissatisfied. It may not matter if weak actors are unhappy with the situation. But the structure of a regime complex is likely to change when powerful actors desire a change in the status quo outcome that is being blocked by the current institutional landscape: that is, when the underlying structures of power and interests no longer conform to institutional arrangements. Their dissatisfaction may be generated by changes in the status quo resulting from market forces, the behavior of transnational actors, the actions of other states, or institutional decisions. Before the state-led transformation of oil markets in the 1970s, a discussion of "major actors" in energy would have focused at least as much on the major

[13] Simon 1982.

international oil companies as on states; but since the 1970s, states have played the dominant roles on these issues so we focus on them.[14] It may also be stimulated by changes in the power of states as they perceive it, or by changes in the values and ideas of those in power.

Although dissatisfaction is a necessary condition for institutional change, it is not sufficient. The more embedded is a set of rules, norms, or information-provision arrangements in the structure of the regime complex and the roles played by its members – states, international secretariats, and non-governmental organizations – the more resistance to institutional reform is likely to emerge. Rather than attempting far-reaching reform, dissatisfied states may therefore engage in strategic "forum-shopping" within a regime complex to achieve favorable legal decisions and outcomes, or in a process of "regime-shifting" in which they choose to operate through particular institutions within the regime complex to craft policy. [15] Or they may settle for relatively minor institutional changes.

Small political changes, such as policy changes within an institution, may require only small investments of political resources, but large political changes, such as the creation of a new institution, require the construction of substantial political coalitions. Constructing a coalition sufficient to impose large institutional changes, or to create major new institutions, is very difficult. Thus while a pattern of incremental changes *within* an institution or regime is quite compatible with the interpretive framework developed here, we expect regime complexes to be quite stable except when sharp dissatisfaction generates discontinuous change, often caused by trigger events.

Two subsidiary propositions follow from this overall argument. First, regime complexes, like other institutions, will be "sticky" in the sense that they are hard to change. As a result, we expect changes in regime complexes to exhibit a pattern of "punctuated equilibrium," driven by sporadic trigger events and dissatisfaction among major states.[16] Although changes in a regime complex are triggered by environmental changes that cause dissatisfaction among major states, these trigger events are not sufficient to generate change. Groups of powerful actors with similar interests have to react to these triggers in similar ways, creating coalitions of actors that are able to translate their preferences into actions. If there is no sufficiently large coalition of dissatisfied states in response to environmental changes, institutional inertia will prevent significant change.

[14] Anderson 1981; Yergin 1991.
[15] Raustiala and Victor 2004; Helfer 2004; Biermann *et al* 2009.
[16] Krasner 1984.

But if such a coalition of dissatisfied actors forms, major changes can result. Hence, we expect a pattern of punctuated equilibrium, with alternating periods of stasis and rapid change. Second, it will matter how similar the preferences of major states are to one another. The breadth of dissatisfaction caused by external trigger events will vary from case to case, as will the degree of homogeneity in state preferences about what institutional changes to make in response to the situation. If the preferences of members of existing institutions are relatively homogeneous, dissatisfaction leads to changes (if any change at all) that are path-dependent, reflecting existing institutional arrangements. By contrast, entirely new institutions are most likely to emerge when there is significant heterogeneity in the preferences among the members of existing institutions.

## *II. Institutional Change in the Energy Regime Complex, 1950-2010*

In this section we explore the implications of the argument sketched above by examining the regime complex that has developed around international trade in energy. The energy regime complex is an ideal case for examining regime complex change as it displays considerable variation in time, and because there exists a plausible measure of dissatisfaction, as discussed in Part III. By far the most important commodity in the contemporary international energy regime is oil, so we focus principally but not exclusively on it here. However, the institutions that we discuss govern related issue-areas as well. Indeed, over time, the concept of international energy policy has been broadened. At a minimum, it now includes issues of market information, investment, transportation, and trade in both traditional (fossil fuels and nuclear) and renewable energy sources and technologies. Hence in our definition, the issue area that is covered by the energy regime complex is not limited to oil, although this commodity was the primary object of the first international energy regimes and remains the most important commodity governed by the energy regime complex.

Second, we narrow our analysis by focusing on the formal organizations that operate in the energy regime complex. While we recognize the existence of multiple international regimes with influence on energy policy outcomes, we focus in this paper on the most important intergovernmental organizations with an energy-specific mandate and on the G7/G8, which coordinates some important dimensions of international energy cooperation at the level of heads of government. This means that the international trade regime, the multilateral development banks, and informal governance networks are not central to the regime complex as we define it

here, even though they clearly affect it.[17] The advantage of this approach is that organizational reforms are relatively easy to observe and thus provide a convenient metric to measure institutional innovation in the regime complex.

Our empirical method is to trace how the international energy regime complex has emerged and changed in the postwar period. To that end, we take a snapshot of the regime complex every fifteen years from 1965 and then systematically compare the energy regime complex at different points in time. Examining the same regime complex over time has the virtue of allowing us to control for numerous variables specific to the issue-area and actors involved.[18]

The late 20th century did not see the advent of a major international energy organization with a truly global membership: on the contrary, there is a fragmented and poorly coordinated set of energy-related organizations. In 1960 the major oil-exporting states created the Organization of Petroleum Exporting Countries (OPEC). The most important organization for the oil-importing countries is the International Energy Agency (IEA), whose members are drawn from the industrialized democracies of Western Europe, North America, and Asia-Pacific. This same set of countries also address energy issues in the Organization for Economic Cooperation and Development (OECD) and in the Group of Seven (G7, later the G8). Two regional international organizations were formed, the Latin American Energy Organization (known as OLADE, its Spanish acronym) and later the African Energy Commission (AFREC). Truly global institutions devoted to energy issues developed only relatively recently, such as the International Energy Forum (IEF), which includes both consumers and producers of energy and petroleum.

**1950-1965**

Until the early 1970s there was almost no structured international energy cooperation among the major energy consuming nations. Only in the area of nuclear energy was there a multilateral institution: the International Atomic Energy Agency (IAEA), established in Vienna in 1957. The basic mission of the IAEA was to assist countries in developing civilian nuclear power in return for their acceptance of international inspections verifying that the assistance is used for

[17] For a more comprehensive mapping of the energy regime complex, see Colgan 2010; Lesage *et al.* 2010; Goldthau and Witte 2009. Scholarly work on the energy regime complex and global energy governance is developing rapidly; see Florini *et al*, unpublished; Lesage *et al* 2010; Witte 2009.
[18] Thompson 2010, 271.

peaceful purposes only. The establishment of the IAEA grew as much out of fear of an atomic arms race as out of enthusiasm for this new source of power.[19]

The lack of sustained multilateral energy cooperation before the 1970s reflected the fact that national energy markets were mostly autarkic, at least until the Second World War. The vast majority of the energy consumed in the developed countries, notably coal, was produced within their borders.[20] Since most industrialized countries were endowed with large indigenous coal reserves, there was almost no international trade in coal, and thus no need for international regulation.[21] Although between 1950 and 1970 Europe changed from a coal-based economy toward one based on petroleum imports from the Middle East, there was still no perceived need to erect multilateral institutions to govern or regulate these growing flows of oil. The principal oil consumers were grouped together in the Organization for Economic Cooperation and Development (OECD), which had evolved from the Organization for European Economic Cooperation (OEEC), itself created to coordinate Marshall Plan aid. On oil, the OECD adopted two legislative measures applicable only to the European member countries of the organization. These measures, which were actually carried over from the OEEC, dealt with stockpiling and oil apportionment in an allocation.[22]

The United States was by far the world's largest oil producer and was self-sufficient in oil supplies until after the end of the Second World War.[23] In 1970, it still produced eighty-five percent of the oil it consumed and it maintained mandatory oil import quotas until 1973. Within this protected market, state regulatory authorities in the United States, most notably the Texas Railroad Commission, enacted policies to restrain production and maintain prices.[24] Meanwhile, the international oil trade was dominated by a small group of oil companies, which were of exclusively American and Western European origin. For 25 years after World War II this oligopolistic market structure was remarkably stable.[25]

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[19] See, for example, President Eisenhower's *Atoms for Peace* speech. Available from: http://www.iaea.org/About/history_speech.html. Accessed 11 March 2010.
[20] Victor *et al.* 2006; Smil 2005, 15.
[21] An interesting exception is the European Coal Organization (ECO), founded in 1945 to allocate available coal supplies to needy member states. Although the ECO was regarded as quite effective, it was disbanded in 1947 by a unanimous decision of its member states.
[22] Scott 1977.
[23] *Ibid.*
[24] On the Mandatory Oil Import Program see Bohi and Russell 1978.
[25] The Soviet Union and its allies were outside this system, being essentially self-sufficient in oil.

This was the situation in which the Organization of Petroleum Exporting Countries (OPEC) was founded in 1960, at the initiative of the Venezuelan Oil Minister Pérez Alfonso and the Saudi Oil Minister Abdullah Tariki. Alfonso and Tariki had studied the example of the pro-rationing policies of the Texas Railroad Commission and wanted to replicate this model on a global scale.[26] Yet other states were opposed to this idea and initially OPEC was established to reduce dependence on the international oil companies by discussing royalties and tax questions, not as a cartel to set prices and quotas. Along with Venezuela and Saudi Arabia, the founding members were Iran, Iraq and Kuwait.

**1965-1980**

In response to the Arab-Israeli War of June 1967, the Arab oil-producing and transporting countries decided to prevent Arab oil from reaching any country that was supporting Israel. The "embargo" was not very successful, because the United States had spare oil capacity and Europe had oil stockpiles, and its failure led to the formation of OAPEC in January 1968. OAPEC was created by the three (then) most moderate Arab oil producers – Kuwait, Saudi Arabia, and Libya. The more politically radical Arab states such as Egypt and Iraq were initially excluded. Given OAPEC's crucial role in the first oil shock of 1973-74, it is ironic that its original purpose was to *prevent* the use of oil as a political weapon. In just a few years, the mood within OAPEC shifted dramatically, in part because of new members, and in part because of domestic political changes in existing member states (e.g., Qadhafi seized power in Libya). By 1972 the majority of OAPEC's membership was intent on using oil as a political weapon.

The global market for oil was reshaped by the oil shock of 1973-74. As a result of the growing world demand for oil, and geological depletion in the United States, the market had tightened; US spare capacity had disappeared by 1971. To fill the shortfall, OECD countries increasingly relied on oil imports from the Middle East.[27] These new market circumstances set the stage for oil-exporting countries to discover the political utility of the "oil weapon."

The trigger to the oil crisis was the Yom Kippur War of October 1973. The pro-Israeli position of the United States and the Netherlands prompted OAPEC – *not* OPEC, as is commonly believed – to impose oil embargoes on those two countries. Iraq, Iran, Venezuela, Indonesia, and other OPEC members did not participate in the embargo. The export ban was later extended to

[26] Yergin 1991, 523.
[27] Victor *et al*. 2006, 7.

Portugal, South Africa and Rhodesia. As a result, oil supplies fell about 9 percent on a global scale between October and December 1973.[28] The major oil-consuming countries reacted to this crisis in an uncoordinated and competitive manner. Some pressured their oil companies into giving them a preferential treatment. Others imposed restrictions on the export of petroleum. Larger countries' companies bid up oil prices on the spot market. European countries sought to distance themselves from the Dutch and appease the Arabs.

Faced with this challenge, the United States viewed existing institutional arrangements for addressing energy issues, mainly through the committee structure of the OECD, as incapable of decisive action. Secretary of State Henry Kissinger therefore wanted to create a new organization. Initially he intended to set up an explicitly anti-OPEC organization, but the European states and Japan, which were more vulnerable to oil supply interruptions than the United States, successfully resisted this call.[29] By November 1974 agreement was reached on the International Energy Program (IEP), establishing the IEA, with sixteen members, as an autonomous agency of the OECD. The IEA's secretariat was housed in Paris, but ironically France did not join the IEA because it preferred to maintain good relations with the Arab countries.

The IEA has two principal functions. The first and most important is to maintain and improve systems for coping with oil supply disruptions. Since its inception, the IEA has required its member countries to maintain a petroleum reserve equivalent to its consumption of net oil imports for a certain period of time. The reserve requirement was initially set at 60 days of imports and was soon increased to 90 days, where it has remained for more than 30 years. In the instance of an international disruption to oil supply, the IEA is empowered to distribute oil allocations to its member countries, although changes in the oil market since the 1970s have fundamentally changed how the IEA performs its function of coping with supply disruptions. The organization also requires major oil companies to share information, including proprietary and classified data, that is required to implement the system in the case of an emergency. The second key function of the IEA is to act as a body for the development of policy, information sharing, and technology transfer. During the long periods of oil-market stability, this second function has been the principal activity of the IEA.[30]

[28] Yergin 1991.
[29] Katz 1981.
[30] Van de Graaf and Lesage 2009.

A year before the IEA was created, in November 1973, the Latin American countries established their own continent-wide energy organization, namely the Latin American Energy Organization (OLADE). Although OLADE was created less than three weeks after the OAPEC oil embargo against the United States and the Netherlands, it was not a direct response to the embargo; talks had been ongoing for months. OLADE, with 27 members and a secretariat in Quito, Ecuador, was designed to contribute to the region's energy integration, conservation, and protection, although in practice the organization's achievements have been modest.

The turbulent 1970s also spawned another new relevant institution, the Group of Seven (G7). Alarmed by the international monetary and energy crises of the early 1970s, the leaders of six major industrialized countries felt the need to come together in an informal setting to discuss joint responses. They started to convene regularly, first as the G6 in 1975, then as the G7 with the addition of Canada in 1976, and then as the G8 after the addition of Russia in 1997. Although the agenda of the G7/G8 has always concentrated primarily on macroeconomic issues, it has also addressed energy issues from the outset. The G7/G8 has a patchy record on energy, since its attention to the subject has waxed and waned, depending on oil prices.

**1980-1995**

Between 1980 and the mid-1990s, some important shifts occurred in the world petroleum markets. After the oil price spikes of the 1970s, oil prices declined before collapsing in the mid-1980s. This oil price collapse was both a cause and a consequence of OPEC's decay over this period. As a result of the two price hikes of the 1970s, consumer countries shifted away from oil and new oil producers emerged outside of OPEC, thus lowering the demand for OPEC's oil. Meanwhile, a war erupted between two of OPEC's most important producers, Iran and Iraq, in early 1980s. These two rivals produced oil at all costs to finance their war activities. Numerous member countries exceeded their OPEC quota at the expense of Saudi Arabia, which then decided to flood the market with oil. As a result, the oil price collapsed to an all-time low and would not recover for more than a decade.

The IEA underwent significant incremental changes during this period. First, the membership grew to become virtually OECD-wide.[31] Particularly significant was the accession of France to the agency in 1992.[32] The IEA also changed the way in which it dealt with oil

[31] At present, the only OECD members not belonging to the IEA are Mexico, Chile, Slovenia, Israel and Iceland.
[32] Van de Graaf and Lesage 2009, 297.

supply disruptions. Soon after its creation it became apparent that the threshold required to activate its ingenious allocation system – a collective or national oil supply disruption of at least seven percent – was too restrictive. In addition, the oil market became much more fungible and integrated with the creation of spot and futures markets in the early 1980s. Thus, in 1984, the IEA's Governing Board established a new, flexible consultation procedure, the so-called coordinated emergency response measures (CERM). Under CERM, a coordinated release of oil stocks to the market becomes possible even when the supply shortfall is less than 7 percent. Releasing oil stocks has thus come to be preferred over oil sharing, reflecting the members' preference for market-based regulation.

A third change in the IEA was a broadening of the agency's purposes and functional scope. In 1993, the Governing Board adopted the so-called Shared Goals, which have come to be known as the "three E's:" energy security, economic development and environmental protection. Compared with the provisions of the IEP Agreement of 1974, the Shared Goals dedicate much more attention to free trade and to the environment, while the document contains fewer references to nuclear energy.[33]

Despite these changes, in some ways the IEA remained structurally frozen in time. Indeed, the five principal divisions of the IEA's organization in 2010 were the same (with some slight name changes) as they were in the early 1980s.[34] A poignant example of the stability and even rigidity of the IEA structure is the voting structure of its Governing Board. Decisions at the IEA are typically made by consensus, but in the event of an energy crisis in which difficult oil supply allocation decisions must be made, voting could become critically important. However, the votes on the Board are distributed according to an arcane system based on the 1973 net oil imports of the member countries. Specifically, each member state is given three votes plus a number of votes based on their 1973 net oil imports. One hundred votes are allocated based on the oil imports. However, since the energy consumption of the IEA states has changed significantly over time, the voting structure would look significantly different if the votes were re-allocated based on current net oil imports. In the 1990s, there were multiple efforts to find a way to redistribute the IEA's votes, but each time a proposal was made, it was defeated.[35] Since

[33] Van de Graaf and Lesage 2009.
[34] In 2010, the five divisions were known as: the Executive Office, Oil Markets and Emergency Preparedness, Energy Technology and R&D, Long-term Cooperation and Policy Analysis, and the Global Energy Dialogue.
[35] Bamberger 2004, 29.

powerful states benefited from the existing regime, there was little incentive for them to support a reform. Figure 1 shows the difference in votes each country would receive if the voting structure were modified to reflect the net oil imports in 2005.[36] While South Korea and Spain stand to benefit significantly, the United States, the United Kingdom, and Canada would all lose a large number of votes. The rigidity in the IEA's voting structure is emblematic of the overall stability in its organizational structure and core rules and procedures since the 1970s.

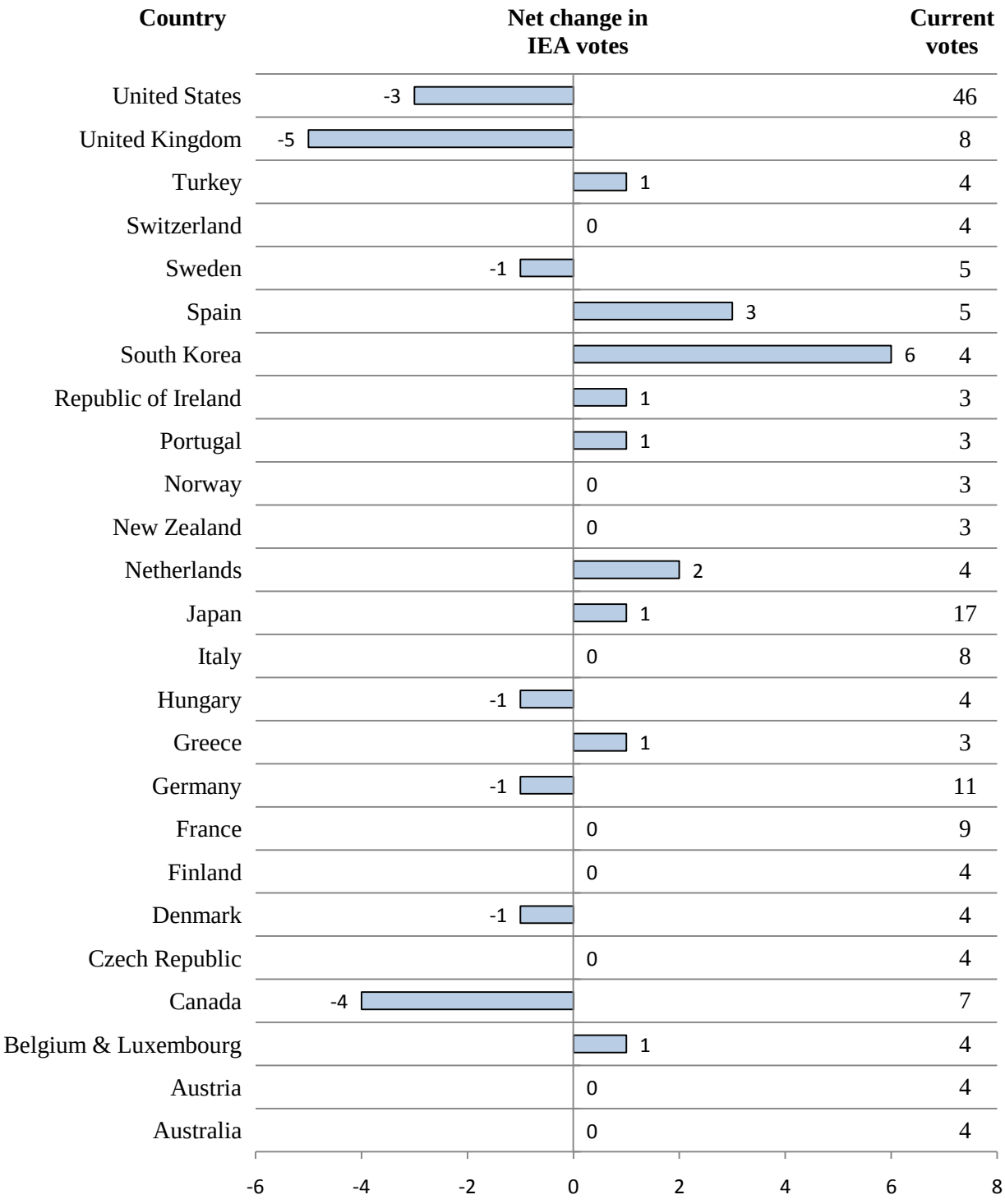
***– Figure 1 around here –***

Outside of the IEA, two new multilateral energy initiatives were launched in the early 1990s. First, there was the International Energy Forum (IEF), a biannual dialogue between energy consumers and producers. The IEF has its roots in the inaugural "ministerial seminar" of producers and consumers held in Paris in 1991, at the initiative of France and Venezuela. As energy ministers showed interest to participate, this informal forum took on high-level proportions, migrating from capital to capital every two years, alternately in an oil-exporting and an importing country. Gradually, the IEF process has moved along the path of institutionalization, with the establishment of a permanent secretariat in Riyadh (Saudi Arabia) in 2003 and a concomitant International Energy Business Forum in 2004. Saudi Arabia wanted to finance a permanent secretariat, because the IEF provided it with political cover to take a more moderate position within OPEC.

The IEF is one of the most inclusive global energy forums. At present, more than 80 countries participate, including all IEA and OPEC members. Importantly, the IEF also gives a voice to important producing countries outside of OPEC, such as Russia, Brazil and Mexico, as well as key importing countries outside the IEA, such as India, China and South Africa, and many other countries from the developing world. Discussions within the IEF focus primarily on oil markets, but they have been extended to include gas markets. One area in which the IEF has successfully made progress is oil data transparency. In 2000, the IEF secretariat brought together the five other key international organizations involved in oil statistics with the objective of achieving systematic global data improvement. In what was called the Joint Oil Data Initiative (JODI), they agreed to gather monthly oil statistics through a monthly questionnaire. The resulting database is coordinated by the IEF secretariat.

[36] Poland and Slovakia, which did not join the IEA until 2008, are omitted from this figure.

**Figure 1: Net change in IEA Votes, if based on 2005 net oil imports**



A second new institution that emerged in this period was the Energy Charter Treaty (ECT). The roots of the ECT date back to the early 1990s, at the height of post-Cold war euphoria. Many successor states to the Soviet Union, including Russia, were rich in energy resources but needed major investments to ensure their development. Western European countries, on the other hand, saw in the region an opportunity to diversify their sources of energy supply to diminish their dependence on the Middle East. Dutch Prime Minister Ruud Lubbers proposed the European Energy Charter, a political declaration stating the intent to promote East–West energy trade, which was signed in December 1991. The Energy Charter Treaty, which is a legally binding multilateral treaty, was signed in 1994. It came into force in 1998 and now includes 51 Eurasian countries (plus the European Communities). The ECT covers a wide range of aspects of energy cooperation: trade, investment, transit, energy efficiency and dispute settlement. However, key energy importing countries such as China and the United States and exporting countries, including Russia, Norway and the OPEC members did not commit to the ECT.

**1995-2010**

Since the turn of the millennium, the oil and gas markets have been quite turbulent. Oil prices rose after 2003 to a peak of almost $150 a barrel in 2008, before falling back to around $70-80 in 2009-2010. In this climate of rapid change, two new multilateral energy institutions were created. The International Renewable Energy Agency (IRENA) was officially established on 26 January 2009. IRENA has not been nested within an existing organization, nor has it been set up within the United Nations family. Instead, it has been established as an independent international organization. To date, 148 countries plus the EU have signed the statute and thirty-four countries have ratified it. On July 8, 2010 the statute entered into force and the organs of IRENA (an Assembly, a Council and a Secretariat) officially began operating. The secretariat is located in the low-carbon project of Masdar City in Abu Dhabi. IRENA performs some soft coordinating functions in the field of renewable energy. It provides policy advice to both industrialized and developing countries, for instance to improve their regulatory frameworks. Knowledge gathering and dissemination is another important function of the new agency, including on the potential of renewable energy, best practices, effective financial mechanisms and

state-of-the-art technological expertise. Finally, IRENA aims to build capacity, promote technology transfer, and stimulate research.

The second institutional newcomer is the International Partnership on Energy Efficiency Cooperation (IPEEC). The decision to establish IPEEC was taken at the G8 Energy Ministerial in Aomori, Japan, in June 2008, by the G8 countries plus China, India, South Korea and the EU. Brazil and Mexico later joined the initiative. The ministers explicitly stated that IPEEC is not about developing standards or efficiency goals for the participants, but about exchange of information and best practices, joint research and development, and developing public-private partnerships. The Partnership, whose secretariat is hosted at the IEA in Paris, will be a high-level international body open to all interested countries.

Meanwhile, the IEA was also adapting by slowly shifting its attention to climate change and engagement with non-member countries. The IEA's initial action on climate was closely linked to the implementation of the United Nations Framework Convention on Climate Change (UNFCCC). Beginning in 1994, the IEA, together with the OECD, provided a Secretariat for the Annex I Expert Group on the UNFCCC. The IEA also hosted the secretariat of the new Climate Technology Initiative (CTI), from 1996 to 2002, after which it was transformed into an IEA Implementing Agreement. Since 1999, the IEA has maintained a database of its member countries' policies and measures to reduce greenhouse gas emissions, as well as databases on energy efficiency and renewable energy policy. The IEA also stepped up its outreach policy in the latter half of the 1990s, concluding cooperation agreements with three priority countries – Russia (1994), China (1996) and India (1998).[37] Both the IEA's climate and outreach policies received a significant boost from the 2005 Gleneagles summit of the G8, where the IEA was explicitly invited for the first time to contribute to the G8's climate and energy discussions. Since Gleneagles, the IEA's Executive Director has been invited to every G8 summit. In response to the G8's call for action, the IEA has published a lot of climate-related studies and has engaged emerging economies through all sorts of channels, ranging from workshops, over energy policy reviews to inviting them to attend the IEA's Governing Board. Today, climate issues have moved to the IEA's mainstream and the agency's Executive Director Nabuo Tanaka explicitly favors full-fledged accession of China and India into the IEA.[38]

[37] Bamberger 2004.
[38] IEA 2007.

The Energy Charter Treaty, however, did not fare well in the last decade. It has had little impact so far on investment flows and on reducing transit risk,[39] nor has it been able to prevent or mediate disputes such as the 2006 and 2009 Russian-Ukrainian gas crises. The key problem is that Russia has abstained from ratification. Thus the ECT violated "the first rule of effective institution building: it alienated the most important player."[40] Although for a while Russia applied the ECT on a provisional basis, in October 2009 Moscow formally withdrew from the treaty, fearing that former shareholders of Yukos would use the ECT to sue it for its appropriation of their investment. To many observers, this was the final blow to the ECT.[41] The member countries of the ECT are aware of the difficulties the regime is having, and have created a Strategy Group with a mandate to try to revitalize the Treaty.[42]

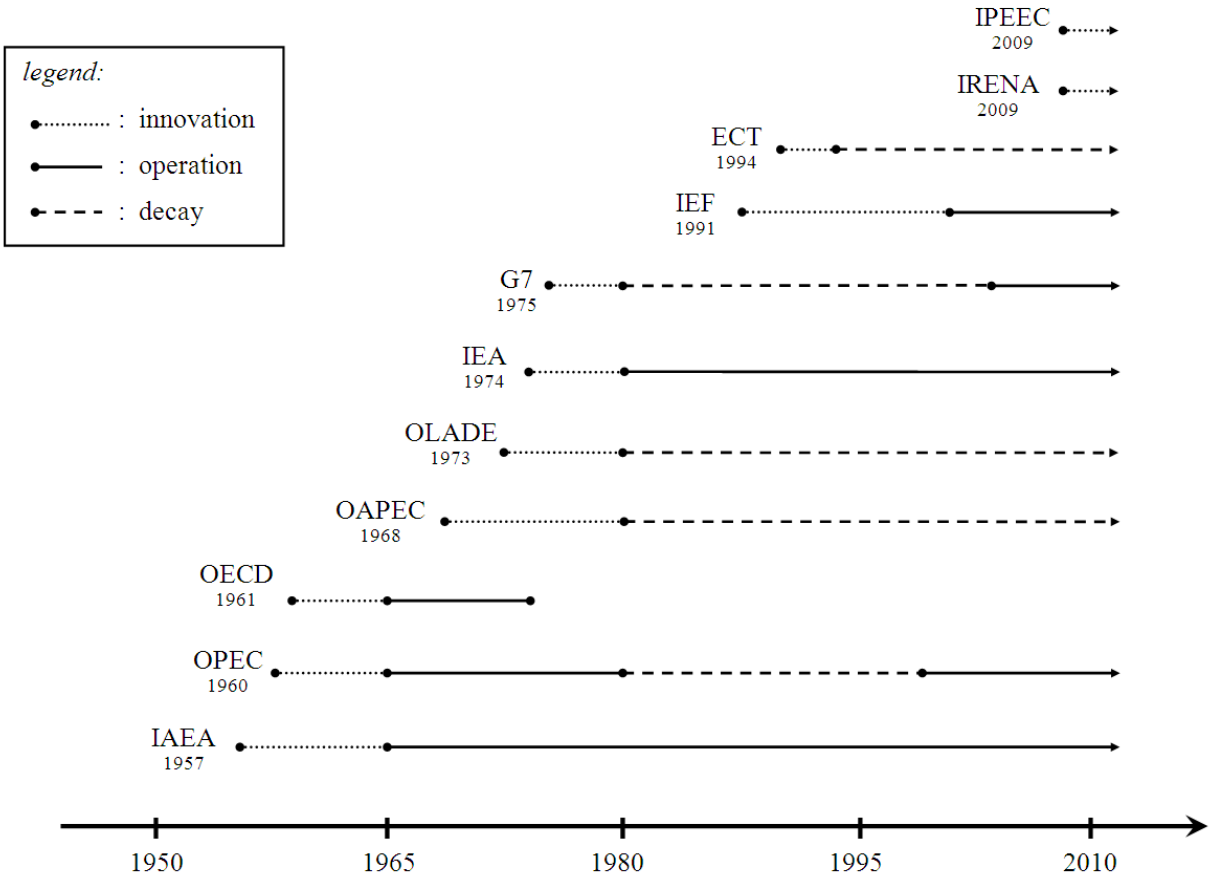
**Summarizing the observed patterns of change**

The patterns of change that we observe are summarized in Figure 2. This figure graphically depicts the main institutional changes in the regime complex for each time period. It provides an overall view, although these institutions vary greatly in importance, with the IEA and OPEC being the most important institutions specifically devoted to energy and the G7/G8 being the most important institution overall.

***– Figure 2 around here –***

[39] Victor *et al.* 2006, 30.
[40] Victor and Yueh 2010, 67.
[41] Author's interview with Claude Mandil, former Executive Director of the IEA, Paris, 9 March 2010.
[42] Source: http://www.encharter.org/index.php?id=21&id_article=205&L=0. Accessed 6 May 2009.

**Figure 2: Institutional changes in the International Energy Regime Complex by period**



## *III. State Preferences and Institutional Innovation in the Energy Regime Complex*

Since our interpretation of institutional change focuses on dissatisfaction by major states we focus first on some measures of which states were important, then on measures of dissatisfaction by major states. We think of the "major states" as the five largest oil importers and exporters in each period, as identified in Table 2. In our analysis, dissatisfaction among at least a subset of these states is a precondition for institutional change.

**Table 2: Major States Affecting the Energy Regime Complex**

| **Energy importers** | | | | |
|---|---|---|---|---|
| **1965-1973** | **1974-1981** | **1982-1990** | **1991-2002** | **2003-2010** |
| United States | United States | United States | United States | United States |
| Japan | Japan | Japan | Japan | Japan |
| France | France | France | France | China |
| Germany | Germany | Germany | Germany | France |
| UK | Italy | Italy | Italy | Germany |
| | | | | |
| **Energy exporters** | | | | |
| **1965-1973** | **1974-1981** | **1982-1990** | **1991-2002** | **2003-2010** |
| Venezuela | Saudi Arabia | Saudi Arabia | Saudi Arabia | Saudi Arabia |
| Iran | Iran | USSR | Russia | Russia |
| Saudi Arabia | USSR | Venezuela | Venezuela | Iran |
| Kuwait | Kuwait | Iraq | Iran | Norway |
| USSR | Venezuela | Iran | Norway | UAE |

Table 3 provides a rough measure of dissatisfaction on the part of importing states: the extent to which members of the G7 have made new commitments on energy issues.[43] The G7/G8 has met annually for the last 35 years with a varying agenda, not specifically related to energy. Commitments imply efforts to change the *status quo*, requiring time and political attention, implying less attention for other issue-areas. By focusing on the number of commitments on energy issues made at the G7/G8 meetings, we can generate a measure of the degree of attention paid to energy by the leaders of the major industrialized countries, giving us an indicator of dissatisfaction that does not depend on a measure of oil prices. We count the number of commitments each year and then, to smooth out the annual variations, combine them for overlapping three-year periods (1978-1980, 1979-1981, etc.).

[43] The G7 has always been principally a set of oil-importing states, although this balance was shifted somewhat when it became the G8, including Russia. We focus on G7 activity as a measure of attention by oil-importing states.

**Table 3: Energy Commitments by the G7/G8, 1975-2009**[44]

| Year | Energy commitments | Description and interpretation |
|---|---|---|
| 1975 | 3 | |
| 1976 | 1 | *Phase 1: high attention (1978-1981)* Each three-year period between 1978 and 1981 has an average of more than ten commitments per year. Energy is on the agenda of each summit over this period and the group agrees on some remarkably far-reaching commitments. At the 1978 Bonn summit, for example, the United States pledges to let its domestic oil prices rise to world levels. One year later, at the 1979 Tokyo summit, the seven countries even agree to put a ceiling on their oil imports by 1985 and to let a high-level group do periodic reviews of the results. |
| 1977 | 5 | |
| 1978 | 17 | |
| 1979 | 23 | |
| 1980 | 25 | |
| 1981 | 9 | |
| 1982 | 1 | *Phase 2: low attention (1982-1990)* In this period, the annual number of commitments per three year period never exceeds one. At the 1982 Versailles summit there are transatlantic tensions over the European participation in a Soviet gas pipeline project. During most of the 1980s, the G7 remains silent on energy. |
| 1983 | 2 | |
| 1984 | 0 | |
| 1985 | 0 | |
| 1986 | 1 | |
| 1987 | 0 | |
| 1988 | 0 | |
| 1989 | 1 | |
| 1990 | 1 | |
| 1991 | 12 | *Phase 3: moderate attention (1991-2001).* In this period, the annual number of commitments per three year period ranges between 5 and 10. The G7 works especially on nuclear safety in the former Soviet bloc, which was a G7 priority from 1992 to 1996. On other issues, the group has more difficulties in finding common ground. An illustrative example is the G8 Renewable Energy Task Force, which was set up at the 2000 Okinawa summit but whose report was largely ignored by the 2001 Genoa summit due to resistance by the new Bush administration in the United States. |
| 1992 | 16 | |
| 1993 | 1 | |
| 1994 | 10 | |
| 1995 | 3 | |
| 1996 | 7 | |
| 1997 | 12 | |
| 1998 | 8 | |
| 1999 | 4 | |
| 2000 | 7 | |
| 2001 | 2 | |
| 2002 | 25 | *Phase 4: high attention (2002-2009)* The G8 turns to energy again, with an average of almost 40 commitments per year. The 2005 Gleneagles summit is a milestone. It results in a detailed plan of action on energy and climate that contains numerous commitments, delegates tasks to international organizations, and sets up energy dialogues with large developing countries. At the 2006 St. Petersburg summit, the G8 agree to a set of "global energy security principles" which all countries should abide by. In 2009, the G8 creates a new international organization for energy efficiency, the IPEEC. |
| 2003 | 40 | |
| 2004 | 15 | |
| 2005 | 77 | |
| 2006 | 108 | |
| 2007 | 55 | |
| 2008 | 60 | |
| 2009 | 38 | |

[44] Table 3 only comprises the energy-related commitments made at the annual G7/G8 summits, not at the ministerial meetings. The figures are based on data from the website of the G8 Research Group at the University of Toronto, available from: http://www.g7.utoronto.ca/. Accessed 12 June 2010.

The results of Table 3 are dramatic. There are two periods of high dissatisfaction: 1977-1982 and 2002-2009. In each three-year period within these longer periods, the annual number of commitments averages ten or more; and as the commentary in the table indicates, some of these commitments are very important. In stark contrast, in the period between 1982 and 1990 – one of falling, then low, oil prices – the major industrialized countries make almost no commitments at the summit level – less than one a year on average. The 1990s are a period of moderate attention, although the figures are inflated by post-Cold War attention to nuclear safety issues. Conventional energy is not a focus of attention again until 2002.

Our measure of the dissatisfaction of oil-exporting states focuses on the price of oil, both its level and its direction and rate of change. Table 4 provides data on OPEC oil revenue from 1975 to 2009, as indicators of dissatisfaction for exporting countries. Our assumption is that OPEC member dissatisfaction depends both on the level of oil revenues and their trend. We therefore interpret OPEC member dissatisfaction as increasing during the early 1980s, reaching a peak in 1986 when oil revenues fell sharply to levels not seen since before 1975. After a slight recovery, revenues fell again to an even lower point in 1998 and stayed quite low until sharp increases began in 2003. Not surprisingly, the periods of high exporter dissatisfaction are almost a mirror image of those for importers.

***– Table 4 about here –***

Our argument implies that importing countries should press for institutional innovation when they are dissatisfied, and likewise for exporting countries. Table 5 evaluates the evidence for this argument by summarizing the expected and actual extent of institutional innovation over the period 1965-2010. The time periods are identified in the first column, while the second column summarizes the period's oil prices and mentions any major trigger events of that period. When oil prices are moderate – that is, roughly $15-35 in constant 2000 US dollars – we expect there to be relatively little dissatisfaction, and thus little innovation in the regime complex, consistent with Simon's notion of satisficing. During periods of high oil prices (e.g., 1973-74; 1979-81; 2005-2010), we expect to see dissatisfied energy-importing states (identified in the third column) acting to change institutional arrangements to handle contemporary problems. Conversely, in periods of low oil prices (e.g., 1985-86, 1998), we expect to see dissatisfied energy-exporting states acting to change institutional arrangements.

**Table 4: OPEC per capita oil revenue and dissatisfaction, 1975-2009**

| Year | Oil revenue (2000$) | Annual % change | Summary characterization of level and direction of prices |
|---|---|---|---|
| 1975 | 2,601 | | |
| 1976 | 2,616 | 0.58% | High/neutral |
| 1977 | 2,601 | -0.57% | High/neutral |
| 1978 | 2,207 | -15.15% | High/neutral |
| 1979 | 3,037 | 37.61% | **High/positive** |
| 1980 | 3,500 | 15.25% | High/neutral |
| 1981 | 2,710 | -22.57% | High/negative |
| 1982 | 1,646 | -39.26% | High/negative |
| 1983 | 1,249 | -24.12% | High/negative |
| 1984 | 1,139 | -8.81% | High/negative |
| 1985 | 918 | -19.40% | Moderate/neutral |
| 1986 | 507 | -44.77% | *Low/negative* |
| 1987 | 622 | 22.68% | Low/positive |
| 1988 | 517 | -16.88% | Low/neutral |
| 1989 | 648 | 25.34% | Low/positive |
| 1990 | 790 | 21.91% | Moderate/positive |
| 1991 | 623 | -21.14% | *Low/negative* |
| 1992 | 631 | 1.28% | Low/neutral |
| 1993 | 537 | -14.90% | Low/neutral |
| 1994 | 562 | 4.66% | Low/neutral |
| 1995 | 603 | 7.30% | Low/neutral |
| 1996 | 699 | 15.92% | Low/neutral |
| 1997 | 656 | -6.15% | Low/neutral |
| 1998 | 425 | -35.21% | *Low/negative* |
| 1999 | 560 | 31.76% | Low/positive |
| 2000 | **899 (median)** | 60.54% | Moderate/positive |
| 2001 | 694 | -22.80% | *Low/negative* |
| 2002 | 655 | -5.62% | Low/neutral |
| 2003 | 775 | 18.32% | Moderate/neutral |
| 2004 | 1,035 | 33.55% | Moderate/positive |
| 2005 | 1,493 | 44.25% | **High/positive** |
| 2006 | 1,704 | 14.13% | High/neutral |
| 2007 | 1,785 | 4.75% | High/neutral |
| 2008 | 2,378 | 33.22% | **High/positive** |
| 2009 | 1,388 | -41.63% | High/negative |

Note: Oil revenue data is per capita and in real 2000 dollars. Percentages are calculated on an annual percentage basis. Oil revenues within 20% of the median level (719-1079) are coded as "moderate;" more than 20% below the median as low, and more than 20% above the median as high. Rates of change are coded as "positive" above +20%, neutral between -20 and +20%, and negative below -20%. (The median absolute rate of change is 19.7%.) Source: data from: http://www.eia.doe.gov/cabs/OPEC_Revenues/Factsheet.html. Accessed 19 June 2010.

**Table 5: Dissatisfaction and Institutional Change in Energy Politics**

| Time period | Oil Prices / Trigger Event | Dissatisfied Major States | Expectation | Actual result | Is the argument supported? |
|---|---|---|---|---|---|
| 1965-1972 | Low-Moderate | None | No innovation | No innovation | Yes |
| 1973-1974 | High | US, Japan, Germany, UK | **Importers innovate** | Importers innovate (IEA, OLADE created) | Yes |
| 1975-1978 | Moderate | None | No innovation | No innovation | Yes |
| 1979-1981 | High | US, Japan, Germany | **Importers innovate** | Importers partially innovate (IEA is restructured) | Partially |
| 1982-1983 | Moderate | None | No innovation | No innovation | Yes |
| 1985-1986 | Low | Exporters dissatisfied, esp. Saudi Arabia, Kuwait | *Exporters innovate* | Not much innovation (OPEC members at war) | ***No*** |
| 1987-1990 | Moderate | None | No innovation | No innovation | Yes |
| 1991-1994 | USSR collapses | Geopolitical trigger: All states re-assess | ***General innovation and re-alignment*** | Re-alignment: IEF, ECT created; OECD, IEA get new members | Yes |
| 1995-1998 | Low, declining sharply in 1998 | Exporters dissatisfied | *Exporters innovate* | OPEC innovates: production agreement with Russia, others | Yes |
| 1999-2002 | Moderate on average | None | No innovation | No innovation | Yes |
| 2003-2010 | High | US, Japan, France, Germany | **Importers innovate** | Importers innovate (IPEEC, IRENA created) | Yes |

The evidence presented in Table 5 provides considerable support for our argument. During the many years in which energy prices were moderate – 27 out of the 45 years covered in Table 5 – there was no innovation. These periods of relative stasis in the regime complex are an integral part of the pattern Krasner labeled "punctuated equilibrium."

During periods of dissatisfaction triggered by high oil prices or major external shocks, we see energy-importing states creating or reforming institutions within the regime complex. Indeed, the periods of high importing state dissatisfaction, as indicated by G7/G8 activity since 1975, correspond almost perfectly to the two periods of importer state innovation identified in Table 5: 1979-81 and 2003-10. If we had similar data for 1973-74, when the West was faced with widespread gasoline shortages, we would surely see high dissatisfaction accompanying the creation of the International Energy Agency (IEA) after the first oil price shock. In 1979, during a period of high importer state dissatisfaction, the IEA was restructured into a form that it then retained for more than thirty years: three major committees were added, and the members' strategic petroleum reserve requirement was set at 90 days of oil importers, where it has stayed ever since. Finally, during the rising oil prices of 2005-2010, energy importers were active in a number of ways, most notably by creating the International Renewable Energy Agency (IRENA) and the International Partnership on Energy Efficiency Cooperation (IPEEC).

Table 5 also shows that energy exporters are likely to innovate when oil prices are very low, as they were in 1998. Weak global demand for oil following the Asian financial crisis of 1997 and excess global oil production capacity combined to lower oil prices to less than $10 per barrel. Many oil exporters faced severe fiscal deficits as a result of the unanticipated drop in revenues. Consequently, OPEC members reinvigorated the organization, agreeing to tighten oil production and more strictly observe their oil quotas. At least as importantly, OPEC also forged a significant agreement with non-OPEC exporters, the most significant of which was Russia, which was also in fiscal crisis.[45] The resulting reduction in oil production and decreased investment in production capacity, combined with a return in global oil demand, meant that prices rapidly appreciated over the next three years, more than doubling by 2000.

Table 5 contains one observation that clearly does *not* conform to our expectations: the period in 1985-1986 when oil prices fell dramatically. The falling prices were both a cause and consequence of Saudi Arabia's decision to abandon OPEC quotas and greatly expand its

[45] M. El-Gamal and A. Jaffe 2010.

production. In this period, we might have expected institutional innovation by OPEC to retrench its quota system and strengthen its market power in order to stabilize prices. This was not done, however, in part because two of its most important members, Iraq and Iran, were at war. The organization was therefore disorganized and unable to reach an agreement for institutional change. 1998.

The genesis of IRENA is a particularly interesting example of how state dissatisfaction plays a role in the development of the regime complex. The creation of IRENA follows a pattern of policy creation described by John Kingdon, in which policy change occurs when three necessary conditions are met: a problem, a solution, and a policy entrepreneur all exist at the same time.[46] The proposed solution – an international agency dedicated to renewable energy – existed for a long time, dating back at least as far as the Brandt Report of 1980 and a UN conference on renewable energy in Nairobi in 1981.[47] A policy entrepreneur emerged in the 1990s: Hermann Scheer, a member of the Social Democratic Party (SPD) in Germany, who led an active lobby for a renewable energy agency. Scheer chaired two environmental NGOs that championed the idea of such an agency; in 1990, he wrote a "Memorandum for the Establishment of an International Solar Energy Agency (ISEA)"; and in 2002 Scheer managed to get the SPD-Green coalition government program to explicitly include an initiative for the establishment of IRENA.[48] Yet despite the presence of both a policy entrepreneur and a proposed solution, the third element of policy change was missing: the perceived problem, in Kingdon's terms, or dissatisfaction, in our terms. In 2004, an international conference on renewable energy was held by Germany, but the resulting Political Declaration, adopted unanimously by 154 high-level government representatives at the end of the conference, did not mention IRENA even once.[49] Only within the context of dramatically increasing oil prices during 2005-2009, and a significant political lobby by the wind energy manufacturers in Germany, Denmark, and Spain, did the proposal for IRENA finally get traction. Two preparatory conferences were held in Germany in 2008 and IRENA was finally established in January 2009.[50]

[46] Kingdon 1984.
[47] Scheer 2007, 166.
[48] Eurosolar and WCRE 2009.
[49] Declaration available from: http://www.ren21.net/pdf/Political_declaration_final.pdf. Accessed 6 May 2010.
[50] See: www.irena.org. Accessed 6 May 2010.

One alternative explanation for the timing of change in the energy regime complex is the increasing salience of climate change. We acknowledge that the state preferences regarding climate change, particularly in Europe, contributed to some of the recent changes in the energy regime complex. Nonetheless, we do not think that climate change alone adequately explains the overall observed pattern of change, for three reasons. First, climate change obviously cannot explain any of the changes in the regime complex until at least the mid-1980s, when scientists first began to raise the issue on an international level. Thus the burst of innovation in the 1970s in the energy regime complex clearly has other causes. Second, the impact of climate change awareness on international politics should not be overstated. Although some (including us) believe that climate change should be the object of profound international cooperation and institutional innovation, that does not mean that it actually has been. Indeed, to date the record of meaningful international action on climate change has been rather dismal. Third, we note that climate change could have caused change in the energy regime complex at any time since at least 1992, when the UN Framework Convention on Climate Change was created. It is striking that the actual instances of institutional change did not occur until recent years (since about 2005), the same period in which oil and energy prices rose dramatically. For all these reasons, we do not think that climate change represents an adequate explanation of change in the energy regime complex.

**Path-Dependency in Institutional Change**

Krasner's notion of punctuated equilibrium built on conceptions of "path dependence" in institutional change, which have been elaborated since then, notably by Paul Pierson.[51] Not surprisingly, in multilateral energy cooperation among major consuming countries, there are tight links over time in the "chain" of connections between successive organizations. The origins of the chain can be traced back to the Marshall Plan, which triggered the establishment of the temporary Committee of European Economic Cooperation (CEEC). The CEEC was divided into numerous specialist subcommittees including coal, oil, and electricity committees. The CEEC was replaced by the Organization for European Economic Cooperation (OEEC), which also had an oil committee. In 1961, the OEEC was replaced by the Organization for Economic Cooperation and Development (OECD). A major difference between the two was that the

[51] Pierson 2004.

United States and Canada entered the OECD as full members. Within a few years, Japan, New Zealand, and Australia would also join. In 1974, the International Energy Agency (IEA) was created to replace the energy and oil committees of the OEEC and OECD which had dealt with energy matters for over twenty years and in 2009 the International Partnership on Energy Efficiency Cooperation (IPEEC) was formed.

Overall, this leads to the following picture of adaptation of existing institutions as shown in Figure 3.[52]

**Figure 3: Path-dependency in energy-consuming country cooperation**


Within the core institutions of major energy importers, therefore, we observe a *path-dependent pattern of institutional development*. Inertia seems to be the rule within individual institutions, the elemental regimes that make up the regime complex. If there are changes, they are largely incremental, such as within the IEA. The important shifts that have occurred in the IEA, such as the preference for market-based ways of dealing with oil supply disruptions instead of through the allocation system, the growing attention to environmental sustainability, and the enhanced outreach policy, have all occurred without a change in the IEA treaty, and without major changes to the structure of the IEA. Crucially, the hegemonic actor among energy importers – the United States – favored the development of each step of the chain of energy-importers' institutions. Indeed, the US was the primary mover in the crucial step, the creation of the IEA in 1974, and was able to convince most other major developed democracies to join it.

In our view, this path-dependent process reflects relatively homogeneous preferences. With the exception of France, the major OECD countries have had similar preferences on energy policy. Similarly, the creation of IPEEC was characterized by a high degree of homogeneity in the preferences of the major OECD players.

[52] Note that, while the OEEC replaced the CEEC, and the OECD replaced the OEEC, the IEA did not replace the OECD, but was placed within the OECD. Similarly, the IPEEC was placed or "nested" within the IEA.

The path-dependent nature of the IEA is brought into sharper relief by considering a thought experiment: if the IEA were to be designed, from scratch, in 2010, what would it look like? To effectively manage prices, the IEA depends on being able to move the market through releases from its members' strategic reserves, which have impact in proportion to their size relative to the global market. While in the 1970s all of the major oil importing countries were members of the OECD, in recent years China and India have changed the landscape and increased the size of the global market. For instance, in 1995 China was importing just 0.4 million barrels of oil per day; in 2008, it was importing more than 4.2 million barrels per day – more than France and Italy combined. If the IEA were being designed today, its organizers would certainly solicit the membership of China and India. Indeed, several prominent policymakers have sought to bring China and India into the IEA, though without much success.[53] The current membership of the IEA, and its continued institutional links to the OECD, thus offers significant evidence of the path-dependent nature of its creation.

In contrast to this path-dependent pattern of institutional development, the regime complex changes in a quite different way when the preferences and beliefs of the major actors are heterogeneous. Three important examples of this type of development exist: the creation of the International Energy Forum (IEF), the European Charter Treaty (ECT), and the International Renewable Energy Association (IRENA). The creation of the IEF was strongly opposed by the United States, which saw it as a competitor to the IEA. Indeed, US policymakers from Kissinger onwards have viewed international energy markets as a mainly zero-sum game in which producer and consumer interests were principally opposed, as reflected in the level of oil prices. Yet several important states, including France, Norway, and Venezuela, argued that the energy markets could be viewed as significantly positive-sum, leaving room for cooperation over issues of information transparency, incentives for investment, and reducing volatility in global prices. These differences in preferences and beliefs gave rise to the creation of the IEF, which sought to take advantage of these potential areas for producer-consumer cooperation. The initial reluctance by the United States was gradually overcome, and the US became a paying supporter of the IEF secretariat more than a decade after the first IEF conference.

Similarly, the Energy Charter Treaty was created as a result of heterogeneous preferences and beliefs. It became feasible to create the ECT only because of the collapse of the Soviet

[53] Colgan 2009.

Union. Optimism, if not triumphalism, was rife in the West, and the European Union was engaged on an historic expansion. However, the United States was again skeptical about the creation of this organization.[54] Moreover, the beliefs among Russian policymakers which made the innovation possible were not sustained: Russia quite quickly began to see the ECT as an obstacle to its ambitions as an "energy superpower." Ultimately Russia signaled in 2009 that it would end its participation in the ECT. The ECT may not be completely abandoned by its member states, but is increasingly considered irrelevant and neglected.

Thirdly, the creation of IRENA owes much to heterogeneous preferences and beliefs. The energy issue had been seen principally in the OECD as a problem of assured supply at stable prices. After 2005, however, it became partly an environmental issue, reflecting increasing concern about climate change. Crucially, the political importance of climate change varied across actors – more important among Europeans than among North Americans – leading to heterogeneous preferences. In addition, the principal policy entrepreneur behind IRENA, Hermann Scheer, strongly believed that the IEA focused too strongly on oil and gas issues. More broadly, German, Danish and Spanish policy-makers were dissatisfied because they saw the IEA as a lobby for fossil fuels and nuclear, underestimating the potential of renewable sources of energy.[55] Not coincidentally, some of the most important wind energy manufacturers are located in these countries, and thus stood to gain economically by the spread of renewable energy technologies.[56] The United States was never in favor of the creation of IRENA but found it politically inexpedient to block it, trusting that it would, when located in Abu Dhabi, remain unimportant. [57]

Thus these three institutional changes – the IEF, the ECT, and IRENA – are all evidence of *de novo innovation*, departing from the existing institutions within the regime complex for energy. Each was created in a context of heterogeneous preferences and beliefs among the major players of existing institutions, making the reform of existing institutions difficult or impossible.

[54] Fox 1996.
[55] Author's interview with German official, Berlin, 6 November 2008.
[56] In 2008, the top ten wind turbine manufacturers globally were (in order of production): Vestas (Denmark), GE Wind (USA), Gamesa (Spain), Enercon (Germany), Suzlon (India), Siemens (Denmark), Sinovel (China), Acciona (Spain), Goldwind (China), and Nordex (Germany). These top 10 were responsible for 85 percent of global production in 2008 (REN21 2009, 16). It is clear that Danish, Spanish and German companies are well represented.
[57] Author's interview with William C. Ramsay, former deputy director of the International Energy Agency, May 6, 2010.

## *IV. Conclusion*

It is unlikely that a coherent energy regime will be constructed over the next few decades, since institutional inertia is strong and the preferences of major states diverge. The interests of current members of the IEA and other large oil importers such as China and India are likely to lead to new patterns of cooperation, although this does not mean that IEA membership for China and India is required or even likely.[58] Pressures from environmentalists and the interests of the renewable energy industry, particularly in Europe, will converge on attempts to construct environmentally-friendly organizations such as IRENA, although how significant they will become depends on whether they receive support from the United States and other major energy consumers. Oil exporters will continue to maintain their own organizations, such as OPEC – bound together by a mutual interest in high prices even in the face of internal competition. In short, the institutional landscape of energy will continue to be that neither of anarchy nor a coherent regime for the issue-area, but of an international regime complex.

By presenting a theoretically-informed interpretation of institutional change in the international energy regime complex since 1970, this paper seeks to contribute to the eventual development of a sound theory, supported by evidence, of how international regime complexes emerge and change. Analytically, we rely on institutional theory, Herbert Simon's concept of satisficing, and Stephen J. Gould's notion of punctuated equilibrium as interpreted by Stephen D. Krasner. The demand for institutional change depends on dissatisfaction, indexed for oil importers by high prices and for oil exporters by low prices and revenues. High levels of dissatisfaction by one set of states or another are a necessary but not sufficient condition for institutional innovation. If there is no sufficiently large coalition of dissatisfied states, there will be little or no institutional innovation. But if such a coalition of the dissatisfied can form, it will generate major changes. Hence, we expect long periods of stasis interrupted by sudden periods of rapid change.

As we noted in the introduction, there has been to date very little empirical support for the notion of punctuated equilibrium in world politics as introduced by Krasner. There are a variety of plausible explanations for the lack of empirical evidence of punctuated equilibrium. It could be, most simply, that punctuated equilibrium is actually quite rare outside of the energy regime complex. Alternatively, it could be that Krasner and others were looking at the wrong

[58] Colgan 2009.

level of analysis: punctuated equilibrium may be rare in individual regimes, but more common at the level of a regime complex. This is possible because, while individual organizations have incentives to ensure their own perpetuation, and thus changes within regimes tend to be incremental at best, the flowering of different regimes within a regime complex might offer better opportunities for bursts of innovation in response to powerful external triggers. Yet a full explanation does not lie within the scope of this paper. Instead, we hope to stimulate more empirical investigations into the nature and timing of institutional innovation, which could in turn contribute to the development of a dynamic theory of change in regime complexes.

Our work also suggests that the character and degree of institutional change in energy politics depends on the degree of homogeneity of preferences among the key players in the existing institutions. When there has been homogeneity in the interests of major actors, the result has been path-dependent institutional change. When there has been heterogeneity in interests, dissatisfied states have had to create new institutions, without obvious predecessors, because existing rules enable their opponents to block major changes in existing institutions.

As a result of this process, a static, functional analysis is insufficient to account for the membership and practices of international regime complexes and the formal organizations within them. The International Energy Agency, for instance, has a very different membership and voting rules than an organization with similar functions, created in recent years, would have had. The inherent difficulties of international institutional innovation ensure that path-dependence is strong. State preferences, reflecting not only the value of effective institutional action but also more specific interests rooted both in international positions and domestic politics, will remain strong determinants of institutional change. So will historical conjunctures, institutionalized at key moments into rules and practices that are difficult to change.

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