POLICY FORUM

ENERGY POLICY

Why nations lead or lag in energy transitions

Policy-driven change hinges on institutions that support insulation or compensation

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Russia's invasion of Ukraine has disrupted energy markets, producing price spikes reminiscent of the 1970s. Many suggest that the crisis may accelerate transitions away from fossil fuels and reduce greenhouse gas (GHG) emissions. Yet, governments have responded very differently to the price shock. Though some are prioritizing clean energy, others are doubling down on fossil fuel production. Why do countries respond so differently to the same problem? Access to domestic fossil fuel resources is only part of the story. Countries also vary in the political sources that enable transformational change in energy and climate policy (*1, 2*). We draw on two historical episodes illustrating variation in energy transitions across countries—the 1970s oil shocks, and policies to address climate change—to offer important lessons on the political opportunities and constraints for policy-makers across different countries to accelerate the transition to clean energy.

Energy transitions impose adjustment costs on businesses and consumers, creating economic winners and losers (*3*). Supply-side policies, such as fuel economy standards or renewable energy deployment standards, primarily put visible costs on businesses. Demand-side policies, such as gas or carbon taxes, impose costs most directly on consumers. Disadvantaged businesses—such as fossil fuel producers and energy-intensive industries—have strong incentives to lobby against such policies, and consumers may express their displeasure by voting against incumbent politicians. Some countries have stronger institutions to manage such opposition to change than others.

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For example, in the 1970s, countries sought to reduce dependence on oil—particularly for electricity generation and transportation—in response to a global supply shock. However, outcomes varied widely (see the figure, top) (*4*). There is similarly substantial variation in policies to promote clean energy transitions in response to climate change (see the figure, bottom) (*5*). Countries have also taken divergent paths in their responses to the current energy price shock.

We draw on recent research on energy policy in advanced industrialized countries to illustrate how they pursued different pathways. We propose that, broadly speaking, governments can pursue energy transitions through one of three pathways: insulation—policy-makers are shielded from political opposition; compensation—policy-makers ease the burden of adjustment for business and consumers; and markets—policy-makers step back and markets drive change. The first two pathways enable a policy-driven approach that gives direction to markets and buffers the costs of market developments. The third pathway defers to market forces to set the pace of change. Market-based transitions are often subject to volatility, reversal, and price fluctuations.

INSULATION

Policy-makers enjoy varying degrees of insulation from policy backlash depending on bureaucratic and electoral institutions. Autonomous bureaucracies are characterized by strong mandates, high levels of expertise, low levels of political appointees, and an administration staffed with elite civil servants recruited meritocratically and with an expectation of long-term employment. Civil servants in such bureaucracies are better insulated from business and public opposition to costly policies than politicians reliant on corporate campaign donations and voter support. Similarly, proportional electoral rules (seats allocated in a legislature proportional to votes shares) tend to better insulate politicians from voter backlash than majoritarian rules ("winner-takes-all," whereby a candidate receiving the highest vote share in a district represents the district) (*6*).

During the 1970s oil crises, the Japanese and French governments substantially moderated their reliance on oil consumption. The Japanese government's promotion of energy conservation and diversification relied on the bureaucratic autonomy of the Ministry of International Trade and Industry and a relatively proportional, single nontransferable vote, multimember district electoral system that allowed politicians to remain secure in office despite imposing exceptionally high prices for fossil fuel consumption (*7*).

In France, despite the country's majoritarian electoral system, bureaucratic insulation gave the government a relatively free hand in the electricity sector. The Commissariat à l'Énergie Atomique and state-owned electricity utility Électricité de France (EDF) operated with a high degree of autonomy in implementing the ambitious Messmer Plan to transition to nuclear energy. The country rapidly expanded nuclear power from 8% of electricity generation capacity in 1973 to 70% by the mid-1980s.

France is following a similar playbook in response to the gas price shock following Russia's invasion of Ukraine. In February, President Macron announced that the country would construct up to 14 new-generation reactors. Although EDF is no longer state-owned, the French government holds a large majority stake in the company, which continues to insulate it from business opposition and grant it a high level of control over the direction of the country's electricity sector. The French government also announced plans to fully renationalize EDF in the face of the energy and climate crises.

By contrast, Japan's political institutions were changed starting in the 1990s: The new mixed-member majoritarian electoral system empowers price-sensitive consumers, and bureaucratic autonomy has been weakened considerably. Under this institutional configuration, successive Japanese governments have struggled to accelerate its clean energy transition (*8*). The country's response to the war in Ukraine has sought to cushion the impact for consumers and businesses by subsidizing oil wholesalers and maintaining economic interests in Russian natural gas projects in Sakhalin.

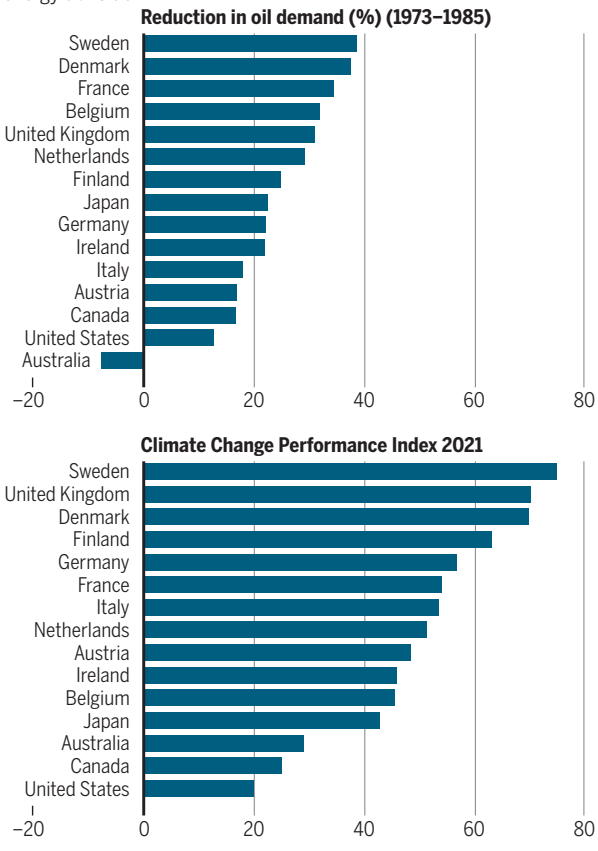
Insulation can also vary at the subnational level. California followed a path of insulation from political headwinds by

delegating regulatory power for the clean energy transition to an independent government agency (*9*). The powerful California Air Resources Board (CARB) steeled itself in battles over air pollution. It has highly specialized career civil servants who cannot be voted out of office for adopting costly policies. And they have used that power. For example, the state's low-carbon transport policies impose an indirect carbon price of up to $1000 per metric ton of carbon dioxide equivalent, one of the highest globally. So far, the legislature has not touched CARB's power to drive climate and clean energy policy. Indeed, the agency may be beneficial to elected leaders because it can take the blame for any unpopular policies.

Insulation is also an important mechanism for energy transitions in developing countries, though with some caveats. China's leaders have engineered a rapid expansion of clean energy under what is often described as authoritarian environmentalism. Although autocratic governments enjoy a high degree of insulation, they also often lack transparency, accountability, and responsiveness to environmental concerns. Autocratic governments do not consistently outperform democracies in energy transitions and environmental outcomes (*10*).

Variation in policy responses

Facing oil price shocks in the 1970s [top, data from (*4*)] and more recently climate change [bottom, data from (*5*)], countries have demonstrated variability in responses to the need for an energy transition.



COMPENSATION

A compensation path seeks to secure the support of businesses and consumers that stand to bear the costs of policy change. Political institutions affect the feasibility of compensatory policies. Corporatist institutions grant enduring, privileged policy-making access to major associations representing business and labor interests, facilitating stable bargaining arrangements. Countries with such institutions can strike long-term compensatory deals that ease the burden of energy transitions for economic losers. Countries with established welfare state institutions that offer generous social safety nets can more credibly commit to compensating individuals facing economic dislocation and high energy prices (*2, 11*). Many northern European countries, such as Denmark, Finland, Germany, the Netherlands, and Sweden, have institutional endowments that facilitate compensation.

Germany's response to the oil crises was to ease the transition away from oil through compensatory bargaining with industry associations and labor unions. Coal and nuclear energy were expanded through subsidies, such as the "coal penny" that was added to consumers' bills. Offering support for both industries, instead of picking one, reduced political conflict. The government used the country's welfare system to ease the burden of higher energy costs for households.

In Germany's contemporary clean energy transition, policy-makers are relying on a similar approach. Successive governments have generously subsidized clean technologies using revenue raised through increased energy prices for consumers, while at the same time compensating dirty producers to transition away from fossil fuels. The feed-in tariff—a subsidy for wind and solar electricity—has helped to substantially bring down the cost of clean technologies in Germany and abroad, particularly solar. Politically, the feed-in tariff has worked to mobilize a broad alliance of farmers, green activists, conservatives, and progressives for reform (*12*). To phase out lignite coal, the country negotiated a "coal compromise" that provides EUR 40 billion to regions with coal mining and to coal-fired power stations in return for political support for a phase-out. Starting in 2023, the government envisages to support households to cope with increasing energy prices by offering a "climate premium." Countries with analogous institutional arrangements, such as Nordic countries, use a similar compensation-based approach to energy transitions (*2*).

By contrast, countries with weak welfare states and pluralist state-business relations, in which many groups compete for influence, tend to see frequent policy reversals and reliance on ad hoc, short-term measures. For example, the US Trade Adjustment Assistance Program, which seeks to mitigate the impacts of trade on workers and industry, has faced repeated budget cuts and rule changes, including a drastic reduction in 1981 as utilization soared in the aftermath of the oil crises and Japanese industrial competition. Countries like the US tend to lack institutional foundations to pursue "just transitions" despite calls to compensate the losers of climate policy.

Developing countries often lack resources and established domestic institutions for compensation like those in welfare states. Here, international institutions that provide bilateral and multilateral aid and other finance streams can facilitate compensatory arrangements, helping producers and consumers absorb costs, reducing political opposition to energy transition policies.

MARKETS

A transition path through markets is effectively the absence of policy reform that imposes direct costs on producers and consumers. Instead, governments rely largely on markets to transform the energy sector. This pathway is common in countries whose institutions allow opponents to more easily block costly energy policies. In such countries, insulation from voters and business is limited because of majoritarian electoral rules and weak bureaucracies. Compensation is difficult owing to small welfare states and pluralist state-business relations. Policy responses to crises tend to focus on short-term stopgap measures and foreign policy solutions that reduce domestic adjustment costs. Countries such as Australia, Canada, the United Kingdom, and the United States tend to fall into this group.

After the 1973 oil price shock, efforts by the US and Australian governments to facilitate policy-driven transitions faltered in the face of resistance from opponents that stood to bear the costs. For example, gasoline tax hikes floated by the Nixon and Ford

GRAPHIC: V. ALTOUNIAN/SCIENCE

administrations as a potential energy conservation measure faced intense objections from congressional legislators concerned about electoral and industry backlash. The US majoritarian electoral system and presidential authority over the federal bureaucracy provide limited isolation, and opponents of policy-driven transitions can often effectively block change. The scope for compensation is limited because of pluralist state-business relations and a weak welfare state. Government initiatives to develop alternative energy sources in Australia during the 1970s faced similar challenges, and the economy's reliance on oil remained largely unchanged. The government promoted market-based measures to encourage oil exploration, including import parity pricing to bring domestic oil prices in line with international levels.

The two countries have also struggled to promote contemporary clean energy transitions. US Vice President Gore's initiative for a British thermal unit (BTU) energy tax during the Clinton administration faced intense opposition from energy-intensive industries and lawmakers concerned about reelection. "Getting BTU'd" became an enduring warning against similar attempts after supportive Democratic legislators suffered steep losses in the 1994 midterm elections. Australia's majoritarian electoral rules based on preferential instant-runoff voting make politicians highly vulnerable to voter backlash over energy prices. Prime Minister Julia Gillard's 2012 carbon pricing scheme led to a sharp decline in support for her Labor Party. The issue became a centerpiece of Liberal Party opponent Tony Abbott's successful 2013 election campaign. Australia promptly became the first country in the world to rescind a carbon tax.

The US and Australia have lacked a stable national climate policy. Efforts to reduce energy emissions have been enacted in both countries only to be reversed by the next government (*13*). The absence of consistent energy policies has elevated the role of markets. Much of the emissions reductions in the US have been the result of a market-driven switch from coal to natural gas.

In the current crisis, the US federal government's immediate reaction was to facilitate oil and gas drilling on public land to increase oil production and bring down market prices. Additionally, the US has encouraged oil producers such as Saudi Arabia to expand production. At the same time, 24 US states have moved to reduce fuel taxes for consumers or are considering doing so. The Morrison government in Australia similarly slashed the fuel excise tax in half from 44.2 to 22.1 cents per liter. These efforts focused on reducing disruptive energy price volatility for industry and consumers.

LESSONS FOR POLICY

Variation in the ability to adopt costly energy transition policies has important implications for the options that policymakers have in different country settings. First, policy-makers that can in principle rely on mechanisms of insulation or compensation need to purposefully leverage both. If they have autonomous agencies, they can delegate policy design questions to those bureaucracies (*9*). They also need to be sensitive about how to bundle compensation packages to mobilize political support. The compensation needed to bring political groups and communities on board depends, for example, on how vulnerable they are to both costly climate policy and the physical impacts of climate change (*14*). Countries that can absorb costly policy investments are thus better able to invest in the deployment of frontier technologies that are not yet cost-competitive with fossil fuel technologies. Historically, this included wind power technology in Denmark and solar photovoltaics in Germany. Today, these include hydrogen storage; hydrogen fuel cells; and carbon capture, use, and storage, to name a few. The hope to reduce hard-to-abate GHG emissions in sectors such as steel, cement, shipping, and aviation (*15*) thus often rests with those countries able to pursue policy-driven transitions. Although these countries bear the costs of developing niche markets for costly technologies, the investments can be worthwhile if they lead to long-run economic advantages such as export industries or cheaper energy inputs.

Second, countries that tend to pursue market-driven transitions rely largely on first-mover countries—those with the capacity to absorb costly policy action—to help bring down the cost of clean technologies through policy for follower countries. But once clean technologies are cost-competitive, market-driven transitions can accelerate rapidly. For example, US adoption of solar and wind power remained robust even under the Trump administration as the cost of renewable power generation continued to fall. In this phase, a commitment to free market principles can be supportive of energy transitions. Governments that lack mechanisms of insulation and compensation can—at a minimum—support energy transitions by easing regulatory barriers to the deployment of clean technologies, such as simplifying permitting of renewable energy plants and grid infrastructure.

Third, policy-makers that cannot pursue insulation or compensation can still pursue policies whose costs are relatively diffuse and less visible, and thus less politically salient. This relates in particular to public investments in research and development (R&D) and clean energy deployment. These costs are spread across all taxpayers and not directly visible to voters and industry as they would be through a carbon price or regulation. Clean energy R&D funding and tax credits for wind and solar have been the one constant in US clean energy policy, garnering bipartisan support. The recent Inflation Reduction Act in the US follows this logic. This approach differs from compensation in that it offers carrots without sticks and tends to be based on ad hoc deals rather than a stable long-term bargain. Clean energy tax credits in the US, for instance, have expired frequently, leading to boom-and-bust cycles in renewable energy development.

Climate laggards are often federal countries where states or provinces can take the lead in energy transitions. Subnational jurisdictions may have greater institutional capacity to pursue policy-driven energy transitions than the national government, as is the case for California and New York. Policy-makers in federal systems can thus leverage pockets of insulation or compensation in subnational jurisdictions to promote clean energy from the bottom-up.

Different political paths result in clean energy transitions at varying paces. This should temper our expectations on common problems—such as price shocks and climate change—mobilizing countries across the globe for a clean energy future. At the same time, understanding these differences helps us target policy interventions more carefully to national opportunities and constraints. ■

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