

Producer Power or Energy Policy? The Effect of Electoral Systems on Prices

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Abstract

What explains cross-national variation in prices? A seminal literature in comparative political economy argues that electoral systems systematically affect price levels: compared to majoritarian electoral systems, proportional systems make governments more responsive to producer interests, and hence engender higher producer profits and overall prices. I argue that higher prices in PR systems actually reflect a different causal mechanism: energy policy. Since the 1970s oil shocks, governments in PR systems have more aggressively pursued energy conservation by raising the price of energy-intensive consumption. Contrary to consumer-producer power theory, which predicts a systematic relationship between electoral systems and prices, I show that price-level differences across electoral systems: 1. only emerged after the 1970s; and 2. the differences that do exist are concentrated in energy-intensive consumption. Higher prices in PR systems are not signs of systematic producer power, but instead reflect government efforts to mitigate the negative externalities of energy consumption.

Why are prices higher in some countries compared to others? This is a core question in comparative political economy with significant substantive implications, affecting essentially all consumers and producer groups. A growing, influential body of work has argued that electoral systems contribute to cross-national variation in prices (Rogowski and Kayser 2002; Rosenbluth and Schaap 2003; Chang et al. 2008; Chang et al. 2010). This article argues that this literature has missed an important source of cross-national price variation – energy policy – and hence mischaracterizes the relationship between electoral systems and prices.

A large body of work on the political effects of electoral institutions has focused on incentives for politicians to serve either organized interest groups or the unorganized voter (Denzau and Munger 1986; Persson and Tabellini 2002; Rogowski and Kayser 2002; Bawn and Thies 2003; Grossman and Helpman 2005; Weinberg 2012). With the exception of lopsided one-party dominated political systems, majoritarian electoral rules tend to discourage the targeting of narrow interests due to large seat-vote disproportionality – i.e., the marginal value of votes is higher compared to the marginal value of support attainable from organized interests (Rogowski and Kayser 2002; Chang et al. 2010). In addition, proportional rules are more forgiving of candidates that harm their personal reputation by catering to organized interests, as party reputation tends to trump personal reputation (Bawn and Thies 2003). A seminal and influential empirical prediction that emerges from this literature is an association between low consumer prices (i.e., limited monopoly rents for organized producers) and majoritarian electoral systems (Rogowski and Kayser 2002; Chang et al. 2008; Chang et al. 2010). Subsequent work has challenged the implications of these findings, arguing that PR countries can remain internationally competitive despite higher prices due to labor market institutions (Iversen and Soskice 2010). However, the basic premise of higher prices in PR countries remains.

In this article, I will argue that this literature has misidentified the causal mechanism underlying cross-national variation in price levels by overlooking an important determinant of prices: energy policy. I will show that higher prices in PR systems are not signs of systematic producer power, but instead reflect government efforts to address the negative externalities of energy consumption, such as pollution, dependence on foreign suppliers, and global warming. These findings have important substantive and normative implications.

This article will proceed as follows. I will first present an overview of state intervention in the energy sector and illustrate how price manipulation is used extensively for the purposes of energy security and energy conservation. Next, I will present my theoretical propositions about why governments in proportional representation (PR) systems are more likely to pursue energy conservation by raising prices on energy consumption. I will then derive empirically testable predictions to clearly differentiate my theory from consumer-producer power theory. Specifically, in contrast to consumer-producer power theory, which predicts a general and consistent relationship between electoral systems and prices, my theory predicts that price-level differences across electoral systems should emerge only: 1. after the 1970s, which saw the rise of large-scale government intervention for the purpose of promoting energy conservation; and 2. in sectors characterized by energy-intensive consumption. A battery of quantitative and qualitative evidence is presented to establish the veracity of these predictions. Finally, I examine electoral reform in New Zealand and Japan to establish the plausibility of my proposed causal mechanisms.

Government Manipulation of Prices in the Energy Sector

There are two principal externalities that motivate states to intervene in the energy sector. First, *energy security*: assuring stable access to energy resources and mitigating the consequences of supply disruptions (Deese and Nye 1981; Yergin 2006; Jacobson 2009). Second, *environmental policy*: managing energy consumption in order to limit adverse effects on the environment such as pollution and climate change (Nordhaus 1994; Bernauer 2013; Aklın and Urpelainen 2013). In effect, certain forms of energy consumption are associated with negative externalities. Pollution is the most obvious negative externality, but the security externality is also important: unmitigated consumption of fossil fuels leaves countries vulnerable to intentional or accidental supply disruptions. In turn, intervention in energy markets under the pretext of addressing externalities remains relatively common and robust even as the state retreats from active intervention in other economic sectors (Hughes 2012).

One common mechanism governments have used to mitigate the negative externalities of energy consumption is the manipulation of energy prices. Imposition of taxes or regulations on fossil fuels, electricity, energy-inefficient products, or carbon emissions are well-established policy tools utilized by governments to increase energy prices and encourage energy efficiency (Stern 2008). Although a comprehensive overview of such policy measures is beyond the scope of this article, I will discuss several examples to demonstrate that such intervention is widespread and varies meaningfully across countries.

As the most energy intensive sector across OECD countries, the transport sector is a frequent target of government energy conservation efforts (Mulder and de Groot 2012). Gasoline taxes have been implemented in a large majority of developed countries, and Western

European nations typically charge the highest rates per gallon. For example, in 2011, gasoline taxes in \$/gallon were 0.49 in the USA, 2.59 in Japan, and 4.10 in Germany (US Department of Energy Alternative Fuels Data Center 2011). This variation is highly consequential. Fuel demand is relatively elastic, and simulations suggest that if Western European tax rates were lowered to US levels, long-term European gasoline consumption would roughly double (Sterner 2007).

Gasoline taxes are not the only available instrument to discourage energy-inefficient transportation. Many countries raise the cost of automobile use through mechanisms such as import duties, automobile registration fees, tolls, and taxes tied to fuel efficiency. An extreme example is Singapore, which imposes some of the highest costs of automobile ownership in the world, including a vehicle import duty of 45% and registration fee of 150% of market value (Seik 1998). Japan similarly levies hefty taxes on automobile ownership and usage that amount to about four times the levels of the United States (Lipsy and Schipper 2013). Many countries have also adopted tiered automobile taxation systems that encourage the use of smaller displacement vehicles (Zhou et al. 2010).

Another area where governments have scope to manipulate energy prices is in the production and provision of electricity. Some nations apply surcharges to electricity rates to promote conservation and efficiency, while others do not. For example, Japan introduced the 1974 Promotion of Power-Resources Development Tax as a means to encourage energy conservation and energy security in the aftermath of the 1973 oil shock. Studies of electricity markets show that electricity prices are often higher than the marginal costs of production: i.e., utilities exercise market power. Lax regulatory policies that allow utilities to maintain market power and charge high prices can contribute to energy conservation by making energy use

expensive for consumers (Green and Newbery 1992; Bernard and Roland 1997; Joskow and Kahn 2001).

In recent years, carbon taxes have become an increasingly popular method of increasing the price of energy consumption. Carbon taxes were first implemented by Finland and the Netherlands in 1990, and have since spread to many developed economies as a mechanism to address global warming and climate change. However, carbon taxes have been politically contentious in some countries. In Canada, a carbon tax proposal by the Liberal Party in 2008 contributed to a sharp decline in public approval and electoral defeat (Jaccard 2012). In the United States, Democratic proposals for a carbon tax have been vigorously resisted by Republicans. Australia implemented a carbon tax in 2012 only to see it repealed by Tony Abbott's government two years later.²

In sum, governments often intervene in the energy sector to promote energy security and environmental conservation. This intervention often takes the form of direct or indirect energy price manipulation. In addition, there is nontrivial variation in the degree to which governments exercise energy price manipulation cross-nationally. In the next section, I will consider how such intervention varies across electoral systems.

Electoral Institutions and Energy Prices

Since the 1970s, an important element of energy policy in advanced industrialized democracies has been the manipulation of energy prices for the purpose of fostering energy conservation and efficiency. In this section, I will argue that such manipulation in favor of

² Rob Taylor and Rhiannon Hoyle, "Australia Becomes First Developed Nation to Repeal Carbon Tax," *The Wall Street Journal*, 7-17-2014.

energy conservation is more likely to arise under PR systems than majoritarian electoral systems.³ This is due to variation in both the *preferences* of ruling governments and their likely *choice of policy instruments*.

First, on average, the *preferences* of ruling governments elected under PR are more likely to be sympathetic to market interventions that produce higher energy prices. Governing coalitions in PR countries tend to lean center-left due to redistributive incentives (Iversen and Soskice 2006). Environmentalism is strongly correlated with a left-wing orientation cross-nationally, both among individuals and political parties. In fact, many datasets use environmental orientation as one criteria to code left-leaning political parties (Neumayer 2004; Benoit and Laver 2007; McDonald et al. 2007). In addition, right-wing economic doctrine tends to emphasize the free, unfettered operation of markets, which runs counter to price-distorting government interventions for social or environmental purposes (Prasad 2006). Hence, on average, PR tends to produce governments with greater sympathy for environmental causes and less reluctance to intervene in markets. Consistent with this, empirical evidence suggests that PR governments generally set stricter environmental regulations based on a variety of environmental policy measures (Fredriksson and Millimet 2004).

The lower effective thresholds for legislative representation under PR also make it easier for single-issue parties to emerge and exercise political influence (Kitschelt 1989; Rohrschneider 1993; Burchell 2002; Folke 2014). Consequently, green parties have been much more viable and influential in PR countries. Using the coding scheme for electoral systems proposed by Chang et al (2010), Table 1 depicts the vote and seat share of green parties in PR and majoritarian

³ For the sake of consistency with consumer-producer theory, I follow Chang et al (2010) in classifying countries dichotomously as majoritarian or PR and use their coding scheme throughout this article.

countries from 1972 to 2012.⁴ As the table shows, seat shares of green parties in PR countries have on average been about 16 times higher compared to majoritarian countries. Green parties have exceeded 10% of total seat shares under PR electoral rules in Austria, Belgium, Germany, Iceland, Luxembourg, New Zealand, and Switzerland, while never exceeding that level in a majoritarian country. In turn, green parties have been able to leverage their seats to enact pro-environmental legislation that raises the price of energy consumption (Folke 2014). Notable examples include the Ecological Tax Reform Act (1999) in Germany – which was passed by the Red-Green coalition and explicitly sought to raise the cost of energy consumption (Kohlhaas 2000) – and the Energy Efficiency and Conservation Act (2000) in New Zealand, which will be discussed below.

Table 1: Green Party Vote Shares and Seat Shares, 1972-2012

Electoral System	Average Green Party Vote Share	Average Green Party Seat Share	Maximum Green Party Seat Share
PR	2.8%	2.5%	13.5%
SMD	1.3%	0.2%	2.9%

Note: Party share data from Armingeon et al (2014); PR and SMD coding from Chang et al (2010), extended through 2012 by author. 1972 is the first year in which votes for a green party are recorded (the Values Party of New Zealand); choosing a later start year increases the difference in average green party vote and seat shares between PR and SMD.

Second, even holding government preferences constant, the *choice of policy instruments* in PR systems is more likely to be biased in favor of mechanisms that raise prices on energy-

⁴ Data is from the Comparative Political Data Set I. 1972 is the first year a green party is coded as receiving votes in the dataset (the Values Party of New Zealand). PR and majoritarian countries are identified using the list presented in Chang et al (2010), pg. 126-134.

intensive consumption. Policy interventions to reduce energy usage can be designed to tilt the scales in favor of consumers or producers. For example, policies that restrict local competition among utility companies benefit incumbent producers by allowing them to maintain high prices and capture the associated rents, while consumers face high electricity prices. In contrast, governments could encourage energy conservation while tilting the scales in favor of consumers by implementing consumption subsidies for energy efficient products or aggressively regulating energy-inefficient producers.

Following the logic of Kayser and Rogowski (2002) and Bawn and Thies (2003), in PR systems, it is easier to offset the loss of political support from consumers facing higher prices by securing support from organized interest groups. This implies that governments will be more willing to pursue policies that raise the price of energy-intensive consumption – e.g. fuel taxes, automobile taxes and fees, granting market power to utility companies – in PR systems. In contrast, under majoritarian systems, even governments supportive of energy conservation will tend to avoid policies that raise prices on consumers.

Importantly, redistributive mechanisms of this nature do not imply higher prices across the entire range of product categories. Existing work on consumer-producer power assumes that the primary mechanism for rewarding producers is the provision of rents through higher prices. However, governments may utilize a range of mechanisms to reward organized interest groups. For example, in Japan, the revenues raised by various automobile-related taxes designed to encourage conservation were redistributed to nominally unrelated interest groups in the infrastructure and agricultural sectors (Lipsy 2012). Governments can also encourage energy conservation by imposing high prices for energy-intensive consumption while simultaneously subsidizing energy-efficient consumption, raising prices in one part of the economy while

lowering them in another. Consequently, the incentives in PR to cater to organized interest groups do not necessarily imply higher prices for consumers *across the board*.

Observable Implications

Strictly speaking, my predictions are not mutually exclusive with price differences emerging from the balance of consumer-producer power. It is logically possible that PR systems are characterized by *both* high energy prices as a result of conservation efforts and high producer prices more generally as the result of greater producer power. In addition, energy is a nearly ubiquitous input in modern production processes and therefore subject to spillover effects. High electricity and fuel prices tend to raise production costs, and hence prices, for a wide range of industries. As such, my theory is consistent with higher overall prices in PR countries. However, my theory and consumer-producer power theory operate according to distinct causal mechanisms and can therefore be tested against each other empirically. The next step is to develop empirical tests to mediate between the two theories. Specifically, my theory generates two specific, testable predictions that diverge from those of consumer-producer power theory.

First, most advanced industrialized countries implemented wide-scale energy conservation and demand management measures only after the oil shocks of the 1970s, which demonstrated the vulnerability of Western economies to supply disruptions. The 1970s also saw the rise of environmentalism as a credible political movement, illustrated by the creation of the first green parties in 1972 (in Australia and New Zealand), bureaucratic agencies dedicated to

environmental issues in major economies,⁵ and transnational epistemic communities focused on the environment (Haas 1989; Haas et al. 1993). Because policy measures designed to increase energy prices for the purposes of conservation and environmental protection were largely absent prior to the 1970s, my theory predicts that systematic variation in price-levels between PR and majoritarian systems should arise only after this period.

Second, my theory predicts that a large price differential should exist across electoral systems for energy consumption and energy-intensive consumption, while price differences should be muted for non-energy-intensive consumption. Although energy is a ubiquitous input, the amount of energy required per value added in production (energy intensity) varies by sector. Government initiatives to raise the price of energy consumption should have a large impact on energy-intensive sectors, such as transportation and heavy industry, but not on production that relies primarily on human capital, such as education, finance or healthcare.

In contrast, if cross-national price differences are attributable to consumer-producer power, factors such as energy-intensity, environmentalism, and the oil shocks should have no systematic effect on observed empirical variation. One attractive characteristic of consumer-producer power theory is that the predictions are general and unconditional, i.e. the tendency for higher prices to prevail in PR systems should be time-invariant and product-invariant. Any variation that does exist across time periods and products should be stochastic.

Hence, we derive the following hypotheses:

H0 (consumer-producer power theory): Prices in PR countries should be consistently higher than those in majoritarian systems.

⁵ E.g., the US Environmental Protection Agency (1970), France Ministry of the Protection of Nature and the Environment (1971), Japan Environmental Agency (1971).

H1 (price incentives for energy conservation): PR systems are more likely to produce ruling governments that promote energy conservation by increasing energy prices for consumers. Therefore: a) Cross-national price differences by electoral system should emerge only after the early-1970s, when governments first undertook large-scale intervention for the purpose of energy conservation; b) Price differences should be concentrated in energy consumption and consumption of energy-intensive products.

Empirical Analysis: Over-Time Variation

As explained above, consumer-producer power theory is time-invariant: electoral systems should affect the balance of power between consumers and producers similarly across time periods. On the other hand, concerns about energy security and efficiency came to the forefront of policymaking during the 1970s, particularly after the 1973 Arab Oil Embargo, motivating governments to initiate energy conservation programs. In Supporting Information I, I include an illustrative list of major policy measures undertaken by OECD countries during this period that directly impacted energy prices. Prior to the 1970s, the international oil market was dominated by Western firms, real oil prices had been falling consistently for about fifty years, energy was abundant, and conservation was not a major policy issue (Ikenberry 1986; Hughes and Lipsky 2013).

Hence, as the first empirical test, I examine whether or not there was a change in the relationship between price levels and electoral systems during the 1970s. Consumer-producer power theory predicts a consistent and stable relationship over time. My theory suggests that the divergence in prices across electoral arrangements should emerge only after the 1970s.

I begin by plotting the raw data in Figure 1. The figure depicts average price levels in OECD countries by electoral system from 1960-2000.⁶ To focus on price level changes attributable to within-country variation, I only include countries that maintained the same electoral system and for which data is available throughout the entire period.⁷ As the figure shows, until the early 1970s, there is no meaningful difference in price levels between PR and SMD countries, and a wide gap opens up during the 1970s. Aside from a brief convergence in the mid-1980s, prices have been consistently higher in PR systems in subsequent years. Substantively, in 1990, price levels averaged across all PR countries were about 31% higher than those for SMD countries. In contrast, in 1960, average prices for SMD countries were slightly higher than those for PR countries.

To conduct a more rigorous test, I replicated and extended the findings from Kayser and Rogowski (2002), the original article that established the relationship between electoral systems and price levels.⁸ The original analysis was performed on cross-sectional data for OECD countries in 1990. I rerun their empirical model for additional years, specifically 1960, 1965, 1970, 1975, 1980, 1985, and 1995. I present results from model 1.3 of Table 1 in their paper, but similar substantive results were obtained from replications of other model specifications. Specifically, I use an OLS regression where the dependent variable is price levels across OECD countries, expressed as prices of aggregate GDP inclusive of tax. The key independent variable is a dichotomous indicator of single member district (SMD) electoral systems. Following the

⁶ Data from *Penn World Tables International Comparison Programme 5.6*.

⁷ This is to suppress changes driven by the composition of countries. A similar chart that includes all countries is available in Supporting Information II.

⁸ I thank the authors for their willingness to share their data from Chang et al (2010). The data was extended using the original sources cited by the authors.

original analysis, I also include controls for per capita GDP, trade openness, and 3-year exchange rate appreciation.

Figure 2 presents the substantive results of interest. The dots represent coefficients for the SMD dummy from the OLS regressions, and the lines represent 95% confidence intervals. The original results from Kayser and Rogowski (2002) correspond to 1990 in the figure. Consistent with the original results, in 1990, there is a negative and statistically significant relationship between the SMD dummy and price levels – prices are lower in countries with SMD electoral systems.

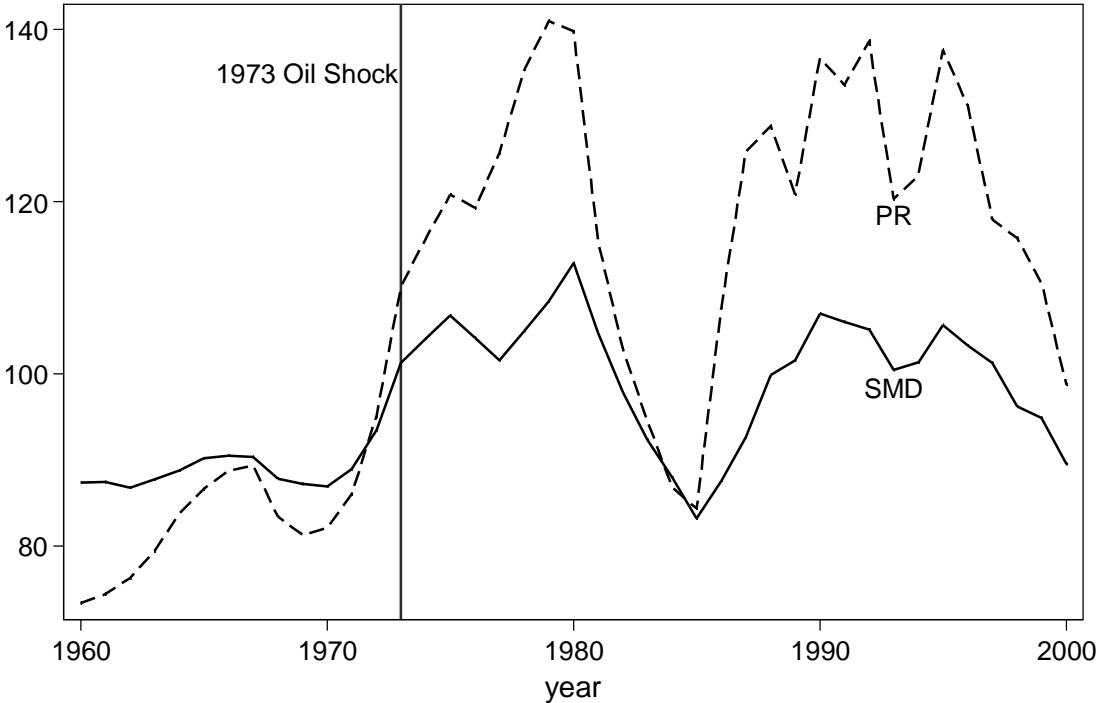
In 1995, the relationship between electoral systems and prices weakens. However, this is attributable to electoral reform in Italy, Japan and New Zealand, which took place in the early 1990s. It is unrealistic to expect that electoral change will have an immediate impact on price levels – it takes time for political parties and voters to adjust to the new system, and policies that affect prices will not necessarily be enacted and implemented immediately.⁹ I will discuss electoral reforms in Japan and New Zealand in the case study section.

More importantly, the figure illustrates that the relationship between SMD and low prices only emerged in the 1970s. Prior to the oil shocks, there is no statistically significant relationship between electoral systems and prices. Unlike the 1990s, there were no changes in electoral systems for the countries included in this analysis during the 1960s and 1970s: the findings are not due to countries switching from one electoral system to another.¹⁰

⁹ Rerunning the analysis for 1995 removing these countries produces a point estimate similar to previous years, though the results are not statistically significant at the 95% level.

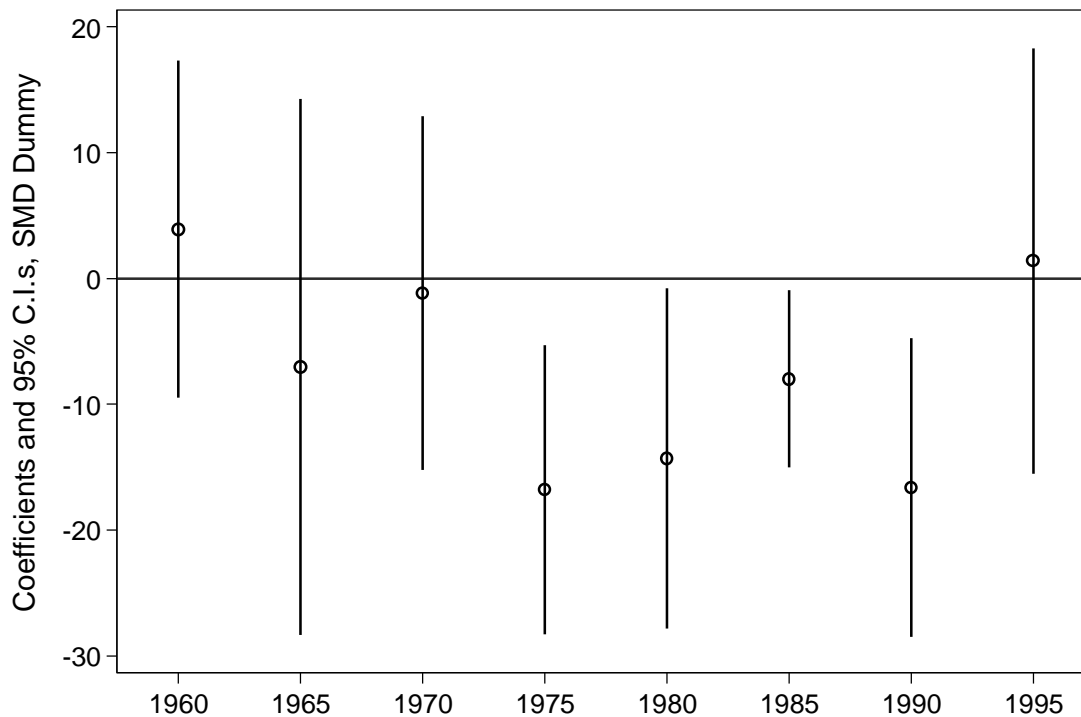
¹⁰ To guard against the possibility that the results are attributable to different countries represented in the sample, the analysis excludes Greece, Portugal, and Spain, which underwent democratic transitions and therefore appear in the dataset during only some time periods. Including these countries produces nearly identical substantive results.

Figure 1: Average Real Prices Levels in PR and SMD Systems, OECD Countries (1960-2000)



Note: The chart only includes OECD countries: 1. for which data is available throughout the time period and; 2. that did not change electoral systems during the time period depicted. This assures that all year-on-year changes plotted are attributable to price changes within countries rather than changes in the composition of countries in each category. Supporting Information II includes a similar figure including all countries.

Figure 2: The Effect of Electoral System on Prices; Replication and Extension of Kayser and Rogowski (2002), Various Years



Note: the dots represent coefficients, and lines 95% confidence intervals, from model specifications where price levels are the dependent variable and a dichotomous indicator of single member district (SMD) electoral system is the key independent variable. The original analysis was conducted for 1990. The results show that SMD is associated with lower price levels only after the mid-1970s. The result for 1995 is affected by electoral reform in Italy, Japan, and New Zealand.

Moving beyond the cross-sectional analysis in Kayser and Rogowski (2002), follow up work by Chang et al (2008) evaluated the relationship between electoral systems and prices using a variety of empirical models and a panel dataset covering 1970-2000. This work also found a strong, consistent relationship between SMD systems and low prices. However, the panel data only covered the period since 1970, when the oil shocks and environmental concerns led to widespread government intervention in energy markets.

Table 2 presents the substantive findings from replications of the major empirical models from this more extensive analysis. The original analysis was performed on a panel dataset covering 1970-2000. I extended this data to also include 1960-1969. It should be noted that these are time series models that retain a large number of years during which both theories predict a relationship between electoral systems and prices. We should not expect the inclusion of a single decade to radically alter the statistical results.¹¹ However, the results do bear on the time-invariant aspect of the consumer-producer story: if PR systems systematically advantage producers, inclusion of the 1960s should have no bearing on the empirical findings. However, across all model specifications, the relationship between electoral system and prices weakens when the 1960s are included in the analysis, and in no case does the coefficient on the SMD dummy remain statistically significant at the 90% level.

These results demonstrate that systematic variation in price-levels across electoral systems emerged only during the 1970s. In the 1960s, there was no meaningful difference in price levels between countries with SMD and PR electoral systems. The findings are consistent with the theorized hypothesis that price differences are attributable to energy policy, and inconsistent with the idea that producers consistently exercise stronger pricing power in PR systems.

The absence of a relationship between electoral systems and prices prior the 1970s is highly problematic for consumer-producer power theory. It also supports my prediction that price differentials should emerge concurrent with large-scale state intervention in the energy

¹¹ Running the models only for the 1960s is somewhat problematic. For Model 2 (between effects) and Model 4 (pool), the SMD dummy is statistically indistinguishable from zero when the time period is restricted to the 1960s. The analyses do not produce meaningful results for Model 1 (fixed effects) and 3 (GMM), which rely on within-country changes in electoral systems: there are no such changes in electoral systems during the 1960s. Details about the models are available in Supporting Information III.

sector. However, there are other developments in the 1970s that plausibly affected price levels, such as the collapse of the Bretton Woods System of fixed exchange rates. Hence, in the next section, I provide additional support for my theory by examining cross-sectoral price differentials according to energy intensity.

Table 2: Replication and Extension of Panel Analysis from Chang et al. (2008), Coefficient and Standard Errors for SMD dummy

Time Period	Model 1: Fixed effects	Model 2: Between Effects	Model 3: GMM	Model 4 Pool
1970-2000	-2.29*** (0.03)	-14.46*** (4.88)	-3.99* (2.29)	-0.90* (0.53)
1960-2000	-1.24 (0.76)	-6.93 (5.90)	-1.70 (1.50)	-0.35 (0.43)

Note: The original analysis was performed in Chang et al. (2008), p. 746 (Table 1). Numbers are coefficients, with standard errors in parentheses, for the key independent variable (a dichotomous indicator for SMD electoral system), for the given model specification and years indicated, in which price levels are the dependent variable. I follow the authors in using * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The table shows that the panel evidence in favor of the consumer-producer power theory weakens when the analysis is extended to cover the 1960s. In no case does the key independent variable retain statistical significance at the 90% level. Details regarding the model specifications are included in Supporting Information III.

Empirical Evidence: Cross-Sector Variation

There is considerable variation in the impact of energy prices on economic activity according to sector. Figure 3 depicts average energy productivity according to sector for OECD countries during the period 1980-2005, based on data collected by Mulder and de Groot (2012).¹² High values in the figure, i.e. high energy productivity, indicate that the sector produces greater

¹² The sectors depicted are those for which I have data on both sectoral energy productivity and sectoral prices, as I will discuss below.

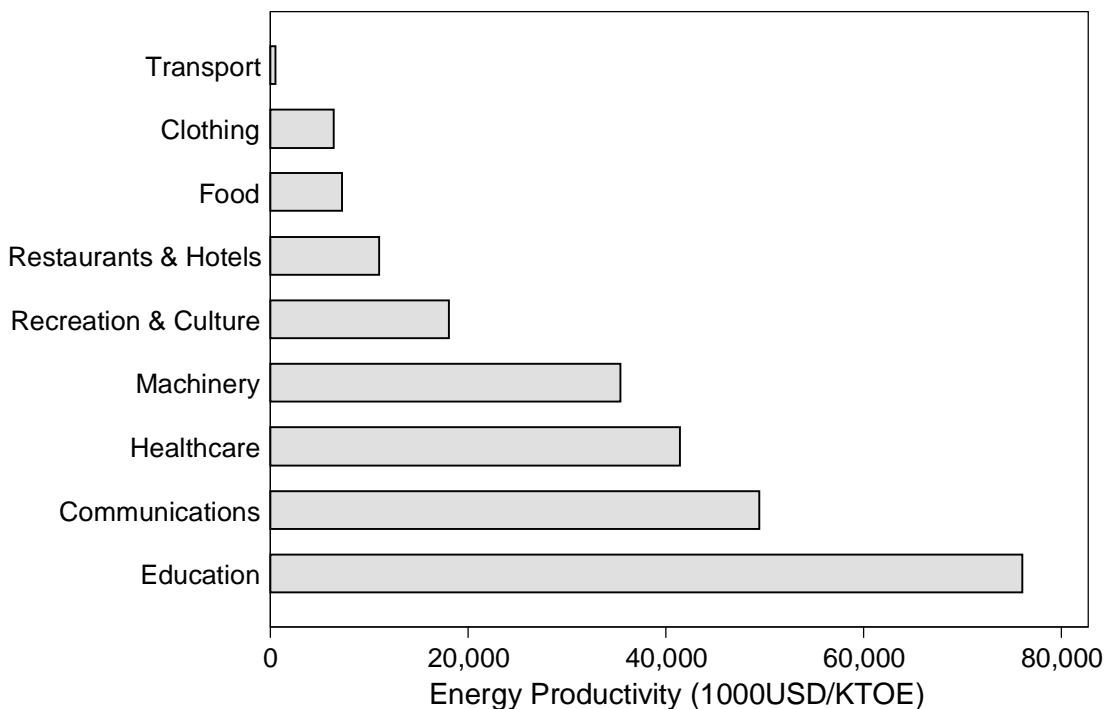
economic value per unit of energy consumed. The patterns are intuitive. Sectors such as education, healthcare, and communications do not require much energy to produce economic value. In contrast, transportation and food production are energy intensive and severely affected by energy prices.

This variation in energy intensity across sectors gives us a means through which to test the predictions of the proposed theories. My theory predicts that higher prices in PR countries will be focused in energy consumption and energy-intensive sectors. If PR governments are more prone to promote energy conservation by raising the cost of energy, we would expect to see higher prices for energy-intensive products. These effects should be negligible in sectors where economic activity does not rely heavily on energy inputs, such as education or healthcare. In contrast, consumer-producer theory predicts higher prices in PR countries across the board, or at a minimum, any variation in cross-sectoral prices ought to be stochastic.

Importantly, my theoretical predictions also diverge from those of Iversen and Soskice (2010), who argue that coordinated wage bargaining and wage compression in PR countries tends to produce high wages, and hence prices, in the nontraded sector. As a practical matter, the nontraded sector is dominated by services, and services tend to be relatively non-energy-intensive compared to the primary and manufacturing sectors.¹³ As such, if wage compression is an important source of high prices in PR countries, we would expect high prices in nontraded services, such as communications and healthcare. In contrast, my theory predicts that high prices will be concentrated in energy-intensive sectors.

¹³ For example, energy productivity (1000USD/KTOE) among OECD countries in 2005 was relatively low in the primary and secondary sectors – 6977 (agriculture), 1584 (basic metals), 6971 (manufacturing) – and higher in the service sector – 32,562 (services).

Figure 3: Energy Productivity by Sector, OECD Average (1980-2005)



Note: Data is from Mulder and de Groot (2012); Higher numbers indicate more economic value generated per unit of energy input. E.g., production in the transport sector is heavily reliant on energy, while education requires very little energy.

There are very few data sources that compare prices cross-nationally at the sectoral level. However, the World Bank has collected this data for 2005 as part of its International Comparison Program (ICP). As this is a cross-sectional analysis, and prices tend to adjust gradually in countries that undergo electoral reform as I will discuss below, I focus on OECD countries excluding Italy, Japan, and New Zealand – including these countries preserves the rough positions of the point estimates, but the models are estimated with less precision.

Figure 4 presents results analogous to the results in Figure 2, but in this case, rather than extending the analysis over time, the analysis is extended across sectors.¹⁴ The variables on the vertical axis are listed according to energy productivity: transportation is least energy productive, while education is the most energy productive. The figure shows that price differentials across electoral arrangements are focused primarily in the consumption of energy-intensive products (e.g. transport, clothing, food production). In PR systems, energy-intensive consumption is expensive. In contrast, the difference across electoral systems in prices for non-energy-intensive sectors are more muted and statistically indistinguishable from zero for healthcare, communications, and education. In Supporting Information IV, I include a more extensive discussion of cross-national price variation in these non-energy-intensive sectors to confirm that the results in Figure 4 are not spurious.

The price differentials observed in energy-intensive consumption across electoral systems reflect energy policy choices in PR countries. PR electoral institutions are associated with relatively stringent environmental policies and higher gasoline taxes (Fredriksson and Millimet 2004). In 2005, gasoline prices in PR countries were about 30% higher than those in SMD countries, primarily reflecting higher gasoline tax rates.¹⁵ Analogously, electricity prices were 50% higher.¹⁶ All countries that had adopted a carbon tax as of 2005 had PR electoral systems.¹⁷ In Supporting Information V, I show that the large divergence in gasoline and electricity prices between PR and SMD countries first emerged during the 1970s, concurrent with the divergence

¹⁴ As with the previous analysis, the results are based on OLS models in which sectoral price levels are the dependent variable, and an SMD dummy is key the independent variable, and the control variables included are per capita GDP, imports of goods and services as a % of GDP, and 3-year exchange rate appreciation.

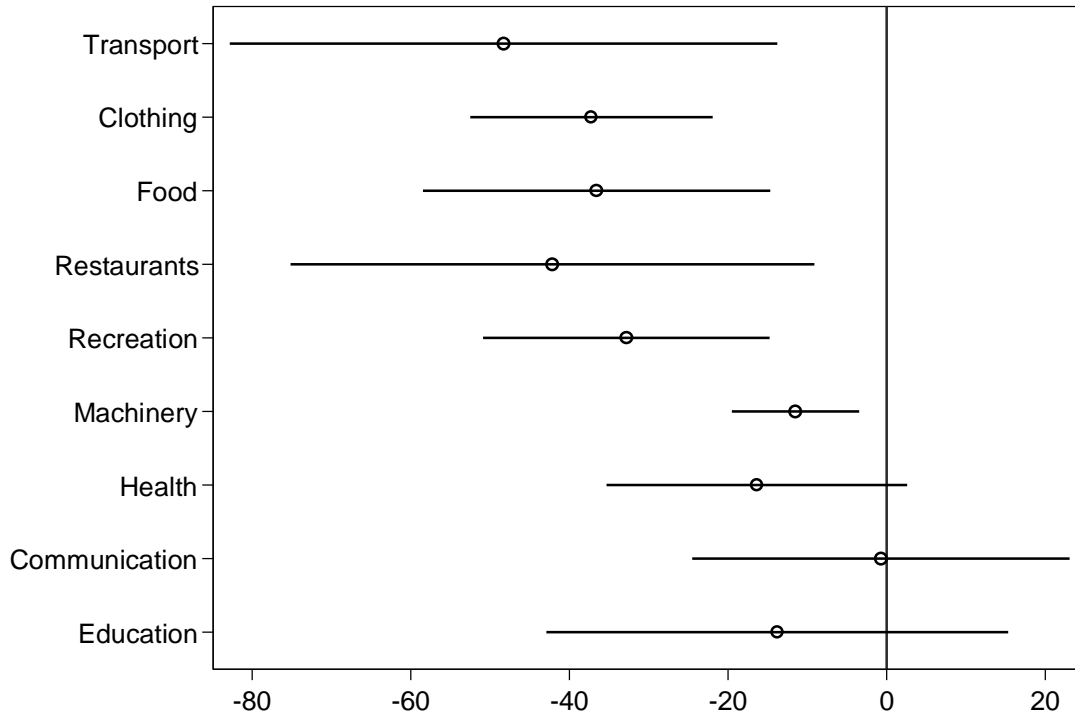
¹⁵ As Broz and Malniak demonstrate, variation in gasoline prices cross-nationally "...can be attributed almost entirely to differential taxation (Broz and Malniak 2009)."

¹⁶ Data for gasoline and electricity prices in 2005 are from the International Energy Agency, *IEA Energy Prices and Taxes Statistics*.

¹⁷ See World Bank (2016), p. 26. The countries were Finland, Poland, Sweden, Norway, Denmark, Latvia, Slovenia, and Estonia.

in overall price levels examined earlier. The evidence consistently points to energy policy as the principal source of price differentials across electoral systems.

Figure 4: Price Levels and Electoral Systems by Sector, 2005



Note: The sectors on the vertical axis are listed in increasing order of energy productivity (e.g., transportation requires a large amount of energy, education very little). The dots represent coefficients, and lines 95% confidence intervals, from model specifications where sector-specific price levels are the dependent variable and a dichotomous indicator of single member district (SMD) electoral system is the key independent variable. The results show that SMD is associated with lower price levels for energy-intensive consumption, but not for energy-non-intensive consumption. Results are for 2005 due to availability of the price data, and countries that underwent electoral reform in the 1990s are excluded from the analysis.

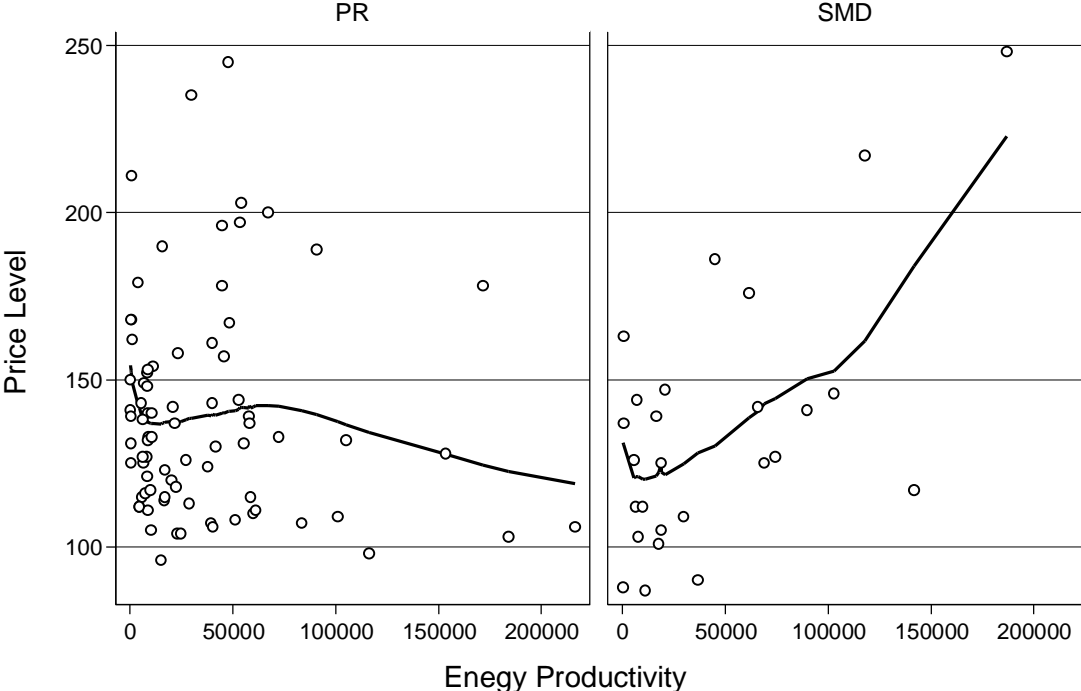
Figure 3 and Figure 4 examined sectors according to energy productivity averaged across all OECD countries. However, energy productivity by sector varies to some degree cross-nationally. For example, in 2005, the transportation sector in the Netherlands was about three

times more energy productive than that of the United States.¹⁸ As such, we can also examine the relationship between energy productivity and prices by electoral system more directly. Figure 5 plots sectoral energy productivity against price levels by electoral system along with lowess curves. Each data point represents a country-sector, such as the French transport sector. High price levels in PR relative to SMD countries are focused towards the left side of the figures, in energy-intensive sectors such as transport and clothing. As we move right in the figures, i.e. as energy becomes less important relative to other inputs such as human capital, the price differential diminishes (as depicted, SMD prices are actually higher in high-energy-productivity sectors, but this is based on a handful of observations).

In sum, there is no evidence of systematic variation in price levels between SMD and PR countries in sectors where the impact of energy prices is minimal. The evidence is consistent with more aggressive energy demand-management policies in PR countries through the imposition of higher prices on energy-intensive consumption. It is troubling for consumer-producer power theory, which predicts higher prices in PR countries without regard to sector. It also raises important questions about theories that predict high prices in the nontraded services sector under PR: this does not appear to be the case among the non- energy-intensive sectors examined here.

¹⁸ The transportation sector in the Netherlands produced \$1379K/KTOE compared to \$441K/KTOE for the United States.

Figure 5: Energy Productivity and Price Levels by Sector and Electoral System



Note: Each point represents a country-sector. Sectors with low energy productivity are associated with higher prices in PR countries compared to SMD countries, but this pattern does not hold in sectors with high energy productivity.

Electoral Reform and Energy Policy: New Zealand and Japan

In this section, I will briefly examine the plausibility of my proposed causal mechanisms by reviewing changes in energy policy associated with electoral reform. If my theory is correct, we should be able to observe substantial shifts in energy policy after episodes of electoral reform. Specifically, a movement from a majoritarian to a PR system should be associated with policies that raise the cost of energy consumption for the explicit purpose of encouraging energy conservation, and a movement in the opposite direction should be associated with removal of such policies. I specifically consider the evolution of energy policy in New Zealand and Japan. These countries meaningfully altered their electoral systems at roughly the same time in the early 1990s, and the reforms have not been reversed.¹⁹ Conveniently for empirical purposes, the electoral reforms moved the countries in opposite directions, shifting New Zealand away from and Japan towards a more majoritarian electoral system. As such, the paired comparison accounts for alternative explanations that might affect the evolution of energy policy more generally, such as international climate change negotiations, norm diffusion, or technological change. The two cases illustrate the operation of distinct causal mechanisms associated with my theory: in New Zealand, the role the Green Party was pivotal, while in Japan, electoral reform undermined energy conservation policies that redistributed revenues to organized interest groups.

¹⁹ France (1986) and Italy (1993) are other notable examples of electoral reform, but the reforms in those countries were subsequently reversed.

New Zealand

New Zealand maintained an SMD electoral system since its legislature was established by the New Zealand Constitution Act of 1852. This gave rise to a two-party system dominated by the Labour and National parties, often described as a quintessential Westminster system (Lijphart 1999; Curtin 2014; Johnson-Myers 2016). The electoral system was shifted to a mixed-member PR system in a popular referendum in 1993, and the first election under PR occurred in 1996 (Miller 2010). Electoral reform in New Zealand shifted energy policy in a conservationist direction by sharply increasing the seat share and influence of the Green Party and enabling governments to increase the prices paid by consumers for energy consumption.

New Zealand's electoral reform dramatically increased the influence of the New Zealand Green Party, which has played a key role in enacting major environmental legislation. In the final election under SMD in 1993, the Greens, in coalition with several other minority parties, only captured 2 out of 99 seats in parliament. The seat share of the Greens progressively increased, and it has been the third largest party in parliament for the past three elections (2008, 2011, 2014), routinely capturing about 10% of seats.

Electoral success under PR, combined with the necessity of coalition-building by the two largest parties, has placed the Greens in a position of influence since electoral reform. The Greens were particularly pivotal in 1999, when a coalition of Labour and Alliance was two parties short of a majority. The Greens struck deal with the coalition in which they would vote for the coalition on confidence and support in return for input into budgetary and legislative affairs concerning environmental issues. This led to the seminal 2000 Energy Efficiency and Conservation Act, which among other things provided the legal basis for the first time for the

government to promote energy efficiency and renewable energy and elevated the Efficiency and Conservation Authority (EECA) to an independent agency tasked with promoting environmental objectives (International Energy Agency 2001).

New Zealand governments under PR have been more willing and able to impose higher prices for energy consumption on consumers. This has been particularly pronounced in the transportation sector. In the years preceding electoral reform, petrol taxes had slightly declined from a historical peak of 37.39 cents/liter in 1989 to 32.89 c/l in 1992. Since electoral reform, petrol taxes have been raised in increments to about double this level, to 67.28 c/l (as of 2016). The evolution of New Zealand petrol taxation neatly illustrates the multiple mechanisms at work. The higher cost for gas partially reflects the direct consequences of environmental policy, most obviously a levy associated with the emissions trading scheme enacted in 2008 (Ministry of Business Innovation & Employment 2016). However, the allocation of revenues from the petrol tax is also telling: since electoral reform, revenues have been shifted from primarily supporting the Crown, the government's general budget, to the National Land Transport Management Fund (NLTF) (Ministry of Economic Development (New Zealand) 2012).²⁰ This has allowed petrol tax revenues to be explicitly targeted to organized interest groups associated with the infrastructure sector. In effect, the petrol tax has evolved to encourage energy efficiency by transport consumers while increasing the government's ability to target and reward concentrated interest groups. Prices for energy consumption aside from petrol have also increased markedly since electoral reform. The price of electricity in New Zealand increased by about 70% between

²⁰ In 1992, the last legal revision before electoral reform, the distribution of revenues was 69% Crown and 31% NLTF. The proportion of funds allocated to the NLTF started increasing after the first legal revision following electoral reform in 1998, and after 2008, 100% of funds were allocated to the NLTF.

1992 and 2015 in real terms.²¹ The real index for total household energy consumption increased by about 40% during the same period.²²

Japan

One potential objection to the evidence presented from New Zealand is that the sharp increases in energy prices could reflect global factors, particularly rising concerns about climate change and international agreements such as the Kyoto Protocol. It is thus helpful to consider Japan, which enacted electoral reform roughly at the same time, but towards a more majoritarian system. In 1994, Japan replaced a multimember district single nontransferable vote (MMD-SNTV) system for the *Shugin*, the lower house of the Diet, with a mixed-member system dominated by single member districts. Under the old electoral system, legislators were frequently elected with a small share of the vote in multi-member districts, and therefore had strong incentives to appeal narrowly to organized interests (Rosenbluth 1989; Sakakibara 1991; Ramseyer and Rosenbluth 1993; McCubbins and Rosenbluth 1995; Scheiner 2006). The new electoral system created stronger incentives to appeal broadly to the general electorate (Christensen 1994; Reed and Thies 2001). Importantly, the factors that led Japan to pursue energy conservation prior to electoral reform – high dependence on foreign energy sources and public support for environmentalism – have not changed.²³

²¹ Calculated from OECD, “National Prices in National Currency toe” and data on annual inflation from the Reserve Bank of New Zealand.

²² OECD, “Indices of Energy Prices by Sector: Total Energy, Real Index for Households.”

²³ E.g. Japanese energy self-sufficiency remained only about 6% in 2012, or about 20% including nuclear power shut down after the Fukushima meltdown (Ministry of Economy Trade and Industry (Japan) 2014). In a 2005 poll by the Ministry of Foreign Affairs, 72% of Japanese survey respondents considered global warming a “global problem that is of serious concern to me in my daily life.” This was the highest response for any category listed,

The MMD-SNTV electoral system used by Japan until 1994 did not produce left-leaning governments or an influential green party, unlike PR systems in many European countries. Rather, the impetus for energy conservation in Japan emerged from a consensus among the country's politicians and bureaucrats to prioritize energy security after the 1973 oil shock, which demonstrated the country's vulnerability to supply disruptions (Johnson 1982; Ikenberry 1986). Electoral institutions in Japan were particularly important in enabling politicians to pursue energy conservation by drastically raising energy prices for the Japanese consumer. After the 1973 oil crisis, the Japanese government enacted a series of laws and regulations that sought to encourage energy conservation by raising prices. For example, Japanese electricity prices increased by about 480% during the decade after 1973 and became the highest in the world by a considerable margin by the mid-1980s.²⁴ Similarly, the price of automobile ownership and operation was raised sharply through increases in highway tolls, gasoline taxes, and various automobile taxes. Japanese highway tolls particularly stood out in international comparison – all Japanese highways were covered by tolls, and Japanese tolls were about 3-4 times higher than other advanced industrialized countries (Lipsky and Schipper 2012). These measures provided strong incentives for Japanese consumers to conserve electricity and opt for energy efficient rail transportation.

Japanese energy efficiency measures were designed to directly redistribute revenues to organized interest groups that supported the ruling Liberal Democratic Party (LDP) in sectors such as agriculture and construction (Lipsky 2012). In turn, these groups provided financial support to the LDP and mobilized reliable voters. The MMD-SNTV electoral system allowed

which included items such as terrorism and war, infectious diseases, and international criminal activity (“Chikyu Ondanka Taisaku ni Kansuru Yoron Chosa,” Cabinet Office, Government of Japan, 8-2007.).

²⁴ Data from IEA Energy Prices and Taxes Statistics, household electricity prices in US\$/MWh.

the LDP to retain power despite imposing punishing energy prices on the Japanese consumer: votes delivered by concentrated interest groups were generally sufficient to secure the modest vote share LDP politicians required for election within multi-member districts.

After electoral reform that introduced SMD, Japanese politicians have faced incentives to appeal broadly to the interests of Japanese consumers. Measures that raise energy consumption prices are deeply unpopular among the Japanese public,²⁵ and reformist politicians such as Junichiro Koizumi and members of the Democratic Party of Japan (DPJ) have sought popular appeal by attacking high energy prices and associated redistributive measures. While highway tolls, automobile taxes, and gasoline taxes were raised routinely prior to electoral reform, no increases have occurred after 1995 (Lipsy 2012).

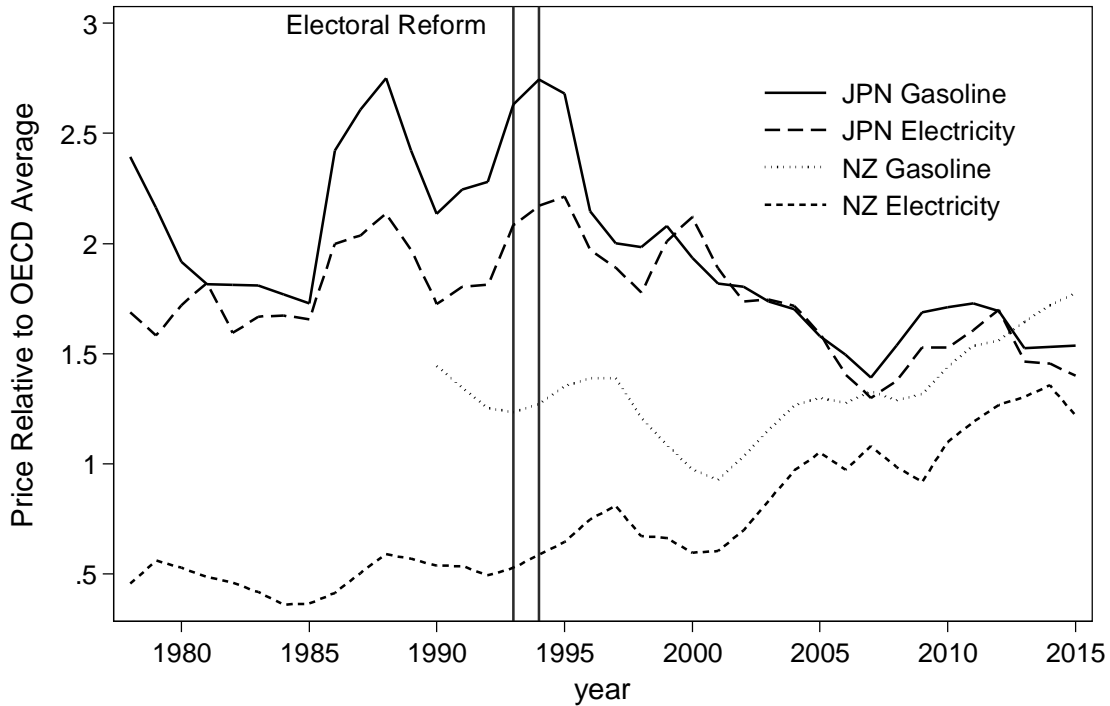
Figure 6 plots the evolution of gasoline and electricity prices in Japan and New Zealand before and after electoral reform. To account for general fluctuations in international energy markets, prices are plotted relative to the OECD average. As the figure illustrates, Japanese energy prices have declined since electoral reform: this largely reflects stagnation in Japanese price levels while many other countries in the OECD implemented policies to address climate change. As predicted, we observe the opposite pattern in New Zealand, where energy price levels have increased after electoral reform, particularly after the passage of the 2000 Energy Efficiency and Conservation Act.

The evidence from New Zealand and Japan provide support for my proposed causal mechanisms. There is a clear link between electoral institutions and the outcomes of energy policy in each country, and electoral reform is associated with variation consistent with my

²⁵ E.g., the gasoline tax was opposed by 72% of the general public in 2008 (“Naikaku Shijiritsu 41%,” *Kyodo Tsushin Yoron Chosa*, 01-12-2008); 57% of survey respondents supported elimination or reduction of the automobile weight tax (“Jidosha no Zeikin Ni Tsuite,” *JAMA Report* No. 91).

theory. The evidence from New Zealand is clear: PR made the Green Party politically viable and pivotal in enacting crucial energy conservation legislation in cooperation with a left-leaning coalition. Revenues from gasoline taxes have been shifted from the general budget to a special account targeted to organized interest groups associated with the infrastructure sector. The evidence from Japan provides partial support for my theory. MMD-SNTV did not produce a left-leaning government or a green party. Thus, Japanese energy conservation efforts cannot be attributed to government preferences under a more proportional electoral system. However, the Japanese case provides strong support for my predictions about the choice of policy instruments. Under MMD-SNTV, Japanese politicians pursued energy efficiency by imposing high prices on the Japanese consumer, and these policies became increasingly unsustainable after electoral reform. Much of the redistribution towards concentrated interest groups in Japan did not take the form of rents, as would be predicted by consumer-producer power theory. Rather, the Japanese government redistributed the revenues raised from energy taxes and tolls to nominally unrelated organized interest groups in areas such as agriculture and construction.

Figure 6: The Evolution of Gasoline and Electricity Prices in Japan and New Zealand Relative to the OECD Average, 1978-2015



Note: Relative to the OECD average, energy prices decreased in Japan after adoption of a majoritarian electoral system, and energy prices increased in New Zealand after adoption of PR. Electoral reform occurred in 1993 for New Zealand and 1994 for Japan. Data is from the International Energy Agency, *IEA Energy Prices and Taxes Statistics*. Data is household prices for electricity (USD/MWh) and regular unleaded gasoline (USD/L).

Conclusion

I have argued that electoral institutions affect how governments manage energy policy, particularly policies concerning energy prices. PR is associated with government policies that encourage energy conservation by raising the price of energy-intensive consumption. The

findings contribute to an expanding literature that examines the impact of electoral institutions on policy outcomes.

The empirical findings challenge a core causal claim of a seminal literature on electoral institutions and the political economy of prices. This article shows that there is no systematic relationship between electoral systems and prices: 1. prior to the 1970s, when governments introduced large-scale intervention to promote energy conservation; 2. in sectors of the economy that do not use energy intensively.

The evidence presented in this article has significant normative implications for how we think about the social consequences of electoral arrangements. According to the conventional wisdom, PR institutions effectively allow producers to take advantage of consumers by raising prices and earning rents. In contrast, the theory and empirical evidence presented in this paper suggest that PR is associated with more aggressive government action to mitigate the negative externalities of energy consumption, such as pollution, vulnerability to supply shocks, and climate change. Consumers in PR systems do pay higher prices in aggregate, but these prices may very well be closer to socially optimal levels after accounting for negative externalities.

The findings in this article illustrate the need for scholars of political economy to pay greater attention to the politics of energy. Since the 1980s, scholarship has often neglected the politics of energy, particularly in advanced industrialized countries (Hughes and Lipsy 2013; Hancock and Vivoda 2014). This neglect can have important consequences for broader theoretical debates in comparative and international political economy. Energy remains a crucial input for much modern economic activity and a major focus for government policies. Scholars of political economy would be well advised to pay greater attention to the causes, effects, and implications of energy policy.

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Supporting Information I: List of Major Policy Measures Impacting Prices Implemented by OECD Countries during the 1970s

The following is a list of major policy measures implemented by OECD countries in the 1970s that impacted energy prices. The list is not meant to be systematic; many of the measures implemented to manage energy prices during this period took the form of administrative interventions based on existing regulatory authority, making a comprehensive overview impractical. However, the list illustrates the wide range of policy measures undertaken during the 1970s for the purpose of energy conservation. Such measures were largely absent prior to the 1970s due to the abundance of cheap oil and underdeveloped environmental movements. A full list of the primary and secondary sources used to compile the table is available from the author by request.

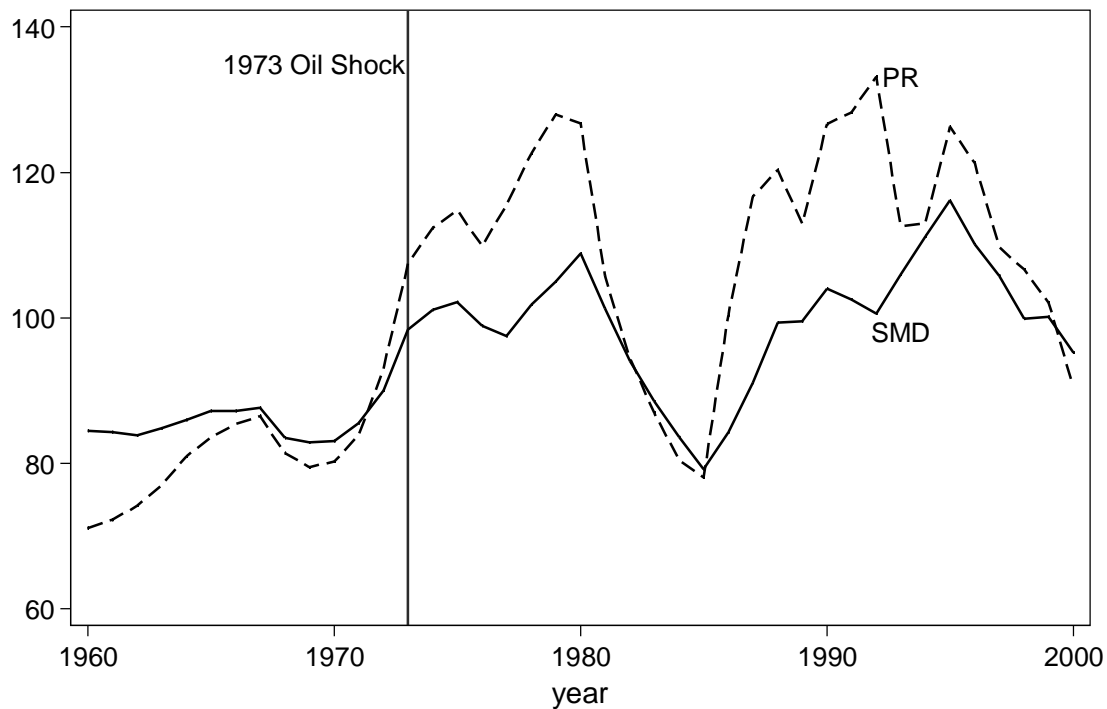
Country	Year	Policy	Description of Major Impact
Australia	1977	Energy Price Deregulation	Pricing and Volume Restrictions for Petroleum Eliminated
Australia	1978	Code of Practice	Fuel Economy Standards, Impact on Automobile Prices
Belgium	1973	Demand Management Measures	Electricity Supply Management; Oil Price Freeze
Belgium	1973	Nuclear Power Development	Construction of nuclear power plants; impact on electricity prices
Belgium	1974	Oil Price Increases	Series of mandated increases for refined oil products (Impact on Petroleum; Heating Oil)
Canada	1973	Oil Price Freeze and Export Tax	Domestic oil price freeze at \$4/barrel; tax on oil exports to U.S.
Canada	1975	Canadian Industry Programme for Energy Conservation	Voluntary Program to Facilitate Energy Efficiency
Canada	1976	Transport Canada Voluntary Motor Vehicle Fuel Consumption Program	Voluntary Fuel Economy Standards, Impact on Automobile Prices
Denmark	1973	Demand Management Measures	Restrictions on Driving; Energy Efficiency Regulations
Finland	1976	Building Efficiency	Regulations for Thermal Insulation

		Requirements	of New Structures
France	1974	Demand Management Measures	Mandated Higher Prices for Gasoline and Heating Oil by about 30%
France	1974	Emergency Energy Conservation Program	Greater Government Authority to Control Energy Prices and Supply
France	1974	Nuclear Power Development	Construction of nuclear power plants; impact on electricity prices
Germany (W)	1973	Gasoline Tax	Raised in increments from 3.5 ct./L in 1972 to 6.9 ct./L in 1980
Germany (W)	1978	Building Efficiency Requirements	Regulations for Thermal Insulation of New Structures
Germany (W)	1977	Blue Angel Symbol	Energy Efficiency Measures for Consumer Products
Greece	1974	Energy Price Increase	Gasoline Price Increase by 75% for Regular
Greece	1979	Energy Price Increase	Prices Increased for Gasoline and Heating Oil
Italy	1973	Demand Management Measures	Energy Taxes Increased for Petroleum; Heating Oil; Rationing
Italy	1976	Nuclear Power Development	Construction of nuclear power plants; impact on electricity prices
Italy	1979	Energy Price Increase	Price Increase for Diesel and Heating Oil
Ireland	1975	Oil Extraction Policy	Government Revenues from Oil Extraction Increased to 80%
Japan	1973-1974	Demand Management Measures	Increases in Electricity Taxes, Oil Taxes, Automobile-related Taxes
Japan	1979	Energy Conservation Law	Government Authority to Regulate Energy Efficiency and Prices
Netherlands	1973	Rationing Law	Supply Limitations on Petrol
Netherlands	1973	Oil Price Decontrol	Oil Price Increased

Netherlands	1974	Demand Management Measures	Oil Rationing and Oil Tax; Greater Government Control over Energy
New Zealand	1973	Demand Management Measures	Limited Measures; Gradual Increase in Petrol Prices
Norway	1973	Demand Management Measures	Gasoline Rationing; Limited Travel Ban
Norway	1975	Petroleum Tax Act	Special Tax on Income from Petroleum Production
Norway	1979	Utilities Regulation	Electricity Prices Switched from Average Cost to Long-Run Marginal Costs
Portugal	1973	Gasoline Price Increase	Petrol and Oil Product Prices Increased 10% and 19%
Spain	1975; 1979	First/Second National Energy Plan	Government Intervention in Energy Price and Supply
Spain	1979	Oil Price Increase	Gasoline and Fuel Oil Prices Increased
Sweden	1975	Nuclear Power Development	Construction of nuclear power plants; impact on electricity prices
Switzerland	1973	Demand Management Measures	Rationing for Gasoline and Heating Oil
Switzerland	1973	Nuclear Power Development	Construction of nuclear power plants; impact on electricity prices
UK	1973- 1974	Demand Management Measures	Rationing and Price Increases for Oil Products
UK	1975; 1979	Oil Taxation Act	Tax on Oil Profits
USA	1970; 1977	Clean Air Act and Amendment	Impact on Electricity Prices (Pollution Control for Utilities)
USA	1973	Emergency Petroleum Allocation Act	Impact on Oil Prices (Higher Price Applied for New Oil Discoveries)
USA	1974	Energy Supply and Environmental Coordination Act	Impact on Electricity Prices (Regulation of Natural Gas and

			Petroleum for Energy Production)
USA	1975	Energy Policy and Conservation Act	Fuel Economy Standards for Automobiles
USA	1976	Demand Management Programs	Subsidies for Energy Efficiency Audits & Training; Grants for Energy Efficiency Improvements
USA	1978	National Energy Conservation Policy Act	Mandatory Energy Standards
USA	1978	Energy Tax Act	Subsidies for Household Renewable Energy Use; Gas Guzzler Tax
USA	1978	Natural Gas Policy Act	Decontrol of Natural Gas Prices

Supporting Information II: Alternative Chart of Average Real Prices Levels in PR and SMD Systems, OECD Countries (1960-2000)



Note: In the figure included in the main text, in order to focus on within-country variation in prices, countries were only included if data was available consistently for the entire time period and no electoral changes took place. This figure includes all countries. Consistent with the arguments made in the article, the divergence in prices across electoral systems only emerges in the early-1970s. The main difference between the figures is the convergence towards the end of the period, which is caused by re-categorization of countries that underwent electoral reforms in the mid-1990s, i.e. Japan, Italy and New Zealand. This convergence is misleading, as it is entirely driven by the composition of countries in each category, and it is unrealistic to assume that price levels across an entire economy would respond instantaneously to changes in electoral systems.

Supporting Information III: Detailed Discussion of Model Specifications related to Table 2: Replication and Extension of Panel Analysis from Chang et al. (2008), Coefficient and Standard Errors for SMD dummy

All models use PPP/XR (purchasing power parity over exchange rate) as the dependent variable, and a dichotomous indicator for SMD electoral system as the key independent variable. All models include the following control variables: CGDP (Gross domestic product per capita in US dollars), IMPORT (Imports of goods and services as a % of GDP), lnPOP (Natural log of population), Growth (Annual GDP growth, %), DXR (Local currency appreciation relative to the US dollar), UNAINF (US inflation rate). Model 1 includes a lagged dependent variable, panel-corrected standard errors, and country and decade fixed effects. Model 2 is a between-effects estimation. Model 3 uses the Arellano-Bond generalized method of moments estimator (GMM) to model unobserved heterogeneity across countries. Model 4 is a linear regression with panel-corrected standard errors that includes variables that proxy for several alternative explanations, RESTRICT (a proxy for restrictions on campaign financing) and CLARITY (a proxy for political systems with clarity of responsibility).

Supporting Information IV: Overview of Cross-National Price Variation in Non-Energy-Intensive Sectors

If consumer-producer power theory is correct, we should be able to identify signs of greater producer power and higher prices in SMD systems across all sectors. I therefore examine in greater detail the three sectors identified as the least energy intensive in Figure 3: education, communications, and healthcare. These three are chosen because they are the least energy intensive sectors in the Mulder and de Groot dataset that are also significant components of consumer spending in advanced industrialized economies.²⁶ In combination, prices in these sectors are a significant component of consumer spending in major economies. For example, in the 2011 US consumer price index, medical care, education, and communication accounted in combination for about 15% of the index, or 25% excluding housing.²⁷ Although categorizations differ slightly, value-added in US GDP paints a similar picture, with the combination of “information” and “educational services, health care, and social assistance” accounting for 15% of private sector value added.

The idea that prices in areas such as education, telecommunications, and healthcare are not necessarily lower in SMD systems should come as no surprise, particularly for those familiar with political debates in the United States. It is well documented that healthcare spending in the US far exceeds that in other OECD countries without producing better access or use of healthcare services. As Anderson et al (2003) note, “...the difference in [healthcare] spending is caused mostly by higher prices for health care goods and services in the United States (90).” The

²⁶ The other sectors characterized by comparable or greater energy productivity as identified by Mulder and de Groot (2012) are “financial intermediation,” “construction,” and “renting, computer, R&D, and other business.” These are predominantly characterized by business-to-business transactions and not major spending categories for individual consumers, which make them less suitable for an examination of the relative influence of diffuse consumers and concentrated producers.

²⁷ Data are from U.S. Bureau of Labor Statistics, “(2011-2012 Weights). Relative importance of components in the Consumer Price Indexes: U.S.” available at <http://www.bls.gov/cpi/#data>

US also boasts the highest average prices for college tuition and attendance in the OECD (Usher and Medow 2010).²⁸ US prices for telecommunications are also high in cross-national comparison, particularly for high-speed broadband connections (International Telecommunications Union 2012; Wallsten and Riso 2010; Organisation for Economic Co-operation and Development 2012). The US also has relatively high prices for mobile telecommunications, ranking highest among the OECD for low- and medium-usage plans and sixth among high-usage plans (Organisation for Economic Co-operation and Development 2009).

The US is not the only SMD country in which non-energy-intensive services command high prices. For example, a 2012 study by the International Federation of Health Plans compiled pricing data for fourteen medical procedures across ten countries and found that the three countries with the highest average prices per procedure were the United States, Australia, and Canada, all countries with SMD electoral systems (International Federation of Health Plans 2011). Higher education costs in SMD countries generally exceed those in PR countries (Usher and Medow 2010), perhaps reflecting the tendency for PR countries to make greater investments in human capital formation (Iversen and Stephens 2008). Although the notoriously high costs of higher education in the United States are well documented, high costs have also been a major policy issue in Australia, where international students shy away from the country to pursue less costly options elsewhere (Australian Education International 2011).

For telecommunications prices, there are no systematic patterns in prices by electoral system. PR countries are generally characterized by lower prices for mobile telecommunications

²⁸ US overall education spending per student is also higher than other OECD countries, but spending on compulsory public education funded largely by tax revenues is somewhat orthogonal to a discussion of consumer-producer power.

for all usage baskets compared to SMD countries.²⁹ On the other hand, fixed-line telecommunications prices are consistently lower in SMD countries.³⁰ For broadband internet connections, prices in PR countries are cheaper for low-speed connections and higher for high-speed connections (Organisation for Economic Co-operation and Development 2009).³¹ Based on the ITU's information and Communications Technology (ICT) Price Basket, which seeks to measure the average affordability of all ICT services cross-nationally, prices are about 10% higher among PR countries compared to SMD countries in the OECD. However, this largely reflects the fact that ICT costs are higher in less developed economies, and the OECD includes several developing countries with PR electoral systems. When developing countries are excluded, average ICT prices in PR and SMD countries are essentially the same, only differing by 1% (International Telecommunications Union 2012).³²

As this brief survey indicates, in non-energy-intensive sectors, prices in SMD and PR countries follow no clear pattern. Healthcare and education costs appear to be somewhat higher in SMD countries, whereas telecommunications prices are generally comparable.

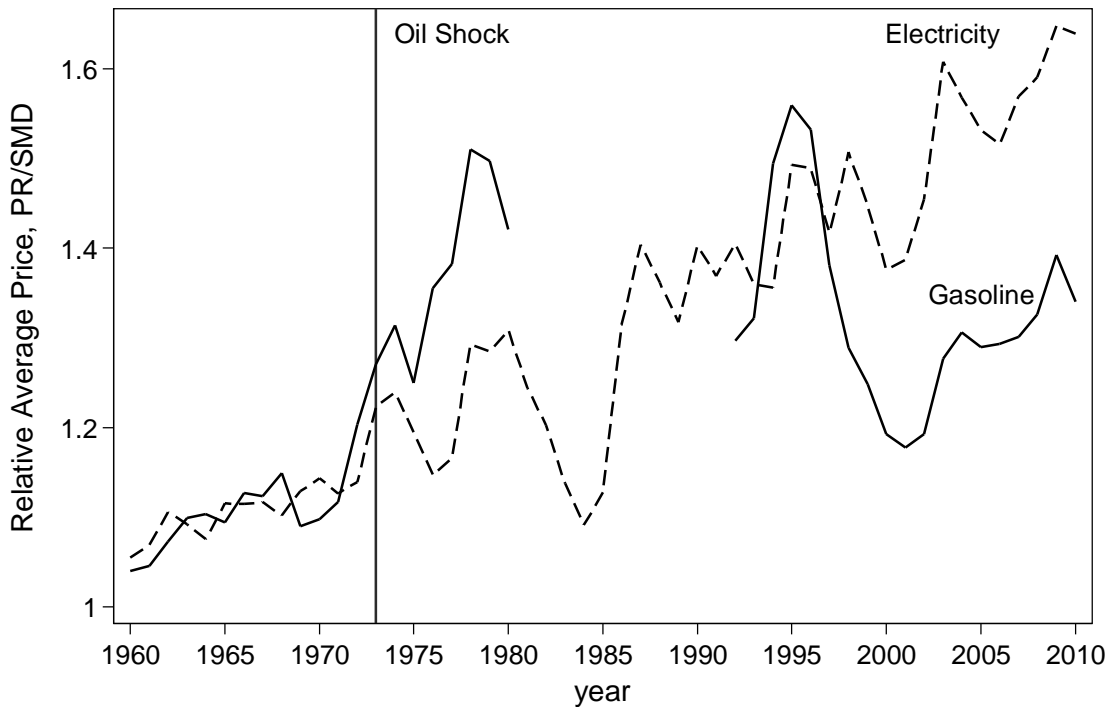
²⁹ Average prices for mobile plans in PR countries were lower compared to SMD countries by 26.1% (high-usage), 26.3% (medium-usage), and 6.0% (low-usage). The cheapest five countries for all usage categories were PR countries, e.g. for high-usage plans, Denmark, Netherlands, Sweden, Finland and Austria had the lowest cost plans.

³⁰ Average prices for residential fixed-line plans (fixed costs + usage costs) in SMD countries were lower compared to PR countries by 8.9% (high-usage), 12.1% (medium-usage), and 8.9% (low-usage).

³¹ The average monthly subscription price for an internet connection (USD PPP) was for low-speed: \$32.25 (SMD), \$27.50 (PR); medium-speed: \$41.23 (SMD), \$43.30 (PR); high-speed: \$51.02 (SMD), \$61.41 (PR).

³² I use a simple cutoff at GNI per capita < \$15,000. The excluded countries are Chile, Estonia, Hungary, Poland, Turkey, and Mexico.

Supporting Information V: Relative Prices of Gasoline and Electricity (PR/SMD Countries), OECD Countries 1960-2010



Note: The lines are derived by calculating the annual mean values for gasoline and electricity prices for SMD and PR countries separately, and then taking the ratio (PR/SMD). Values above one imply that prices were higher in PR countries. The figure shows that gasoline and electricity prices were about 10% higher in PR countries from 1960 to the early 1970s, but the difference became more pronounced during and after the 1970s, when the oil shocks and the rise of environmentalism facilitated widespread government intervention in energy markets.

The data before and after 1980 comes from two different data sources due to availability. The data prior to 1980 is from Baade (1981), and measures prices for regular gasoline in US dollars per BTU and electricity for households in US dollars per BTU for 19 OECD countries. After 1980, the data is from the International Energy Agency, *IEA Energy Prices and Taxes Statistics*, and measures gasoline prices for premium unleaded 95 RON in US dollars per litre and electricity prices for households in US dollars per MWh. Data for regular gasoline in the IEA dataset is limited to a handful of countries, and hence the more widely available premium unleaded 95 RON was used. The plot for IEA data for gasoline prices starts from 1992, as there is missing data for several countries prior to this year. Prices per BTU are unavailable in the IEA data – note that the figure plots ratios, which should mitigate differences in measurement units.