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**The Efficiency of Institutions:
Political Determinants of Oil Consumption in Democracies**

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Abstract

Oil consumption has varied significantly among democracies, but scholars have not systematically studied the political determinants of this variation. We examine the effects of political institutions on a democratic country's propensity to consume oil. We argue that, other things being equal, more centralized national political institutions facilitate the adoption of policies that lower oil intensity. Our primary focus is on the impact of veto players, but we also consider electoral systems, party organization, and legislative-executive relations separately. We evaluate our hypotheses with a TSCS analysis of all democracies since the first oil shock in 1973 (contingent on data availability), and we make use of an error correction model to separate short- and long-term effects and to correct for the non-stationarity of the dependent variable. We find strong support for the hypothesized link between numerous veto players and slower reductions in oil intensity as well as weaker support for the influence of party decentralization.

Energy consumption is an important determinant of state interests, and since the early 1960s oil has accounted for roughly 40 percent of global energy use. Even in 2008, despite a relative decline in oil's share to 34.8 percent over the previous decade, it still surpassed coal (29.3 percent) and natural gas (24.1 percent) as an energy source. Moreover, outside of China, which still relies on coal to meet some 70 percent of its energy needs, oil continues to provide for more than 38 percent of the world's primary energy consumption.¹ At the same time, oil consumption has varied substantially across states, even when controlling for population or economic output. For example, oil consumption per capita has typically been much higher in the United States than in France, Japan, or even the United Kingdom, another major oil producer.

Such variations in oil consumption can have important implications for the policies and well-being of states. Other things being equal, levels of consumption can affect the relative competitiveness of oil-dependent sectors and industries, especially during times of high oil prices. Likewise, countries that use more oil can suffer more from disruptions in world oil markets, and more vulnerable states may be more inclined to use extreme measures to ensure access to oil supplies.²

What accounts for variations in national oil consumption? Surprisingly, this question, despite its political importance, has rarely been asked by political scientists, and it has never been satisfactorily answered. Scholars have conducted few, if any, systematic studies of the political factors that determine a country's propensity to consume oil. That is the goal of this article. We seek to explain the potentially consequential variation in oil consumption across democracies. In particular, we seek to account for differences in reductions in oil intensity since the first oil shock sent prices skyrocketing and created uncertainty about oil supplies.

As a first step, we control for structural and economic variables that may be expected to

affect oil intensity. The core of the paper, however, focuses on how national political institutions might affect oil intensity through government policy. Our broad argument is that lower levels of oil intensity have been a public good, at least since the mid-1970s, and that more centralized political institutions in democracies facilitate the aggregation of societal interests into policies that foster a lowering of oil intensity.

We draw on the political economy literature to derive hypotheses about domestic political institutions that may be expected to impact oil use. Our primary focus is on veto players, but for robustness, we also consider the effects three particular types of political institutions: electoral systems, party organization, and legislative-executive relations. We then evaluate our hypotheses with a time-series cross-sectional analysis of all democracies over the thirty-four year period (1974-2007) following the first oil shock. We make use of an error correction model to separate short- and long-term effects as well as to correct for the non-stationarity of the dependent variable.

Our results provide strong and robust support for our primary hypothesis concerning the role of veto players, demonstrating that democracies with more veto players tend to have more difficulty reducing oil intensity. We also find evidence that more decentralized parties are associated with less conservation as expected, although the results are less robust than for veto players. Contrary to our expectations, however, we find no evidence that the electoral rule has a systematic effect on oil use or that systems in which political power is more concentrated in the executive are better able to reduce oil consumption. Thus we conclude that our findings, overall, provide further confirmation of the contribution of political institutions to the provision of public goods in general. But they also indicate the need for further theoretical and empirical investigation of the processes through which such institutions can promote reduced oil intensity

and other specific types of policies that benefit society as a whole.

I. Oil Consumption Across Democracies and Years

World oil consumption has grown by more than 150 percent since 1965.³ The oil-consuming behavior of democracies is of particular interest, however, because many of them have exhibited the highest per capita levels of oil consumption. And with just a couple of exceptions – the USSR/Russia and China – democracies have routinely filled the ranks of the largest overall oil users and, as consumers, have exerted the biggest impact on world oil markets. Thus oil consumption trends in democracies are especially important for understanding global tendencies.

Perhaps the most useful overall indicator of oil consumption for comparative purposes is oil intensity, which is calculated by dividing total oil consumption by gross domestic product (GDP). It describes the amount of oil needed to produce a dollar of economic output and thus controls for differences in total oil consumption due to changes in the amount of economic activity alone. Consequently, we focus our analysis on explaining cross-national differences and temporal changes in oil intensity.⁴ Because oil intensity is a measure of efficiency, it should reflect the effects of government efforts to promote conservation, our primary theoretical interest.

How has oil consumption varied among democracies over time? For illustrative purposes, we offer a brief description of trends since 1965 in twenty-one OECD countries, which constitute the majority of the democratic country-years that have existed over this period. Although the average oil intensity for these countries rose in the late 1960s and early 1970s,

Figure 1 reveals a clear downward trend between 1973 and 2007. The average oil intensity dropped from 170.1 metric tons of oil per million dollars of GDP (in constant 2000 dollars) in 1973 to 80.9 in 2007.

Figure 1 about here

Nevertheless, these trends should not be allowed to obscure major differences across the states. For example, U.S. oil intensity has averaged about 50 percent higher than that of France and of the UK, and about twice that of Japan. Canadian oil intensity has been even higher. In 1965, oil intensity levels among these illustrative cases ranged from a high of 242.3 (Canada) to a low of 62.4 (Switzerland), and in 2007, the highest level (155.0 in Belgium) was nearly four times as great as the lowest (40.9 in Switzerland again).

II. Economic and Structural Determinants of Oil Intensity

What factors best account for these patterns and variations of oil intensity in democracies? Like other economic phenomena such as trade, much of oil consumption can presumably be explained by economic and structural conditions that are beyond the immediate control of government policy. Among the conditions with the greatest promise to explain oil intensity are the cost of oil, national income, sectoral composition, population density, and energy self-sufficiency.

In market economies, oil costs money. Consequently, when the cost of oil rises, we expect overall consumption to fall. We also expect oil intensity to decrease, although not to the same extent, since the decline in oil consumption might be accompanied by some decrease in

economic activity.

H1: As the cost of oil rises, oil intensity will decrease.

The cost of oil is counterbalanced by national income. As people's incomes increase, they tend to buy more goods and services. Thus we expect that oil intensity will rise with average individual income, as measured by GDP per capita. As countries grow yet richer and more technologically advanced, however, we might also expect energy efficiency to increase, and at some point, efficiency gains should begin to outpace increases in consumption, resulting in lower levels of oil intensity.

H2: As national income increases, oil intensity will exhibit a curvilinear form, first increasing and then decreasing.

The cost of oil and national income will influence oil consumption across the board. Oil intensity will also depend on the sectoral composition of the economy, however. In particular, we expect the agricultural and, especially, the industrial sectors to be more oil intensive than the service sector as a general rule.

H3: As the share of the economy devoted to industry and agriculture (vis-à-vis services) increases, oil intensity will increase.

Other factors will have the greatest impact in particular end-use sectors, which include

transportation, industry, and the commercial and residential sectors. One such factor is population density. Much oil is consumed in the process of moving people and goods from place to place. Indeed, the transportation sector accounts for a high percentage (approximately two-thirds in the United States, for example) of all oil consumption.⁵ The demand for transportation is in turn influenced by the distribution of a country's population. We expect that the more concentrated the population is, the lower oil consumption and oil intensity should be.

H4: As population density increases, oil intensity will decrease.

Finally, we expect oil consumption to be influenced by the degree to which a state depends on oil imports. Although oil markets have become increasingly integrated over the years, oil produced domestically may be available to users at lower prices and with greater certainty than oil from other sources.

H5: As oil consumption produced domestically increases, oil intensity will increase.

III. Political Determinants of Oil Intensity

Generally, we expect markets to determine the level of national oil consumption, except where governments seek to promote or discourage it for social reasons. Oil consumption can have a variety of negative economic, security, and even environmental externalities.⁶ Consequently, central governments may have an incentive to adopt policies intended to reduce those costs, largely by achieving lower levels of oil intensity.

These incentives have been especially pronounced since the first oil shock. The 1973-1974 oil crisis saw a quadrupling of the price of crude oil, resulting in massive wealth transfers to oil exporting countries, and raised questions about the security of oil supplies. In reaction, most governments have made efforts to reduce oil consumption over the years, while at the same time protecting their countries against possible disruptions of foreign oil supplies. Beyond increasing the energy efficiency of their own operations, however, governments in market economies exercise little direct control over aggregate consumption. Instead, they may incentivize or require other oil users to reduce consumption and to use energy more efficiently. Among the policy tools at their disposal have been taxes and tax incentives; regulations for the efficiency of motor vehicles and other oil-consuming devices; and, at a more general level, incentives for promoting a shift to less oil-intensive economic activities.⁷ Other government policies may seek to reduce oil imports by increasing domestic oil production and to minimize the short-term economic impact of oil supply disruptions, for example, by creating strategic stockpiles.

Nevertheless, the precise combination of policies pursued by democracies since the first oil shock has varied substantially. For example, U.S. efforts to reduce oil consumption have emphasized the establishment of vehicle fuel economy standards, while European countries have maintained much higher taxes on petroleum-based fuels.⁸ And arguably, national efforts to reduce oil consumption have enjoyed varying degrees of success, at least judging by continuing differences in levels of oil intensity. Assuming that these differences cannot be entirely attributed to economic and structural factors such as those identified above, what political factors might help to account for them? Why, in particular, might different governments have been more or less able to influence levels of oil consumption and efficiency?

One way to approach this question is to regard such policies as generating public goods. Many of the benefits that these policies yield, in terms of reducing the economic, environmental, and national security costs of oil consumption, accrue to society as a whole. Thus the adoption of policies that, among other things, reduce oil intensity is related to the ability of governments to provide public goods.

The ability of democracies to provide such policies and the resulting benefits, where they may be desirable, varies. In particular, not all democratic governments are equally able to take measures that would result in significant decreases in oil consumption. Representative governments are constrained to varying degrees by society and private interests. Society in the aggregate might benefit from such measures, but particular sectors and groups will inevitably be hurt by particular policies and thus are likely to oppose them. For example, oil-intensive industries and even consumers as a whole are unlikely to support higher taxes on oil and petroleum products. Likewise, the manufacturers of oil-consuming devices, such as the auto companies, are likely to resist costly regulations intended to increase fuel efficiency. Thus success in adopting and implementing energy policies may depend on the ability of governments to take unpopular measures that may nevertheless serve the common good and to resist the pressures generated by special interests and other concentrated pockets of domestic opposition.

Under what conditions, in fact, are governments in representative democracies most likely to be able to provide such policies? We argue that more centralized political institutions enable governments to adopt policies that promote lower levels of oil intensity that would tend to advance the overall interests of the state and society.⁹ Centralized political institutions are less likely to be constrained by special interests that would resist conservation policies. Of course, the institutions must also be democratic in character, as the theorized link between centralization

and energy conservation depends critically on the electoral connection. Autocrats would have no incentive to respond to the interests of citizens for public goods, although they may have their own reasons for reducing their countries' oil consumption. Because there is no systematic literature on the role of political institutions in shaping energy policy, we draw heavily on the broad political economy literature to develop our more specific hypotheses below.

A. Veto Players and Political Constraints

We focus our attention on the relationship between oil intensity and the number and diversity of policy-making veto players, which is perhaps the most general measure of political institutional centralization and constraint. The role of veto players in policy-making has been most thoroughly theorized by Tsebelis, who argues that as the number of individuals or institutions with veto power over policy increases, the likelihood of policy change declines.¹⁰ The logic is straightforward. When more political actors must agree to a policy reform, the probability of one of them preferring the status quo and thus blocking change increases. This effect should be particularly likely when the relevant veto players are ideologically diverse, as in divided or coalition government.

The importance of veto players to policy stasis has been tested across a wide variety of policy arenas, with broad empirical support. For example, in the trade literature, Henisz and Mansfield find that the effect of deteriorating macroeconomic conditions on trade openness is mediated by the number of a country's veto players.¹¹ Similarly, Haggard and Kaufman argue that economic reform will be harder in transitional democracies with fragmented and polarized party systems, and Hallerberg finds that states with more veto players (i.e., federal, multiparty systems) are less able to use independent monetary and fiscal policies effectively.¹² In addition,

Spruyt has shown that the difficulty or ease of decolonization was greatly determined by the number of veto players in the governments of the former imperial powers, and a number of authors in the budgetary politics literature have found a robust and significant link between the size of government coalitions in parliamentary systems and the ability to rein in deficit spending.¹³

Theoretically, we expect that countries with fewer and less diverse veto players will be more likely to adopt policies that successfully reduce oil consumption and intensity. In countries with multiple, diverse veto players, the incentives to improve efficiency provided by concerns about the price and availability of oil are less likely to be transformed into successful conservation policies because status quo interests that would be harmed are more likely to obstruct policy change.

H6: Democracies with fewer and less diverse veto players (i.e., fewer political constraints) will be more likely to reduce oil intensity.

B. Other Political Institutions

For robustness, we also examine the possible impact of three other particular types of national institutions that have been studied in the wider political economy literature: electoral systems, party organization, and legislative-executive relations. These institutions are, of course, among the components of the veto player concept (although not necessarily of the *Political Constraints* variable that we use to operationalize the concept). Our broad intuition is that, when these democratic institutions are more centralized, governments will be better able to introduce policies that reduce oil intensity.

1. Electoral Systems

We begin with electoral systems, which play a key role in the process of interest representation. The basic argument here is that the broader and more diverse the set of interests an elected official must represent, the more likely she is to support policies that provide public goods. By contrast, the more decentralized and fragmented the interests that she represents, the more likely she will be to advocate for local, private goods. We derive this argument primarily from the literature on trade policy, where a number of studies have found an association between electoral district size and open trade. Rogowski's approach to the question is particularly relevant for our purposes.¹⁴ In his analysis of OECD countries, Rogowski argued that democracies that are more dependent on trade generally choose large, proportional electoral districts as opposed to small, single-member districts. This is because, for Rogowski, the lobbying power of concentrated protectionist interests will be greatly increased in small, single member electoral districts. By contrast, providing public goods, such as free trade, may be a more efficient way to ensure reelection in larger, proportional districts, where the collective interest more closely approximates the national interest in free trade.¹⁵

A number of other scholars have found support for the role of constituency size in trade policy outcomes, although some, more recently, have not.¹⁶ This disagreement notwithstanding, there is ample reason to believe that the argument may apply equally well to oil intensity. In this scenario, the collective interests of larger, proportional electoral districts would better approximate the national interest in reducing energy intensity, whereas particularistic interests that oppose reductions would have significant lobbying power in smaller districts. This argument leads us to our fifth hypothesis:

H7: Democracies with larger, proportional electoral districts will be more likely to reduce oil intensity.

2. Party Organization

Even in electoral systems that foster the fragmentation of interest representation through the use of small, single member electoral districts, this tendency can be counteracted by the institutional characteristics of political parties. In particular, the stronger a political party is, the better able it is to aggregate interests and, when in power, to provide public goods.

The systematic study of party organization and public policy is relatively new in the political economy literature. It received a significant boost when Carey and Shugart developed a way to measure an individual legislator's "incentive to cultivate a personal vote" rather than follow the policies of national party leaders, based on such factors as party nomination power and electoral system characteristics.¹⁷ Since the publication of this measure, at least three scholars have used various applications of it to examine the provision of public policies. Nielson examined 18 developing countries and found that centralized parties (which rein in the personal vote) are more likely to liberalize their trade policies.¹⁸ Similarly, Hallerberg and Marier identified an association (mediated by executive strength) between centralized parties and balanced budgets in Latin American democracies.¹⁹ And Hankla expanded the analysis to 81 developed and developing democracies and also found support for the relationship between centralized parties and freer trade.²⁰ The logic of these three arguments is similar: centralized party leaders have an incentive to provide public goods because of their national constituency, whereas individual legislators have a greater incentive to provide private goods. As a result,

when central party leaders are empowered and individual party members are constrained, the provision of public goods such as free trade or balanced budgets becomes more likely. We apply this logic directly to reductions in oil intensity:

H8: Democracies with more centralized parties will be more likely to reduce oil intensity.

3. Legislative-Executive Relations

We turn finally to possible links between legislative-executive relations and oil intensity. We assume that, among democracies, national executives will tend to have broad, national constituencies, whereas individual legislators will generally represent more particularistic interests.²¹ Therefore, we expect that when national decision-making is centralized in an executive, and when that executive is controlled by a single individual or party, the provision of public goods, such as lower oil intensity, will be easier.

This expectation is supported by numerous findings in the political economy literature. In his examination of Latin American countries, for example, Nielson finds that delegation to presidents is associated with lower tariffs.²² Using a similar logic, Hallerberg and Marier and Franzese find that strong presidents are generally associated with more balanced budgets.²³ Haggard and Kaufman argue that, because of their relative insulation, strong executives can facilitate economic reforms in newly democratized countries, at least in the short run.²⁴ And scholars of the developmental state generally find that more insulated government institutions facilitate the disciplining of capital and labor necessary to promote the public's long term interest in economic growth.²⁵ Because executives, whether elected directly or by a parliament, have national or semi-national constituencies, they should be more insulated from interest group

pressure.

The well-developed literature on the role of executive preference and divided government on American trade policy outcomes arrives at similar findings. Keech and Pak demonstrate empirically that American Presidents, regardless of party, have advocated some degree of trade liberalization.²⁶ Moreover, a number of scholars have suggested that when Congress and the Presidency are controlled by different parties, there will be a protectionist bias in policy. This outcome could result from the reluctance of Congress to delegate “fast track” or trade promotion authority to a President of the opposing party.²⁷ As a result, Congress will retain greater control over trade and, because of its greater openness and proclivity to logrolling, protection will likely increase. While several scholars, most recently Karol, have questioned this argument, few have challenged the fundamental notion of the free-trading president.²⁸

The same general logic should apply to parliamentary systems. When coalition governments are in power, public goods should be in shorter supply than when single party governments hold sway. The budget literature on party fragmentation, discussed above with respect to veto players, has borne out this argument in a number of studies.²⁹ It is, however, important to realize that the precise nature of the relationship between unified government and public goods provision may vary between parliamentary and presidential systems, and so they should be analyzed separately.³⁰ These considerations suggest the following hypotheses:

H9: Presidential democracies will be more likely to reduce oil intensity under unified than under divided government.

H10: Parliamentary democracies will be more likely to reduce oil intensity under single-party than under coalition government.

IV. Statistical Analysis

A. Model

We ask how well the various factors identified above can explain longitudinal and cross-national variations in oil intensity. We are especially interested in understanding how effectively different democracies have been able to reduce oil intensity after the first oil shock drove up the price of oil around the world and raised concerns about the security of oil supplies. To accomplish these goals, we analyze all democracies over the period 1974-2007, contingent on data availability.³¹ We begin our analysis in 1974 because it was only after the first oil shock that oil consumption became a major political issue. We make the assumption that the political, economic, and strategic pressure for oil conservation remained relatively constant during our period of analysis. While this is not strictly true, it would be difficult to operationalize the cross-temporal variation in pressure and, more to the point, the wide variety of conservation policies employed by the states could take anywhere from a few weeks (price incentives) to years (mileage standards) to manifest. As a result, a simple post-1973 additive model is the best option for testing our arguments.

To analyze our data, we make use of an error correction model, a very useful technique that is only now finding its way into the political science literature.³² Two factors motivate this choice, one econometric and the other theoretical. First, our dependent variable (Y), oil intensity, is non-stationary for the country-years we consider, exhibiting a downward trend for most countries. This non-stationarity presents a variety of complex estimation problems that are

most easily resolved by differencing our dependent variable. Second, the use of an error correction model allows us to distinguish between the short- and long-term effects of some of our independent variables (X) on the dependent variable. The coefficient of a differenced independent variable (diffX) estimates the effect of a change in that variable on a change in the dependent variable (diffY), a relationship that can be termed the short-run impact of X on Y. The coefficient of a non-differenced independent variable, by contrast, estimates the effect of the value of X on changes in Y, or, put differently, the variable's long run effect.

In the error correction model, then, our dependent variable becomes differenced oil intensity. Following the standard estimation for error correction models, we include the lagged level of the dependent variable in the estimation to control for the impact of the size of oil intensity on its change. We also include both the differenced and lagged non-differenced values of our economic independent variables on the right side of the equation. We do not, however, difference our political variables because they vary very little across time.

B. Operationalization of the Variables

1. Dependent Variables

We operationalize our primary dependent variable as the annual change in oil intensity (*Diff Oil Intensity*). It is calculated by dividing oil consumption (in metric tons) from the British Petroleum (BP) Statistical Review of World Energy by gross domestic product (in millions of constant 2000 US dollars) from the World Bank's World Development Indicators (WDI).³³ To test for robustness, we also make use of the annual change in a country's overall energy intensity (*Diff Energy Intensity*), which we expect to be influenced in similar ways by the economic, structural, and political variables, as a dependent variable. Indeed, energy intensity in the OECD

countries has also declined more or less steadily since 1973, although by only about two-thirds as much as has oil intensity. We calculate this variable from data for primary energy consumption (in the same units) from BP and GDP per capita data (in millions of constant 2000 US dollars) from the World Bank. Overall energy consumption, of course, includes not only oil but also other fossil fuels, nuclear power, and renewable sources of energy. If our independent variables prove to be significant across both operationalizations, we will have even stronger evidence in support of our arguments.

2. Economic and Structural Variables

To measure the price of oil, we use data from BP for crude oil prices per barrel in constant U.S. dollars. We expect both the lagged and differenced oil price variables (*Lag World Price* and *Diff World Price*) to have a negative association with oil intensity.³⁴

We take all of our remaining economic and structural variables from the World Bank.³⁵ We measure the long-term effects of increasing income on oil intensity using the lagged natural log of GDP per capita and the lagged squared natural log of GDP per capita in constant dollars (*Lag lnGDPpc* and *Lag SqrtlnGDPpc*). We difference these variables to capture the short-term effects of growing income (*Diff lnGDPpc* and *Diff SqrtlnGDPpc*).³⁶ As noted in H1, we expect increases in the level of GDP per capita to have a positive effect on oil intensity for less developed countries and a negative effect for developed countries.³⁷ Similarly, to measure the effect of sectoral composition on oil intensity, we use measures for the share of gross national income attributable to industry (*Lag Percent Industry*) and agriculture (*Lag Percent Agriculture*), using the service sector as the reference category. We expect oil intensity to increase with industry share in particular, and also probably with agricultural share. We include both the

lagged and differenced values of both variables in the model.

To measure the long-term impact of population concentration on oil intensity, we use overall population density (*Lag Pop Density*), or the average number of people per square kilometer. Other things being equal, lower population densities mean a greater need for transportation. We use differenced population density (*Diff Pop Density*) to capture the short-term impact of increasing population density (identical to population growth in the absence of territorial acquisition or loss) on oil intensity.

Next, we seek to control for the share of oil produced domestically. Because data on oil production are not available for many of our cases, we use as a proxy intensity of energy production (total domestic energy production in metric tons of oil equivalent divided by gross domestic product in millions of constant 2000 US dollars). We expect overall energy production to correlate with oil production and thus for oil intensity to increase as intensity of energy production goes up, other things being equal. As usual, we include both lagged and differenced values of the variable in the model. Finally, to control for cultural factors and for the regional dissemination of ideas, we include dummy variables for North and Central America, South America, Oceania, Eastern Europe, the Middle East and North Africa, Sub-Saharan Africa, and Asia, with Western Europe as our omitted variable.³⁸ These regional dummies can also be used to control for the possible effects of European Union membership, although the overlap between the EU and the Western Europe dummy is imperfect. Basic data relating to the economic and structural control variables can be found in Table 1.

3. Political Variables

We evaluate our primary political hypothesis, the relationship between veto players and oil

intensity, using the fifth political constraint variable developed by Henisz.³⁹ This variable provides an aggregate measure of the degree to which the formation of policy is constrained by (1) the presence of multiple veto gates, including the executive, two possible chambers of the legislature, the judiciary, and sub-federal units and (2) the control of these veto gates by ideologically dissimilar parties. Political systems with more veto gates, as well as those systems where veto gates are controlled by more ideologically heterogeneous parties, will score higher on the variable (*Political Constraints*), which can range between “0” and “1”.

To operationalize party organization, we make use of the data set developed by Hankla, which is based on Carey and Shugart’s ballot variable.⁴⁰ Our variable *Party Decentralization* is coded “1” when party leaders have little influence over legislative candidate selection (as in primary systems), and “0” when their influence is significant. Control over the ballot is among the most important sources of party centralization.

We operationalize our remaining political variables using the Database of Political Institutions (DPI).⁴¹ To measure electoral district size and proportionality, we use the *HouseSys* variable, which is coded “1” when the majority of seats in a country’s lower house are elected by plurality vote, “0” when they are elected under proportional representation, and “0.5” when seats are evenly divided between the two. To test our theoretical expectations linking centralized, executive decision-making with lower oil intensity, we create dummy variables for divided presidential government (*Divided Pres Govt*), unified presidential government (*Unified Pres Govt*), and coalition parliamentary government (*Coalition Parl Govt*). These variables are based on the interaction of DPI’s *AllHouse* dummy, coded “1” when the party of the executive controls all relevant legislative houses, with DPI’s *System* variable, coded “1” for presidential governments.⁴² Our omitted variable is of course majoritarian parliamentary systems.

We estimate one set of regressions for the veto player (*Political Constraints*) models, and another for the models evaluating the other political institutions. This approach is reasonable because the *Political Constraints* variable encompasses many of the more specific political institutions that we are considering. To estimate these models, we use random effects regression, a technique that allows us to consider the panel structure of the data in both our point estimates and our standard errors, but which is also compatible with our often time-invariant political variables. We also make use of fixed effects regression to verify the robustness of our veto player models, as there is sufficient temporal variation present. Summary statistics for our variables are reported in Table 1.

Table 1 about here

V. Results

Table 2 presents the results of our models. In it, we report three *Political Constraints* models (random and fixed effects models with *Diff Oil Intensity* as the dependent variable and a random effects model with *Diff Energy Intensity* as the dependent variable) and two models testing our additional political variables (a random effects model with *Diff Oil Intensity* as the dependent variable and another using *Diff Energy Intensity*). The results provide strong support for our primary political hypothesis (H6) – that, in the post 1973 world, democracies with fewer veto players have been better able to reduce their dependence on oil. The variable *Political Constraints* is significant at the 1% level for our primary oil intensity model with random effects and at the 5% level for both the oil intensity fixed effects and the energy intensity models. Its

effect is also substantively important, leading to an increase in oil intensity of about 9 metric tons of oil per million dollars across its range, just over half a standard deviation.

Table 2 about here

The results also provide support for most of the economic hypotheses that we identified in the theory section. In both of the oil intensity models, higher oil prices reduce oil consumption as expected in H1, although surprisingly the effect seems to be primarily a long run effect (as evidenced by the insignificance of differenced price). By contrast, the price variables are insignificant in the energy intensity models, perhaps because higher oil prices may both lead countries to consume more of other types of energy and dampen economic activity, with a net neutral effect on overall energy intensity.

As expected, in two of the three models, higher levels and faster growth of domestic energy production are associated with greater oil and energy intensity; in only one model are the effects not statistically significant. This finding indicates that states that can produce more of their own energy have fewer incentives to conserve, probably because they face fewer of the security externalities that arise from import dependence. There is also evidence that, as agriculture and especially industry give way to services in modern democracies, oil and energy intensity decline. This effect is stronger with the differenced variables, suggesting that it is a short term relationship that is more determined by shifts in economic structure than by the long term make-up of an economy. Turning to the population density variables, growth in population density (equivalent to population growth in the absence of territorial change) is associated, as expected, with reductions in oil and energy intensity.

In our primary model, oil intensity with random effects, higher levels of GDP per capita are significantly associated with increases in oil intensity whereas higher levels of squared GDP per capita are associated with decreases. This finding, also strongly present in our primary model testing the additional political variables, is in keeping with H2, which predicts that national income should have a curvilinear effect on oil consumption. In other words, we find evidence here that poorer countries in their early phases of growth use more oil, whereas richer countries, as they become even richer, find new ways to conserve. In the remaining models, it is the differenced GDP per capita variables that are significant, indicating that fast growth is associated with less efficiency and slow growth with more. This finding is compatible with the previous one as developing democracies tend to experience more rapid changes in GDP growth than richer democracies.

Turning now to the models testing our additional political variables, we find support for the hypothesized relationship (H8) between party decentralization and higher oil intensity. The *Party Decentralization* variable is strongly significant (at the 1% level) in our primary oil intensity model, with the predicted effect substantively important. Democracies with decentralized parties will, on average, see greater reductions in oil intensity by over one-third a standard deviation. We do not, however, find support for the *Party Decentralization* variable in our energy intensity robustness test, calling into question the robustness of the relationship.

The results for the divided presidential government (*Divided Pres Govt*), unified presidential government (*Unified Pres Govt*), and coalition parliamentary government (*Coalition Parl Govt*) dummies indicate that single party control of the legislature has no significant effect on oil intensity in parliamentary systems. Moreover, presidential systems with divided governments are found to be more inclined to conservation than other types of systems. These

surprising findings are less robust than our findings for *Political Constraint*, however, as they are significant in the primary oil intensity model but not in the energy intensity model.

Finally, we find no evidence to support the hypothesized relationship between electoral proportionality and energy conservation (H5), with the *HouseSys* variable insignificant in both models. Future research could usefully try a wider variety of indicators, but, as noted before, the precise effects of the electoral system in other policy areas have been controversial. The results for our control variables in the additional political models generally accord with the results of the *Political Constraints* models.

VI. Conclusion

Because the level of oil consumption and energy consumption more generally can have important economic, environmental, and security implications for states, it is important to understand their determinants. We have examined the relationship between national political institutions and oil intensity in democracies. In particular, we have tested the argument that more centralized political institutions have made it easier for democratic governments to reduce levels of oil intensity since the 1973-1974 oil crisis caused prices to jump dramatically and raised questions about the security of oil supplies.

We have found that the most comprehensive measure of political institutional centralization, veto players, has a significant effect. Lower levels of political constraint are significantly associated with larger decreases in oil and energy intensity. Alternative political institutional variables yield mixed results. Our measure of the decentralization of political parties is significant in the expected direction, suggesting that democracies with more centralized

parties have an easier time implementing policies that lower oil consumption. By contrast, we find no relationship between oil intensity and electoral system structure, a variable that has been questioned as a determinant of other policy outcomes but which we believe requires more testing before we can definitely reject it as a factor in energy policy. Finally, our interactive measure of the centralization of power in the executive produced the surprising result that divided presidential systems are more likely to reduce oil intensity than other types of systems, although the effect is not as robust as that of veto players.

Overall, these results provide further confirmation of the link between political institutions and cross-national differences in public goods provision. Most of the research making this connection has developed in isolation, with trade politics scholars, budgetary politics scholars, and others producing arguments broadly independent of one another. We extend these arguments to an understudied but important policy arena. More than that, however, this article demonstrates the usefulness of crossing sub-field boundaries to expand our understanding of how political institutions factor into public policy.

At the same time, our results leave unclear the precise mechanisms through which centralized political institutions foster the adoption of policies that result in lower levels of oil intensity in particular, and thus indicate the need for further investigation of these processes. Some answers may come from the development of better empirical measures of the different dimensions of democratic centralization explored here. But greater attention to the operation of party, electoral, and policy-making institutions and how they may vary across democracies and across issue areas is also merited. Likewise, we are unable to identify the effects and effectiveness of different types of policies for reducing oil intensity and the conditions, political or otherwise, that favor or militate against their adoption. Given the particular methods

employed here, policy choices are endogenous to the analysis. More fine-grained statistical techniques, involving the collection of detailed data on policy choices, or in-depth case study analysis will be necessary to shed light on these important issues.

From a more practical perspective, this study also helps to identify the potential opportunities for and constraints on efforts aimed at increasing economic efficiency, protecting the environment, and promoting national security through energy policy in the future. The advanced industrialized (OECD) democracies continue to account for more than 50 percent of the world's energy consumption, and some 85 percent of the energy they use still comes from fossil fuels.⁴³ Yet their incentives to reduce the use of oil and other fossil fuels are perhaps greater than ever. Over the past decade, the price of oil, still the most widely used single energy source, has sustained its largest increase, in both absolute and percentage terms, since World War II. Over the same period, prices for natural gas, the second most important fuel, have also risen substantially.⁴⁴ Meanwhile, the advanced industrialized countries have come to depend increasingly on oil and gas imports from unstable or potentially hostile countries. And concern about the negative environmental consequences of burning fossil fuels, especially climate change, has reached unprecedented levels.

Some reductions in fossil fuel consumption have already come about simply as a result of higher prices and the heightened concerns of individuals about the negative environmental and security externalities of energy use. But national policies will continue to play an important role in promoting conservation and energy efficiency. As this study has shown, however, how successful democracies can be at using policy to reduce energy consumption and intensity will depend in part on their political institutions. As a general rule, those with less centralized political institutions, especially in the form of larger numbers of more ideologically diverse veto

players, will find it more difficult to take strong measures.

Indeed, there is some recent evidence to support this generalization. Of the largest advanced industrialized democracies, France and the United Kingdom arguably enjoy the most centralized political institutions. And in the last several years, first France and then the UK have developed comprehensive national energy policies.⁴⁵ In contrast, the United States, where political authority is more diffuse, has thus far seen only piecemeal, and relatively limited, legislative efforts to address high energy prices, concerns about climate change, and dependence on foreign oil.⁴⁶ Of course, it would be inappropriate to draw definitive conclusions from such limited observations. And the differences in the degree of political constraint are not so great as to ensure that these countries are fated to follow completely different policy paths. But it does suggest that efforts to promote greater energy efficiency and conservation through policy will face greater obstacles in some countries than others because of the relative efficiency of their political institutions.

Table 1: Summary of the Variables

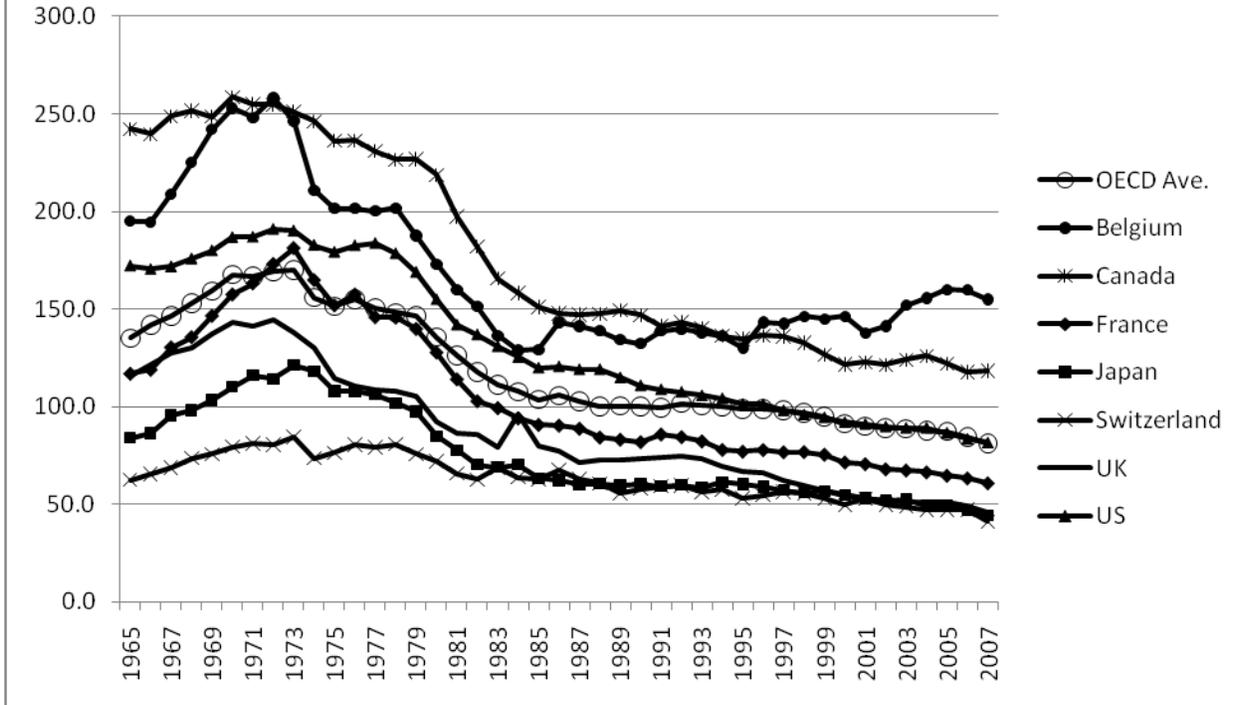
| Variable | Range (Min-Max) | Mean | St. Dev. | Expected Effect on Y |
|----------------------------|------------------------|-------------|-----------------|-----------------------------|
| Diff Oil Intensity | -375 to 45.7 | -2.95 | 16.9 | N/A |
| Diff Energy Intensity | -384 to 269 | -5.08 | 35.9 | N/A |
| Lag Oil Intensity | 47.1 to 1598 | 143 | 92.9 | Negative |
| Lag Energy Intensity | 105 to 4560 | 388 | 474 | Negative |
| Political Constraints | 0 to .894 | .713 | .153 | Positive |
| Unified Pres Govt | 0 or 1 | .509 | .500 | Uncertain |
| Divided Pres Govt | 0 or 1 | .171 | .377 | Positive |
| Coalition Parl Govt | 0 or 1 | .212 | .409 | Positive |
| HouseSys | 0 or 1 | .373 | .482 | Positive |
| Party Decentralization | 0 or 1 | .218 | .413 | Positive |
| Diff World Price | -27.0 to 47.7 | .822 | 11.1 | Negative |
| Lag World Price | 17.3 to 96.6 | 38.9 | 19.0 | Negative |
| Diff Energy Production | -209 to 227 | -1.88 | 30.6 | Positive |
| Lag Energy Production | 5.97 to 2559 | 352 | 434 | Positive |
| Diff Percent Industry | -12.5 to 13.8 | -.245 | 1.65 | Positive |
| Lag Percent Industry | 19.9 to 60.6 | 32.6 | 6.13 | Positive |
| Diff Percent Agriculture | -7.72 to 10.4 | -.279 | .941 | Positive |
| Lag Percent Agriculture | .963 to 38.0 | 7.75 | 7.07 | Positive |
| Diff Pop Density | -1.50 to 21.5 | 1.05 | 2.71 | Negative |
| Lag Pop Density | 1.83 to 1156 | 133 | 161 | Negative |
| Diff lnGDPpc | -.172 to .150 | .020 | .033 | Uncertain |
| Lag lnGDPpc | 5.39 to 10.6 | 9.00 | 1.22 | Positive |
| Diff SqrtlnGDPpc | -2.76 to 2.52 | .366 | .550 | Uncertain |
| Lag SqrtlnGDPpc | 29.0 to 112 | 82.4 | 20.4 | Negative |
| North & Central America | 0 or 1 | .068 | .253 | Uncertain |
| South America | 0 or 1 | .126 | .331 | Uncertain |
| Oceania | 0 or 1 | .058 | .234 | Uncertain |
| Eastern Europe | 0 or 1 | .303 | .460 | Uncertain |
| Middle East & North Africa | 0 or 1 | .027 | .161 | Uncertain |
| Asia | 0 or 1 | .140 | .347 | Uncertain |
| Africa | 0 or 1 | .011 | .105 | Uncertain |
| Polity | 6 to 10 | 9.21 | 1.15 | N/A |

Table 2: Results of the Models

| Variables | Random Effects (Oil Intensity) | Fixed Effects (Oil Intensity) | Random Effects (Energy Intensity) | Random Effects (Oil Intensity) | Random Effects (Energy Intensity) |
|-----------------------|---------------------------------------|--------------------------------------|--|---------------------------------------|--|
| Lag Level of Y | -.141*** (.006) | -.234*** (.018) | -.056*** (.004) | -.201*** (.007) | -.043 (.005)*** |
| Political Constraints | 10.1*** (3.88) | 11.9** (5.87) | 16.3** (7.66) | | |
| Unified Pres Govt | | | | 1.71 (2.23) | .455 (5.24) |
| Divided Pres Govt | | | | -6.98*** (2.36) | -7.66 (5.58) |
| Coalition Parl Govt | | | | -0.822 (1.48) | -.408 (3.57) |
| HouseSys | | | | 1.77 (2.19) | 5.60 (4.81) |
| Party Decentral | | | | 5.59*** (2.13) | 3.17 (4.28) |
| Diff World Price | -.056 (.040) | -.038 (.040) | -.036 (.080) | -.001 (.036) | -.019 (.090) |
| Lag World Price | -.053* (.027) | -.071** (.030) | -.030 (.054) | -.081*** (.024) | -.002 (.060) |
| Diff Energy Prod | .023* (.013) | .014 (.015) | .245*** (.027) | .032** (.014) | .462*** (.035) |
| Lag Energy Prod | .007*** (.002) | -.002 (.005) | .012*** (.003) | .011*** (.002) | .026*** (.006) |
| Diff Percent Industry | .649** (.276) | .577** (.282) | 1.52*** (.554) | .071 (.243) | -.356 (.609) |
| Lag Percent Industry | -.055 (.114) | .078 (.151) | .024 (.221) | .201* (.117) | -.084 (.277) |
| Diff Percent Agric | .162 (.466) | .191 (.470) | 2.82*** (.937) | -.633 (.429) | 1.47 (1.08) |
| Lag Percent Agric | .335** (.168) | .151 (.228) | -.168 (.335) | .507** (.200) | -.649 (.475) |
| Diff Pop Density | -.936** (.460) | 1.20 (1.08) | -1.43 (.941) | -1.62*** (.556) | -1.62 (1.27) |
| Lag Pop Density | .006 (.008) | .014 (.041) | .017 (.015) | .009 (.010) | .031 (.021) |
| Diff lnGDPpc | -187 (118) | -285** (122) | -709*** (231) | -291*** (99.9) | -1863*** (246) |
| Lag lnGDPpc | 35.6*** (9.17) | 15.2 (26.2) | -8.12 (18.2) | 49.0*** (11.7) | -.610 (27.1) |
| Diff SqrtlnGDPpc | 9.55 (6.90) | 13.9* (7.11) | 37.2*** (13.6) | 13.8** (5.82) | 101*** (14.4) |
| Lag SqrtlnGDPpc | -2.34*** (.515) | -1.92 (1.36) | -.075 (1.01) | -3.26*** (.656) | -0.621 (1.50) |
| Regional Dummies | Yes | Dropped | Yes | Yes | Yes |
| N | 985 | 985 | 985 | 929 | 929 |
| R2 | .455 | .293 | .424 | .513 | .378 |

***p<.01, **p<.05, *p<.10 All tests are 2-tailed. Standard errors are in parenthesis.

Figure 1
Oil Intensity for Select OECD Countries
 (Metric Tons/\$1,000,000)



Sources: BP, *BP Statistical Review of World Energy 2009* (London: BP, 2009); World Bank, *World Development Indicators* (Washington, DC: The World Bank, 2009).

NOTES

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¹ BP, *BP Statistical Review of World Energy 2009* (London: BP, 2009), available at <http://www.bp.com/productlanding.do?categoryId=6929&contentId=7044622> (accessed Sept. 2, 2009).

² For examples, see John S. Duffield, *Over a Barrel: The Costs of US Foreign Oil Dependence* (Palo Alto: Stanford University Press, 2008).

³BP.

⁴ As we discuss in more detail below, theoretical and econometric reasons lead us to examine changes rather than levels of consumption.

⁵ Energy Information Agency, *Annual Energy Review 2008* (Washington, D.C.: Department of Energy, June 2009).

⁶ See Duffield.

⁷ G. John Ikenberry, "Market Solutions for State Problems: The International and Domestic Politics of American Oil Decontrol," *International Organization*, 42 (Winter 1988), 151-77.

⁸ International Energy Agency, *Energy Prices and Taxes: Quarterly Statistics* (various issues).

⁹ One caveat is that we focus here on the centralization of political institutions at the national

level. Existing theory leaves open the possibility that the existence of strong sub-national governments may facilitate conservation, although this link has rarely been studied.

¹⁰ George Tsebelis, “Decision Making in Political Systems: Veto Players in Presidentialism, Parliamentarism, Multicameralism, and Multipartyism,” *British Journal of Political Science*, 25 (July 1995), 289-325, and George Tsebelis, *Veto Players: How Political Institutions Work* (Princeton: Princeton University Press, 2002).

¹¹ Witold J. Henisz and Edward D. Mansfield, “Votes and Vetoes: The Political Determinants of Commercial Openness,” *International Studies Quarterly*, 50 (March 2006), 189-211.

¹² Stephan Haggard and Robert R. Kaufman, *The Political Economy of Democratic Transitions*, (Princeton: Princeton University Press, 1995); Mark Hallerberg, “Veto Players and the Choice of Monetary Institutions,” *International Organization*, 56 (Autumn 2002), 775-802.

¹³ Hendrik Spruyt, *Ending Empire: Contested Sovereignty and Territorial Partition*, (Ithaca: Cornell University Press, 2005). For scholarship that focuses on deficits and veto players, see Alberto Alesina and Allan Drazen, “Why Are Stabilizations Delayed?” *American Economic Review*, 81 (1991), 1170-89; James E. Alt and Robert C. Lowry, “A Dynamic Model of State Budget Outcomes under Divided Partisan Government,” *Journal of Politics*, 62 (November 2000), 1035-70; Robert Franzese, *Macroeconomic Policies of Developed Democracies* (Ann Arbor: University of Michigan Press, 2002). For research in the common pooled resources school (which views deficits as a collective action problem) see, for example, Nouriel Roubini and Jeffrey Sachs, “Government Spending and Budget Deficits in the Industrial Countries,” *Economic Policy*, 8 (April 1989), 99-132.

¹⁴ Ronald Rogowski, “Trade and the Variety of Democratic Institutions,” *International Organization*, 41 (Spring 1987), 202-23.

¹⁵ See Mancur Olson, *The Logic of Collective Action: Public Goods and the Theory of Groups* (Cambridge: Harvard University Press, 1971).

¹⁶ For research that has found a relationship, see Robert E. Baldwin, *The Political Economy of US Import Policy* (Cambridge: MIT Press, 1985); Stephen Magee, William Brock, and Leslie Young, *Black Hole Tariffs and Endogenous Policy Theory: Political Economy in General Equilibrium* (New York: Cambridge University Press, 1989); Susanne Lohmann and Sharyn O'Halloran, "Divided Government and US Trade Policy: Theory and Evidence," *International Organization*, 48 (Autumn 1994), 595-632. For dissenting voices, see Sean Ehrlich, "Constituency Size and Support for Trade Liberalization: An Analysis of Foreign Economic Policy Preferences in Congress," *Foreign Policy Analysis*, 5 (July 2008), 215-32; David Karol, "Does Constituency Size Affect Elected Officials' Trade Policy Preferences?" *Journal of Politics*, 69 (May 2007), 483-94. Rogowski, in his more recent work, has also questioned the relationship. See Ronald Rogowski and Andreas Kayser, "Majoritarian Electoral Systems and Consumer Power: Price-Level Evidence from the OECD Countries," *American Journal of Political Science*, 46 (July 2002), 526-39.

¹⁷ John M. Carey and Matthew Soberg Shugart, "Incentives to Cultivate a Personal Vote: A Rank Ordering of Electoral Formulas," *Electoral Studies*, 14 (December 1995), 417-39.

¹⁸ Daniel L. Nielson, "Supplying Trade Reform: Political Institutions and Liberalization in Middle-Income Presidential Democracies," *American Journal of Political Science*, 47 (July 2003), 470-91.

¹⁹ Mark Hallerberg and Patrik Marier, "Executive Authority, the Personal Vote, and Budget Discipline in Latin American and Caribbean Countries," *American Journal of Political Science*, 48 (July 2004), 571-87.

²⁰ Charles R. Hankla, “Party Strength and International Trade: A Cross National Analysis,” *Comparative Political Studies*, 39 (2006), 1133-56.

²¹ The degree to which this assumption is accurate will depend on characteristics of the electoral system and political parties, some of which we examine separately above. Nevertheless, it is fair to say that executives will tend to consider the national interest more than legislatures, which generally represent aggregated local interests.

²² Neilson.

²³ Hallerberg and Marier; Franzese.

²⁴ Haggard and Kaufman.

²⁵ See Peter Evans, *Embedded Autonomy: States and Industrial Transformation* (Princeton: Princeton University Press, 1995); Atul Kohli, *State-Directed Development: Political Power and Industrialization in the Global Periphery* (New York: Cambridge University Press, 2004); Robert Wade, *Governing the Market: Economic Theory and the Role of Government in East Asian Industrialization* (Princeton: Princeton University Press, 2003).

²⁶ William R. Keech and Kyoungsan Pak, “Partisanship, Institutions, and Change in American Trade Politics,” *The Journal of Politics*, 57 (November 1995), 1130-42.

²⁷ Lohmann and O’Halloran; Sharyn O’Halloran, *Politics, Process, and American Trade Policy* (Ann Arbor: The University of Michigan Press, 1994).

²⁸ David Karol, “Divided Government and U.S. Trade Policy: Much Ado About Nothing?” *International Organization*, 54 (Autumn 2000), 825-44.

²⁹ Roubini and Sachs; Hallerberg and von Hagen; Bjørn Volkerink and Jakob de Haan, “Fragmented Government Effects of Fiscal Policy: New Evidence,” *Public Choice*, 109 (December 2001), 221-42; Yianos Kontopoulos and Roberto Perotti, “Government

Fragmentation and Fiscal Policy Outcomes: Evidence from OECD Countries,” in Poterba and von Hagen, eds., pp. 81-102.

³⁰ See Charles R. Hankla, “Fragmented Legislatures and the Budget: Analyzing Presidential Democracies,” paper presented at the annual convention of the American Political Science Association, Toronto, September 2009.

³¹ To limit our observations to democracies, we include only those country-years coded above “5” in the Polity IV dataset. See Monty G. Marshall and Keith Jaggers, *Polity IV Project: Political Regime Characteristics and Transitions, 1800-1999, Dataset Users Manual* (College Park: University of Maryland, 2000). Each of our models includes 47 democracies.

³² For more on error correction models, see Badi H. Baltagi, ed., *Nonstationary Panels, Panel Cointegration, and Dynamic Panels* (New York: Elsevier Science, 2000); Anindya Banerjee, Juan J. Dolado, John W. Galbraith, and David F. Hendry, *Co-Integration, Error Correction, and the Econometric Analysis of Non-Stationary Data* (New York: Oxford University Press, 1993).

³³ BP; World Bank, *World Development Indicators* (Washington, DC: The World Bank, 2009).

³⁴ We also estimate the models lagging the price variables two years to control for possible endogeneity, and it does not significantly affect the results for the political variables.

³⁵ World Bank.

³⁶ Because logging a squared variable produces a number that is exactly twice the value of the log of the unsquared variable (presenting a collinearity problem), we were unable simply to log unsquared and squared GDP per capita. Instead, we generated the variables by first logging GDP per capita and then squaring and differencing the logs. Including the unlogged GDP per capita variables in the models as a substitute does not, however, have a significant impact on the results of the political variables of interest.

³⁷ The expectations for differenced GDP per capita are more ambiguous, but we model both the unsquared and squared terms for completeness.

³⁸ Two of these regional dummies are coded “1” in our models only for a single country: the African Dummy for South Africa and the Middle East/North African Dummy for Turkey. The results on the political variables are robust to including or to excluding these two dummies from the model.

³⁹ Witold J. Henisz, *Political Constraints Dataset and Codebook* (2003), available at <http://www-management.wharton.upenn.edu/henisz/>.

⁴⁰ Hankla 2006; Carey and Shugart.

⁴¹ Thorsten Beck, George Clarke, Alberto Groff, Philip Keeper, and Patrick Walsh, “New Tools in Comparative Political Economy: The Database of Political Institutions,” *World Bank Economic Review*, 15 (September 2001), 165-76.

⁴² To simplify the analysis, we have recoded the System variable (which takes on three values in the DPI) into a dummy variable by pooling assembly elected presidential systems with other forms of presidentialism.

⁴³ BP.

⁴⁴ Energy Information Agency 2009.

⁴⁵ French policy is detailed in Nicole Fontaine, “Livre blanc sur les energies” (White Paper on Energy) (November 7, 2003), available at <http://www.developpement-durable.gouv.fr/energie/politiqu/pdf/livre-blanc-integral.pdf>, and “Loi de programme fixant les orientations de la politique énergétique” (July 13, 2005), available at http://www.ecologie.gouv.fr/IMG/pdf/Loi_Energie.pdf. British policy is presented in Department of Trade and Industry, “Meeting the Energy Challenge: A White Paper on Energy

Policy” (May 2007), available at <http://www.berr.gov.uk/files/file39387.pdf>.

⁴⁶ In mid-2009, the U.S. House of Representatives approved ambitious legislation to establish a cap-and-trade program for greenhouse gas emissions, but as of December 2009, its fate in the Senate was still uncertain. For a description of the legislation, see U.S. House of Representatives, Committee on Energy and Commerce, *The American Clean Energy and Security Act (HR. 2454)* (July 24, 2009), available at http://energycommerce.house.gov/Press_111/20090724/hr2454_housesummary.pdf (accessed Oct. 26, 2009).