Political Economic Determinants of Petroleum Subsidies

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Abstract:

Why do countries subsidise fossil fuel? What determines the level of petroleum subsidies? This article identifies structural, political, and economic determinants of petroleum subsidies using a panel dataset (N=60, T=20). The findings suggest that, contrary to conventional wisdom, regime type (democracy or autocracy) has no explanatory power controlling for resource endowments and development level. Similarly, party ideology (left or right) has no explanatory power when it comes to petroleum subsidies. I argue that the theory of veto players has more explanatory power for policy change than simplistic notions of regime type and party ideology. Furthermore, administrative capacity and quality of bureaucracy of the state plays a significant role in explaining the presence of petroleum subsidies controlling for other factors. The results also show that international institutions and level of globalisation play an important role in inducing countries to reduce or phase out subsidies and encourage them to tax petroleum appropriately.

Keywords: fuel subsidies, globalisation, energy governance, institutions, quality of government, democracy, autocracy, party ideology

JEL Classification: D7, N7, O57, Q4

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Introduction

There is almost a universal consensus that fossil fuel subsidies are harmful to the environment, economy, and fiscal resources of a country. First, fossil fuel subsidies encourage wasteful consumption of energy resources and are counterproductive to climate change mitigation policies. Second, fuel subsidies create distortions in the market instead of reaching to their purported target group - poor households in this case. Finally, fuel subsidies are a burden on fiscal resources of countries, both net importers as well as net exporters, particularly when international oil prices are higher. The International Monetary Fund (IMF) estimates the post-tax energy subsidy incidence at 1.8 per cent of world GDP or roughly USD 1.3 trillion (Ian, Dirk, Eliza, & Shanjun, 2014). The International Energy Agency (IEA) estimates that every ton of carbon emitted in the atmosphere receives USD 110 as government support worldwide (IEA, 2013).

By phasing out fossil fuel subsidies, governments can enhance the effects of their climate change mitigation policies, reduce their fiscal burdens, and in certain cases may channel the saved amounts to subsidise renewable and efficient energy technologies as well as targeted programs for the poor households. From an international cooperation perspective, phasing out fossil fuel subsidies is the least contentious issue on the international energy and climate cooperation agenda (Keohane & Victor, 2013; OECD, 2013). The member countries of the G20, IEA, Organization for Economic Cooperation and Development (OECD) and those under the IMF and World Bank credit programmes, all have pledged to phase out or 'rationalise' fossil fuel subsidies (Coady et al., 2010; G20, 2009). However, governments across the world continue to subsidise fossil fuels, particularly petroleum products. Countries either have not tried to phase out subsidies or have failed to do so for various reasons (Coady et al., 2010; IEA, OECD, OPEC, & World-Bank, 2011). In an

IMF study, Ian et al (2014) further argue that even those countries which appear to tax petroleum are not taxing it to the amount which h incorporates the actual social cost of environmental damage.

Why do countries subsidise petroleum? The most common narrative is that resource rich countries with autocratic regimes subsidise petroleum in order to share economic rents with their citizens (Acemoglu, 2001; Cheon, Lackner, & Urpelainen, 2015; Karl, 1997; Keen, 2012; Overland, 2010; Victor, 2009). Also, fuel subsidies serve as payments for gaining political support because resource rich countries are prone to conflict between competing groups (Acemoglu, 2001; Collier & Hoeffler, 2004; Fearon, 2005). This is in line with overall redistribution policies that governments use to satisfy demands from various constituencies using regulation, taxes, and subsidies (Bernauer & Caduff, 2004; Blais, 1986; Buchanan & Tullock, 1975; Harris & Milkis, 1989; Hood, James, & Scott, 2000; Le Maux, xee, Rocaboy, & Goodspeed, 2011; Stigler, 1971; Wasserman, 1999).

Nevertheless, the variations in petroleum prices across countries are so great that it requires more nuanced explanations. For example, even within the autocratic resource rich countries gasoline price per litre in 2012 constant USD terms ranged from 0.02 in Venezuela to 0.5 in the United Arab Emirates (GIZ, 2011). This is a difference of 25 times. More importantly, the data shows that developing and even poor countries, lacking energy resources and with democratic regimes, keep petroleum prices artificially low either through direct subsidies or taxing petroleum less than their peers and other products. For example, tax on per litre of gasoline in 2012 was USD 0.25 in India and 0.15 in Pakistan, both resource poor and democratic countries at that time.

Furthermore, there is no consensus on theorizing about the relationship between regime type and fuel subsidies either, what Victor (2009) calls 'populist paradox'. Scholars are divided on the

question whether democracies facing popular vote are inclined to keep petroleum prices low or autocratic regimes facing existential threats are more prone to providing subsidies (Cheon et al., 2015; Overland, 2010). Overland (2010), for example, expects non-democracies to be more able to phase out subsidies but argues that for democracies it shall be relatively easier. Overland's argument, however, is counter intuitive as the literature in policy sciences and the theory of veto players suggest that changing any policy in a democracy is relatively difficult (Tsebelis, 2002). Cheon et al. (2015) contend that autocratic regimes, particularly those lacking administrative capacity, tend to subsidise petroleum more, nevertheless, democracies offer subsidies as an expedient political tool.

Moving away from the regime type, the question that if party ideology (left or right) matters, when it comes to fuel subsidies, has not received much attention in the literature. On a general level, the median voter theorem and convergence literature suggest that the ideology of the party in government matters little (Downs, 1957; Holzinger & Knill, 2005; Howlett & Ramesh, 2006; Jensen, 2010; Knill, 2005; Thomas, 1980). However, some scholars continue to contend that partisan politics matters (Imbeau, Pétry, & Lamari, 2001; Milner & Judkins, 2004; Tavares, 2004; Zahariadis, 1997). For example, Milner and Judkins (2004) finds that right parties favour free trade more than left parties. Similarly, Tavares (2004) finds that left parties cut budget deficits by raising taxes while right parties tend to cut spending. Zahariadis (1997) finds empirical evidence that the left parties offer more subsidies in general.

From an administrative perspective, other scholars argue, that subsidies offer an easy albeit expensive policy instrument for achieving social goals. Victor (2009, p. 7) argues that "a subsidy is a readily available mechanism for governments (or their agents, such as state oil companies) and requires very little administrative capability". Countries lacking institutional capacity subsidise

petroleum more because of a lack of sophisticated bureaucracy that can implement targeted programs. The IMF and World Bank studies reach to similar conclusions (IMF, 2013; Vagaliasindi, 2013). However, empirical tests by Cheon, Urpelainen, and Lackner (2013) show weak or inconclusive evidence. Another empirical study shows that regardless of regime type and institutional capacity, countries with National Oil Companies (NOCs) are more prone to subsidising petroleum (Cheon et al., 2015) since NOCs provide "optimal obfuscation" particularly for forgone revenues (Kono, 2006).

So why do governments subsidise fossil fuels? More importantly what political economic factors determine the level of subsidies across countries over years? In this paper, I attempt to answer this question using a panel dataset (N=60, T=20). There have not been many studies that offer systematic explanations as to what structural and political economic factors facilitate or hamper attempts to phase out fuel subsidies. The two most comprehensive and latest studies by the IMF (2013) and World Bank (Vagaliasindi, 2013) assess 14 and 20 country cases respectively and furnish significant insights on the political economy of petroleum subsidies. The only large-N empirical study in my knowledge is by Cheon et al. (2013). However their study has two main shortcomings; first they don't attempt to specify their dependent variable and use variations in gasoline prices as dependent variable which, secondly and more importantly their study suffers from omitted variable bias and measurement issues. By addressing those issues as well as including some important variables, this paper makes an important contribution to the literature on comparative political economy of petroleum subsidies.

My results show that contrary to prior findings and conventional wisdom, regime type is irrelevant in explaining the presence of petroleum subsidies controlling for other variables. Both,

autocracies and democracies subsidize petroleum. Similarly, party ideology has no explanatory power when it comes to petroleum subsidies. The left and right parties are equally inclined to subsidise petroleum (or not to tax appropriately). I argue that the theory of veto players has more explanatory power for policy change than simplistic notions of regime type and party ideology. Furthermore, administrative capacity and quality of bureaucracy of the state plays a significant role in explaining the presence of petroleum subsidies controlling for other factors. The results also show that international institutions and level of globalisation play an important role in inducing countries to reduce or phase out subsidies and encourage them to tax petroleum appropriately.

The rest of the article is organised as follows. The next section introduces the dependent variable, petroleum subsidies, and a detailed discussion on how to calculate them. debate around political economy of fuel subsidies. The third section introduces the The fourth section develops hypotheses along with a discussion of explanatory variables followed by a section on research methodology, model specification, and data. In the final section, I discuss the findings and their implications.

Petroleum Subsidies: The dependent variable problem

There are widespread disagreements on the definition of a subsidy and how to measure it (Blais, 1986; Cheon et al., 2015; GSI, 2010a, 2010b; Overland, 2010; Rubini, 2015). My working definition is that a subsidy is the positive difference between the ideal market determined price and the actual lower price as a result of any government policy, whether direct budgetary support, tax breaks, or price regulation. However, identifying and measuring subsidies is a major problem, since governments use various policy instruments to provide subsidies, ranging from direct budgetary support to tax breaks to price regulation. For example, in order to arrive at an 'appropriate' price for

petroleum products, the Organisation of Petroleum Exporting Countries (OPEC) prefer a cost-recovery approach (IEA et al., 2011). In the cost-recovery method it is mainly the cost of producing the product and a subjectively defined premium for the depleting resource by that country. This approach does not put an "appropriate" price for the resource itself but only the production cost. The International Energy Agency (IEA) uses a price-gap approach. In the price-gap approach, the domestic fuel prices are subtracted from the prices at the nearest international hub and adjusted for transportation costs (Coady et al., 2010; GSI, 2010b). The difference indicates presence of subsidy or taxes. In this case, the subsidy may not be a budgetary transfer from government to consumers but may be forgone taxes or revenues, that is, opportunity costs. The Organisation for Economic Cooperation and Development (OECD) has its own way of measuring subsidies as budgetary transfers or foregone revenues. It closely follows the World Trade Organization (WTO) definition of a subsidy and identifies 250 price support mechanisms within the OECD countries (OECD, 2013).

The IMF follows the IEA approach but further differentiates between pre-tax price comparisons and post-tax price comparisons. This calculation ensures that the energy policy regime is not confused with the tax policy regime. Nevertheless, none of these methods is free from criticism (Koplow, 2009). All these approaches are highly contentious and involve a lot of subjective judgements. Furthermore, there is no large enough and comprehensive dataset available that can be used for cross-country and over time comparisons. Therefore, researchers face a number of trades-off.

The obvious choice is to restrict our panel to the OECD/IEA countries where relatively comprehensive and reliable though not large enough panel data is available on the subsidy/tax

incidence itself. However, this leaves out many developing countries that are of paramount interest to us. A second option is to focus on general movements in prices controlling for as many factors as possible. A third option is to follow the IEA and IMF method of price difference between domestic and international prices and assume that the difference is subsidy/tax.

Taking the third approach, I limit my analysis to only gasoline instead of all fossil fuels for three reasons. First, this choice is appropriate for the purpose of an analysis of domestic responses to international developments in a comparative perspective. Gasoline forms the largest component of all petroleum products. It is also politically sensitive issue as an overwhelming majority of electorate is affected by the changes in gasoline prices. These changes have economy wide repercussions that are more pronounced than any other petroleum products. Second, subsidies on petroleum comprise more than 70 percent of all fossil fuel subsidies (IEA, 2010). Third, petroleum constitutes the largest component of internationally traded energy commodity and is more likely to be sensitive to the international market. In the case of natural gas, more often than not its price is pegged with the international crude oil price. The existing regional differences in natural gas prices are likely to disappear under increasing international trade in gas as is happening in the LNG market. This means our main results are likely to hold for gas as well and can be generalised for energy subsidies.

My main dependent variable is the level of subsidy or tax on per litre of gasoline. This is because we are more interested in identifying the sources of variations across countries and over years rather than the exact amount of subsidy incidence, which is the aim of many studies mentioned above. The indicator is conceptualised, following the IEA approach, as the difference between the gasoline price in the United States and the country in focus. This is a simplifying assumption compared to the IEA. The United States gasoline prices, as many studies have

concluded, remain a relatively no-tax-no-subsidy regime since at least the Reagan era and used by various studies as reference point (Coady et al., 2010; GIZ, 2011).[1] The pairwise correlation between my measure of the level of subsidies per litre of gasoline and the IEA estimates of absolute dollar value of subsidies for all petroleum products is 0.63 (for 100 observations that correspond) and is statistically significant at the 0.01 significance level ($p<0.000$). This validates the construct validity of my indicator. The main benefit of this approach is that we can have data for many countries over the years; and we cover a wide range of policy instruments and institutional settings through which governments may influence energy and environmental policy outcomes.

The table below shows the gasoline prices (left) and level of tax/subsidy (right). The rising international crude oil prices have not been passed through uniformly across countries over the years. We observe that the mean of gasoline price per litre in constant USD 2012 terms has increased from 0.63 to 1.38 across the world over the two decades with a slight increase in variation across countries from 0.33 to 0.53. Nevertheless, all of the observed divergence comes from the non-OECD countries where the variation has almost doubled. The OECD countries, on the other hand, show some convergence.

We observe that on average the world taxed its gasoline by USD0.28 vis-à-vis the United States in 1995. There is a slight increase in this value over the years. However, what is more interesting to us is the fact that the variation has increased from 0.39 to 0.66 over the same period. All of this increase in variation, again, comes from the non-OECD countries. The OECD countries are on a convergent pattern and increasingly taxing their petroleum use. The graphs (Figure) show

[1] As I have noted, some studies argue that not taxing 'enough' implicitly constitutes a subsidy. Others point to the regulations, like ban on crude exports, which have kept gasoline prices artificially low in the United States.

the trends in domestic petroleum prices and level of subsidy per litre over the year comparing the two groups.

(table 1 and figure 1 here)

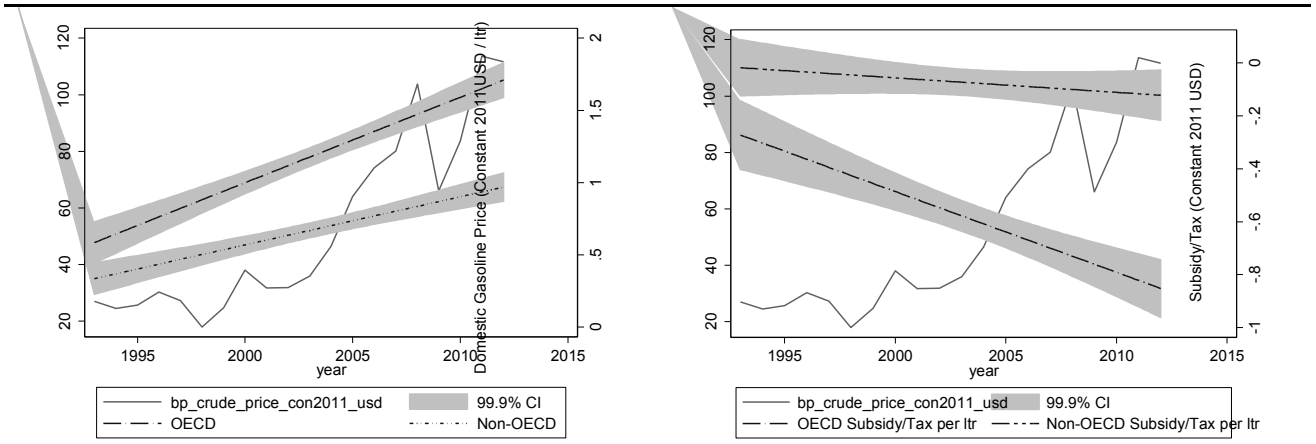
Table 1: Gasoline Prices and Tax/Subsidy (constant 2012 USD/ltr)

Price	World	OECD	Non-OECD
Mean			
1995	0.63	0.93	0.53
2012	1.38	1.88	1.26
Std. dev.			
1995	0.33	0.37	0.25
2012	0.53	0.36	0.48
No. of countries	60 60	23 28	28 32

Tax/Subsidy	World	OECD	Non-OECD
Mean			
1995	-0.28	-0.58	-0.11
2012	-0.31	-0.89	0.03
Std. dev.			
1995	0.39	0.39	0.26
2012	0.66	0.38	0.55
No. of countries	60 60	23 28	28 32

Source: GIZ/IEA.
Note: A negative (-) value indicates a tax and positive (+) value indicates a subsidy.

Figure 1: Domestic Gasoline Prices (left) and Subsidies/Tax (right)



Note: The line in centre is mean and the shaded area is confidence interval of the fitted lines. A negative (-) value indicates a tax and positive (+) value indicates a subsidy. In 1995 total numbers of countries are 23, 37, and 60 in OECD, Non-OECD, and world categories respectively. In 2012 total number of countries are 28, 32, and 60 in OECD, Non-OECD, and world categories respectively.

Political Economy of Petroleum Subsidies

The argument in favour of government intervention with subsidies (or tax breaks for that matter) is largely based on the rationale of market failure. Governments subsidise (or tax) in order to achieve some social policy goals or correct market failures, while simultaneously balancing between equity and efficiency concerns (Gupta, Verhoeven *et al.* 2000).

The argument against subsidies rests on the point that government interventions in the market create more distortions than they correct. Firstly, fossil fuel subsidies encourage wasteful consumption of energy resources and are counterproductive to climate change policies. Secondly, subsidies are a burden on fiscal resources of both net importer and net exporter countries. Finally, fossil fuel subsidies create distortions in the market instead of reaching their intended target group, which in this case are low income households. Overwhelming evidence suggests that subsidies rarely reach to their actual target group and remains an inefficient way of redistribution (Acemoglu, 2001; Coady et al., 2010; GSI, 2010b; IEA et al., 2011). Various organisations like the IMF and World Bank recommend targeted aid programs instead of blanket subsidies on petroleum products (IMF, 2013; Vagaliasindi, 2013).

(table 2 here)

Table 2: Explanations of Policy Change and Energy Policy

	Structural	Institutional
International	relative capabilities, market power, and globalisation	UNFCC (Kyoto Protocol), IMF, WB, etc.
Domestic	endowments and economic structure	political institutions / veto players, and administrative capacity

Table 3: Correlation of Globalisation Index with its Component Parts

Globalisation Index	Economic	Social	Political	Overall
Economic	1.00			
Social	0.81	1.00		
Political	0.41	0.39	1.00	
Overall	0.89	0.89	0.73	1.00

Table 4: Correlation of Relative GDP to other Measures of Size and Power

	Relative GDP	**GDP**	**CINC**
Relative GDP	1.00		
GDP	0.98	1.00	
CINC	0.72	0.72	1.00

Globalisation

We identify globalisation as the greater mobility of goods, capital, people, and information/ideas across political borders. The rise in the volume of external relative to domestic transactions indicates the level of internationalisation of an economy. These flows are an indicator of underlying largely exogenous changes in transaction costs, that is, the ease of exchange facilitated by technological changes as well as government policies. This conceptualization of internationalisation and its channel of policy influence is closer to the archetype 'complex interdependence' conceptualised by Keohane and Nye ([1989] 2012).

The concept of internationalisation goes beyond the mere movement of capital and goods. The external transactions in this conceptualisation also include the concepts of epistemic communities, transnational linkages, and issue linkages. As we noted in the literature review, a lot of government policies are also influenced by various learning channels including the exchanges between policy elites. Similarly, transnational business, production, and social networks influence preferences of these actors towards more standardised ways that consequently influence government policies. The complex webs of interrelationships that emerge from the previous two dimensions make it harder for governments to deal with the issues in isolation within their political border as well as when dealing with their counterparts outside. All of these dimensions work in tandem to exert influence on government policies to change in the direction of harmonisation with the international economy; or in terms of international cooperation, towards more coordination and cooperation in the long run. The efficiency pressures of international economy compel countries to use resources efficiently.

Nevertheless, the resistance to such pressures to policy change may be more pronounced in the short run. The path dependent institutional arrangements and their paradigms may exert a pressure on governments to resist change. The adversely affected groups may demand more protection or compensation. The vested interests in the status quo would use various venues. The access to resources, policy elites, influence on existing paradigms, and policy discourse all have a bearing on the prospects of success and failure for these

groups. This means good quality governance institutions are likely to be more path dependent, on the one hand. On the other, these institutions are likely to be more responsive to population demands. In the long run, however, various kinds of relative costs of not reforming are likely to increase and consequently pressures to change.

Therefore, the propositions on the effects of internationalisation on government fuel subsidy policy can be formalised as follows:

H1: *the increasing internationalisation would negatively influence energy subsidies*

These affects are expected to be dependent on various factors but most importantly on the institutional quality of the state and the character of domestic political institutions and processes

To measure internationalisation, scholars traditionally use the trade to GDP ratio as an indicator. However, this is very restrictive and do not fully capture the concept of internationalisation as defined above. These indicators only capture the actual flows but not the restrictions that may influence these flows separate from what business logic would dictate to be the actual flows. Therefore, we also need to include restrictive policies on the movement of capital and goods. Trade to GDP ratio is also sensitive to normal business fluctuations. For example, the 2008 financial crisis has adversely affected the trade flows without substantially changing the underlying structural forces that have been at the forefront of opening up economies.

Therefore, I use a more comprehensive measure of internationalisation that is the KOF index of globalisation (Dreher, 2006). It measures the level of globalisation on an index ranging from 0 to 100. The KOF index is comprised of three roughly equally weighted components, namely economic (37 percent), social (37 percent), and political (26 percent) globalisation. The economic component gives equal weightage to actual flows and restrictions. The data for both flows and restriction come from the UNCTAD and IMF financial statistics

respectively. The social component measures the flow of people and information using various proxies like internet, telephone, newspapers, and tourism traffic from outside. The political component measures the embedded-ness of a country in the overall international relations. The proxies include number of foreign embassies, memberships in international organizations, participation in the UN missions and number of multilateral treatise signed by a country.

Nevertheless, the use of composite globalisation measure (coded as GLOBAL) does not affect the fundamental dynamics of openness. As the table 3 shows, there is a very high (0.89) correlation between overall globalisation and economic openness.

(table 3 here)

International Institutions

I concur that international institutions are created by a concert of powerful actors. The reason other countries outside the concert join international institutions is to avail opportunities provided by these institutions. Besides performing the functions of information gathering and dissemination, international institutions offer economic and political opportunities. These benefits range from economic to technology to policy advice/transfer. On the political side, international institutions provide convenient forums for issue linkages and side payments as well as bargaining in a multilateral environment. International institutions also give less powerful members a collective voice in agenda setting and in influencing the policy discourse on the margins. We expect international institutions to make a difference if they matter and if that is why the bargaining process often is so tense.

In our case of subsidies the relevant international institution are UNFCC, the IMF and WB. The structural adjustment programmes and liberalisation under IMF and WB are linked with a reduction in subsidies (Hope & Singh, 1995). The IMF has particularly been proactive on the removal of fuel subsidies. Many countries

under the IMF debt programmes are also advised to apply fiscal discipline and raise revenues (Coady et al., 2010; Sippel & Neuhoff, 2009). The WB has many large scale energy related programmes in many developing countries that have some marginal influence on energy policies of those countries.

The propositions on the role of international institutions are formalised as follows:

H3: *being party to the Kyoto Protocol, or being under debt to IMF/WB would have a negative effect on energy subsidies*

The institutional variable is a discrete one (coded as KYOTO). The first commitment period for Annex I parties to the Kyoto Protocol of the UNFCC began from 2008. However, the Protocol came into effect in 2005 and parties to it are more likely to be preparing since then. Moreover, counting the pre 2008 economic recession would also help us in mitigating effects of recession on carbon emissions. The variable is a discrete variable taking values of 0 if the country is not an Annex I member in that year and taking the value of 1 if a country is Annex I member in that year. The proxy for influence of IMF and WB (coded as IMFWB_GDP) is the ratio of the IMF plus WB loans to the country in that year as percent of GDP.

Domestic Institutions: Regime type, Ideology, Veto Players, and Bureaucratic Quality

The are many problems with various approaches to cross country comparisons of political process and institutions that range from interest groups (capital or labour), to party ideology (left or right) to systems of government (presidential or parliamentary) and regime types (democracy or autocracy). The veto points as an explanatory variable over other political process and institutional variables overcome all such problems. From a policy dynamics and international cooperation perspective, we are mainly interested in the variables that explain policy stability/change and its direction. The benefit of using veto points is that the index is structurally derived as compared to mostly subjective datasets on the regime type. It also provides a theoretically more robust comparative approach than systems of government. CPE scholars have increasingly used the concept of veto players as a more sophisticated way to do comparative analysis of policy

outputs/outcomes than traditional approaches of differentiating political systems across countries (BASINGER & HALLERBERG, 2004; Kastner & Rector, 2003; Kӧnig, Tsebelis, & Debus, 2010; Mansfield, Milner, & Pevehouse, 2007; Tsebelis, 2002; Zohlnhöfer, 2009)

The theory of veto players put forward by Tsebelis (2002) contends that the real distinction between political systems is the number of veto points that impinge on policy decisions. The number of veto points increases with an increase in the number of actors who have veto power over policy decisions and with an increase in the divergence of preferences of these veto players. Thus the possibility of policy change from status quo decreases with an increase in the number of veto players or the divergence in preferences of veto players irrespective of the political system and regime type.

Nevertheless, for robustness purposes, I also regress on regime type, party ideology, and margin of majority for the government party. Scholars have been divided on the question whether democracies are more prone to subsidising fuel consumption than autocracies (Cheon et al., 2013; Coady et al., 2010; Gupta et al., 2000; Strand, 2013; Victor, 2009). Democracies are supposedly subsidise fossil fuels either to increase voter support or succumbing to the mass protests and temporary inflationary pressures. Autocracies (often resource rich) supposedly subsidise more heavily to remain in power and share national wealth. Similarly, left governments are more likely to subsidise compared to right wing governments depending upon the margin of majority. Margin of victory between the government and opposition party also matters on the grounds that a convenient majority makes it easier for government to enact policies by reducing veto points.

More important than the character of legislative institutions is the quality of implementing institutions, since in the final analysis it is bureaucracy that would have to implement policies. Nevertheless, scholars remain divided on the causal relationship between growth and governance on the one hand and between governance and environmental policy on the other (Falola & Achberger, 2013; Victor, 2009; Victor, Raustiala, & Skolnikoff, 1998; Young, 2013). For example, these scholars argue that fuel subsidies provide a convenient

policy instrument compared to other poverty and equity targeted programs for which many developing countries do not have the capacity. Following the same line of argument, what matters is the quality of governing institutions and not necessarily the regime type. Other scholars argue that the short term adverse impacts of globalisation can be mitigated by high quality domestic institutions by compensating losers (Frieden, Pettis, Rodrik, & Zedillo, 2012; Rodrik, 2008). The literature on good governance also emphasises the difference that quality domestic institutions make in development policy (T. Beck, Clarke, Groff, Keefer, & Walsh, 2001; Kaufmann, Kraay, & Zoido-Lobaton, 1999; North, Acemoglu, Fukuyama, & Rodrik, 2008).

The above propositions can be formalised as follows:

H4: i*ncrease in veto points would have a positive correlation with the change in the level of energy subsidies*

H5: *democracies and left governments are likely to have a negative correlation with the change in the level of energy subsidies*

H6: *bureaucratic quality is likely to have a negative correlation with the change in the level of energy subsidies*

However, since the quality of governance institutions also reflect the level of development that is directly correlated with our dependent variables, we are more interested in observing change under globalisation. For this purpose, I add an interaction term in the explanatory variables that is:

*Globalisation * Quality of government*

The interaction term would tell us if the impact of globalisation is same or different across different qualities of institutions taking into account level of development and short and long term horizons.

In order to operationalise the concept of veto points, Henisz (2002) creates an index. The veto player index builds on the idea of checks and constraints on policy making by T. Beck et al. (2001). The index assumes a one-dimensional policy space populated by various institutional actors with differing preferences. The index first identifies the number of independent government branches (executive, lower and upper legislative chambers, judiciary, and sub-federal political entities). Henisz exploits the asymptotic theory by assuming that

the preferences of each of these branches and the *status quo* policy are independently and identically drawn from a uniform, unidimensional policy space. This initial measure is then modified to take into account the extent of alignment across branches of government using data on the party composition of the executive and legislative branches. Such alignment increases the feasibility of policy change. The measure is then further modified to capture the extent of preference heterogeneity within each legislative branch which increases (decreases) decision costs of overturning policy for aligned (opposed) executive branches. The main results are that (1) each additional veto point (a branch of government that is both constitutionally effective and controlled by a party different from other branches) provides a positive but diminishing effect on the total level of constraints on policy change and (2) homogeneity (heterogeneity) of party preferences within an opposition (aligned) branch of government is positively correlated with constraints on policy change.

The resultant index (VETO) is a measure from 0 to 1. Countries with absolute autocracies like Saudi Arabia rank 0 and countries like Switzerland with many sub-federal units and different parties rank closer to 1 (0.89). Although slightly different from a measure of democracy, the way veto players are conceptualised and measured, this indicator is very closely related to democratic structure of a polity, Corr(veto, polity)>0.73. In that a country might have full democracy but may still have relatively few veto players compared to other democracies. On the other hand, a country cannot have relatively more veto players if it is not a democracy, but it may still have more or less veto players compared to other non-democracies.

These variables are from the Polity IV dataset developed by Marshall and Jaggers (2002). The POLITY variable measures the level of autocracy or democracy taking values from -10 to 10 respectively. Although the subjective element remains, the POLITY index is constructed by assigning or deducting points for each country on five dimensions, namely competitiveness of executive recruitment, openness of executive recruitment, constraints on chief executive, regulation of participation in politics, competitiveness of

participation. Similarly, LEFT and RIGHT are discrete variables taking values 1 if the party in government can be categorised as such otherwise 0. The variable MARJ is a ratio indicator of the margin of victory between the government and the opposition and range from 0 to 1. The quality of government (QOG) variable is an index ranging from 0 to 1 developed by International Country Risk Guide (ICRG). It includes subjective and objective measures on three dimensions, namely corruption, law and order, and quality of bureaucracy.

Relative Capabilities and Market Size

In realist thought distribution of power in the international system is a key element that explains a large part of state preferences and policy choices. However, the definition and operationalization of the concept of power remains elusive and controversial in political science. The military spending in absolute levels or relative to GDP or relative to other states is the most simple and common indicator. However, as we discussed this measure does not allow us to imply influence on outcomes in matters of outright war, strategic interactions, or domestic non-military policies. The second most common approach is the material capabilities approach, which though still suffers from the same problem, but substantially broadens the scope and domain of power analysis. The relative material capability approach is also justified on the theoretical grounds that the larger economies are better equipped to isolate their domestic policies and politics from international influences. It also captures approximately all dimension of structural power of an economy. Therefore, I use the relative GDP as an indicator of the size and power of an economy (coded as GDP_RW).

The simple GDP for this purpose could be sufficed but using country GDP as ratio to world GDP captures the 'relative' dimension emphasised in the realist literature. The use of this indicator is consistent with the Composite Index of National Capabilities (CINC) indicator. The CINC is a widely used index in international relations literature from the Correlates of War project. It combines relative measures of six indicators, namely military personnel, military expenditure, primary energy consumption, steel and iron

production, urbanisation, and total population. I am already using many of energy related variables as controls, so the relative GDP measure would effectively capture whole of CINC. The table below (

Table) shows that the correlation between relative GDP and CINC is significantly high (0.72).

(table 4 here)

States with more relative capabilities and market power are likely to invest more in securing energy supplies either domestically or from abroad using their hard power. The likelihood of taking policy measures that are beneficial in terms of global energy security and cooperation is less likely. Nevertheless, this makes the expected relationship between power and globally cooperative energy policy measures complicated. For example, the powerful actors are likely to be indifferent to diversification of energy resources and sources to a certain extent or would focus on energy self-sufficiency through domestic exploitation of resources. On the other hand, these very measures may force these countries to adopt energy efficient policies and inadvertently reducing their energy intensity and carbon emissions. Thus we can't predict with certainty how the overall economic and military might may impact the energy policies. The relationship is expected to be shaped by the level of sensitivity and vulnerability of these powerful actors.

Sensitivity and Vulnerability (power in the issue area)

The concept of sensitivity and vulnerability of a country to international political economy is essentially an issue specific concept of relative power. As we discussed, the greater openness brings greater sensitivity but vulnerability also depends on available alternatives. Therefore, in the energy sector the sensitivity is operationalised as total energy and particularly petroleum imports to total energy or oil consumption respectively. The vulnerability then depends on the resource endowments and dependence of an economy on

energy resources. While some powerful actors may seek security against their vulnerability using traditional geopolitics outside their borders, others are expected to favour a stabilised international institutional environment and adjust their policies domestically.

Both sensitivity and vulnerability, depending on the institutional capacity of a country, are likely to force countries to adjust their policies on subsidies. For example, a country importing three quarters of its oil would be sensitive to the changes in the international oil market but if it has enough access oil capacity or reserves the sensitivity may not translate into vulnerability. On the other hand a country which has no alternative would be more vulnerable. In such scenario the likely course of action is to diversify energy resources and use energy more efficiently. Similarly, rising oil prices in the international market would affect both net importers (rising costs of imports) and exporters (rising opportunity costs). However, net exporters may be able to let go opportunity costs in the short run and continue to subsidize. Net importers, on the other hand, particularly those facing fiscal constraints would be under pressure to pass through the international oil prices to end consumers. The indicators for energy and oil imports are the proportion of imports to total consumption (coded as OIL_IMP and EN_IMP).

Structure of the Economy

The economic structure and resource endowments bear upon all of our dependent variables and need to be controlled for. First of all, the level of industrialisation is likely to explain the high energy intensities and emissions. The choice of variable is the share of industry in GDP (codes as INDUSTRY) and the level of development measured as per capita income (coded as GDP_PC). Controlling for everything else, countries on higher levels of their development stage are less likely to subsidise fuel, more likely to diversify energy baskets, and use energy efficiently.

Furthermore, fiscal space is required for subsidising (including not taxing) or mobilising resources for most energy related policy changes (coded as FIS). It is likely that governments running high fiscal deficits are more

likely to be under pressure for doing away with the subsidy regime. However, the influence of fiscal constraints may not be that pronounced in other dependent variables. Other controls include international oil prices in constant 2011 USD. For subsidy data the constant terms (against a basket of currencies using IMF REER) are used to control for movements in inflation and exchange rates.

Finally, the available oil, gas, and coal reserves (coded as OIL_RES, GAS_RES, and COAL_RTP) are likely to determine the level of subsidies on that particularly fuel and share of that fuel in the national energy mix. Since energy intensity is measured in units of energy obtained the choice of fuel would not be related to energy intensity. However, coal and oil abundant countries are likely to consume more of these fuels and consequently contribute more into carbon emissions. The indicator for coal is not reserves but reserve to production ratio. This is due to lack of time series data on reserves, the 2011 level of reserves is denominated by the production levels in all other years. Some energy experts prefer to use reserve to production ratio instead of reserves. However, for our purpose that is not an appropriate indicator since the reserve to production ratio carry implicit policy assumptions. For example, government decisions on not to exploit domestic resources would tend to give bias inference on actual structural weakness and strengths of the state.

The Statistical Model

To capture the dynamic effects of all variables of interest, I specify the following general Ordinary Least Square (OLS) model:

$$Y_{it} = \sum_{k=1}^{n} \beta_k X_{k,it} + \alpha_i + \tau_t + \varepsilon_{it} \quad (1)$$

Where Y_{it} is an observation on country *i* at time *t* for the dependent variable *j,* and *i = 1, …, N* and *t = 1, …, T*. $X_{k,it}$ is an observation on explanatory variable *k* on country *i* at time *t; k* includes all primary variables of interest and control variables while β_k is the coefficient. The country-fixed effects α_i and time-fixed effects τ_t are included in the model to control for unobserved time and state invariant heterogeneity. The error term

of the model is ε_{it}. The choice of a fixed effect model is motivated by both theoretical considerations as well as technical tests. Theoretically, I argued that each country has its own structural differences while all countries face the same situational aspects of internationalisation and international institutions. Also we cannot assume a perfectly random data generating process. Technically, in all six regressions, the F-test, Hausman test, and Breusch and Pagan Lagrangian multiplier test results suggest the presence of country specific effects. The above specification controls for unobserved time invariant differences among countries and is often termed the Least Square Dummy Variable (LSDV) model. The LSDV is considered a superior method to 'within' fixed effect for larger panels like ours although both report identical parameter estimates.[2] The LSDV is preferred because it is possible to include time invariant variables of interest in the LSDV model which would otherwise drop out in a 'within' specification. Secondly, the 'within' fixed effect model reports smaller standard errors giving a false impression of precision. The LSDV reports larger standard errors due to a loss in degrees of freedom because it includes all dummy country variables on the right hand side.

Furthermore, the character of all of our *j* dependent variables is such that the values in year *t* are likely to be correlated with the values in year *t-1,* like carbon emissions, subsidies, energy intensity, and share of fuels in national energy baskets. Tests for serial correlation also indicated the presence of autocorrelation of first order. Therefore, my main model uses Newey-West heteroskedasticity and autocorrelation consistent standard errors adjusted for first order lags. Some scholars, however, argue that including a lagged dependent variable (LDV) is more robust an approach for data with substantially larger time dimension compared to cross-sectional dimension (N. Beck & Katz, 1995, 2009; Stock & Watson, 2007, p. 543). The argument is that including LDV would produce consistent and efficient estimates under conditions of strictly exogenous explanatory variables and a time dimension of 30 or above; as $T \to \infty$ the asymptotic assumptions would hold (N. Beck & Katz, 2009; Keele & Kelly, 2006). However, this is not the case with our panel dataset.

[2] A within fixed effect model uses the difference from group mean instead of actual observations on dependent and independent variables, e.g. $Y_{it} - \widehat{Y_{i*}} = X_{it} - \widehat{X_{i*}} + \varepsilon_{it} - \widehat{\varepsilon_{i*}}$

Furthermore, other scholars have questioned the un-thoughtful application of lagged dependent variable models to the political science data (Achen, 2000; PlÜmper, Troeger, & Manow, 2005). These scholars argue that including a lagged dependent variable produces efficient and consistent but biased parameter estimates due to the absorption of all variation in the dependent variable by the LDV. The LDV technique may be justified on technical grounds but carries little theoretical support in dynamic models when a researcher is interested in explaining changes over time. The inference from the coefficient on LDV is also controversial. It is not straight forward to treat the coefficient on LDV as a path dependent component of the time series. Other scholars have suggested a bias correction method for LDV models (Bruno, 2005; Kiviet, 1995). Nevertheless, the strict exogeneity assumption in the LDV model is too strong an assumption. The spatial interdependence in my panel dataset is also a matter of concern for which both Newey-West and the LDV bias corrected models are considered insufficient (Driscoll & Kraay, 1998). However, the Driscoll Kraay (D&K) solution is not suitable for large cross sectional and small time series dimension datasets. Instead I control for spatial interdependence using dummy variables for regions. Nevertheless, I report results for all three models.

Descriptive Statistics

My unit of analysis is country-year for a slightly unbalanced (missing values) panel dataset. The panel dataset is comprised of 60 countries over 20 years (1993-2012). In the 60 selected countries, there are 28 OECD and 32 non-OECD countries in the sample considering 2012 as base year or 23 and 37 respectively considering 1993 as base year. The criterion to choose this dataset and structural attributes of the dataset are as follows.

For countries, I chose all the countries for which data on most of our dependent and independent variables was available from different sources. Then I dropped all those countries which consumed least amount of petroleum, these are often the countries where data on most independent variables are missing. The combination of data availability and elimination by the above method helped to arrive on the sample size of

60. Together these countries consumed above 90 percent of total world petroleum consumption, 80 percent of total world primary energy consumption, and emitted 90 percent of all per capita carbon emissions in the world. As such my sample size is virtually the whole population of interest.

For number of years, the decision criterion followed the common consensus among policy scholars that most policy change outcomes shall be studied over a 10 year period (Baumgartner & Jones, 2009; Sabatier, 2007). The overall energy policy is a further special case where policy decisions demand long-term commitments from successive governments (Baccini, Lenzi, & Thurner, 2013; Goldthau, 2013; Winzer, 2012). Almost all energy infrastructures are characterised by high asset specificity. The policy instruments to influence energy production/import or consumption decisions may be handily available to governments but the economy wide structural transformations required to align with the new incentive structure take more than a decade. The choice of number of years is also motivated by statistical theory. To estimate dynamic effects using panel data in CPE, most scholars argue that a $T > 20$ shall be the minimum requirement (N. Beck & Katz, 2009).

The tables 5 and 6 in the appendix explain all the variables, their definitions, and unit of analysis.

The findings from the regression analysis are summarised in table 4 below. Firstly, we find that international institutions matter. The statistically significant negative sign of the coefficient on KYOTO suggests that international institutions play a critical role in ensuring phasing out of subsidies. Being party to the Kyoto Protocol is associated with a USD 0.20 per litre reduction in gasoline subsidies (or an increase in taxes) compared to those not bound under the Kyoto protocol. The results are statistically significant on a 0.01 level (99 percent confidence level).

Secondly, veto players are associated with more subsidies. A one unit increase in veto points is associated with USD0.19 increase in subsidy per litre of gasoline. This is despite the fact that a large number of subsidizing countries in our sample score low on veto point index. This seems to vindicate the proposition that countries with multiple centres of power or fractured polities find it difficult to reduce subsidies or

increase taxes on fossil fuels. As I argued before, democracy and ideologies of political parties are not appropriate indicators in the post-cold war period for two reasons, namely the structural change that followed and the subjectivity of these indicators. Even after including the margin of majority for the ruling party, the results remain statistically insignificant. Nevertheless, in most cases the democracy indicator has the expected negative sign, but the right and left parties are largely indistinguishable.

Thirdly, globalisation has an impact on fuel subsidies. However as hypothesised, the impact of globalisation is blocked or mediated by domestic institutions, like the number of veto players and the quality of governance. Globalisation negatively affects fuel subsidies. For example, for subsidies/taxes on gasoline, one unit increase in globalisation is associated with USD 0.02 per litre reduction in subsidies on gasoline (or increase in taxes). But because this effect is dependent on quality of governance (QOG), the actual amount is (-0.023 + 0.030*QoG). In other words, if we assume QoG as a discrete variable taking values of 0 for low quality governance and 1 for high quality governance, a one unit increase in globalisation in countries with high quality of governance results in USD0.007 more subsidies per litre compared to those with low quality institutions, taking into account all other factors. To put things in perspective, the difference in the level of globalisation in 2011 between China (60.5) and India (50.4) is 10 units. If India were to reach the globalisation level of China, holding its quality of governance at the same level of 0.58, it would reduce subsidies (or increase taxes) on per litre of gasoline by USD0.056 calculated as follows: (-0.023+ 0.030*0.58)*10.09 = -.056. Similarly, if China were to improve its level of governance from current 0.48 to the Indian level of 0.58 holding its level of globalisation at the same level it would reduce subsidies by a mere (-1.84 + 0.03*60.5)*0.10=-0.0025. But if India were to increase its level of bureaucracy by the same 10 point, holding its level of globalisation constant, it would reduce subsidies by USD0.033 on per litre of gasoline calculated as follows: (-1.84 + 0.03*50.4)*0.10 = -0.033. At higher levels of globalisation, improvements in bureaucratic quality have a lower impact compared to improvements at the lower levels of globalisation. Similarly, improvements in level of globalisation at a higher level of bureaucratic quality have a lower impact compared to improvement in level of globalisation at the lower level of bureaucratic quality.

The results are in line with the proposition that, in the short run, domestic institutions may block competitive pressures from international political economy that are perceived as adverse for the national economy (Frieden and Rogowski 1996; Rodrik 2008; Rodrik, Subramanian and Trebbi 2004). The results also seem to reject the null hypothesis that governments may use subsidies as easy-to-implement policy instruments put forward by some scholars (Cheon, Urpelainen and Lackner 2013; Victor 2009). The findings also tend to support that trade/globalisation can be beneficial for the environmental standards (Frankel and Rose 2005; Kleemann and Abdulai 2013).

Fourthly, relative power, as expected, has mixed results. A one percent increase in a country's share of total world GDP is associated with USD0.11 decrease in subsidies (or increase in taxes). The decrease in subsidy could be due to efforts to increase self-sufficiency and reduce imports. Finally, the results on all other structural and institutional variables are according to expectations, although statistically insignificant in a few cases. As expected fiscal surplus enables governments to subsidise gasoline but governments facing fiscal constraints tend to phase out subsidies. The level of energy imports only marginally impacts the outcomes on all four of our dependent variables. Similarly, resource endowments have expected but marginal influence. The higher indebted a country to the IMF and World Bank the more likely it is to phase out fossil fuel subsidies.

Table 4: Determinants of Subsidies (A Summary)

	Subsidy/Tax
Kyoto Protocol	-0.202***
Globalisation	-0.023***
Veto Players	0.195**
Bureaucratic Quality	-1.843***
Bureaucratic Quality X Globalisation	0.030***
Relative Power	-11.955***
F (p<)	2176 (0.00)
N	820
Fixed Effects(N&T)	Yes

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Other independent and control variables and standard errors not reported in this summary table. For full results see the respective regression tables. All results are from the Newey-West Heteroskedasticity and Autocorrelation Consistent (HAC) standard errors of first order lags (model-6 in detailed results).

Conclusion

In this paper, I set out to identify the relative salience of various domestic and international structural and political variables through Ordinary Least Square (OLS) regressions on a panel data for explaining variances in fuel subsidies across countries over years.

The foregoing analysis demonstrates that the world is in fact on a convergent path. I term this convergent path as a 'marathon to the top' contrary to the popular belief of a 'race to the bottom'; to the top because the world on average is subsidizing fossil fuels less and less (more taxes). Nevertheless, substantial variations persist across countries particularly across OECD and non-OECD group. The non-OECD countries show a lot more variance within their group. In the OECD, the United States is the only outlier. The variances across countries can be explained by the character and quality of domestic governing institutions, level of globalisation, and the membership in international institutions.

The findings support the neoliberal institutionalism's claim that international institutions and level of internationalisation matter. The parties to the Kyoto Protocol are more likely to tax fossil fuels. Similarly, increasing level of globalisation of a country is associated with less subsidies (or more taxes) on fossil fuels. Furthermore, my findings suggest that the character and quality of domestic governing institutions systematically explain the variances in fuel subsidies across countries over years. The international pressures for policy change are mediated by domestic institutions. In that more veto players tend to block international competitive pressures and resist international obligations. Countries with high quality bureaucracy are better placed to deal with the challenges. Since a large part of variances across countries is explained by domestic structural and political factors, therefore, we cannot ignore domestic politics and institutions (alongside perceptions) if we are to understand the sources of conflict and cooperation in the international arena.

Figure Error! No text of specified style in document.**.1: Interaction between Globalisation and Quality of Bureaucracy (Left axis subsidy/tax on USD per litre of gasoline)**

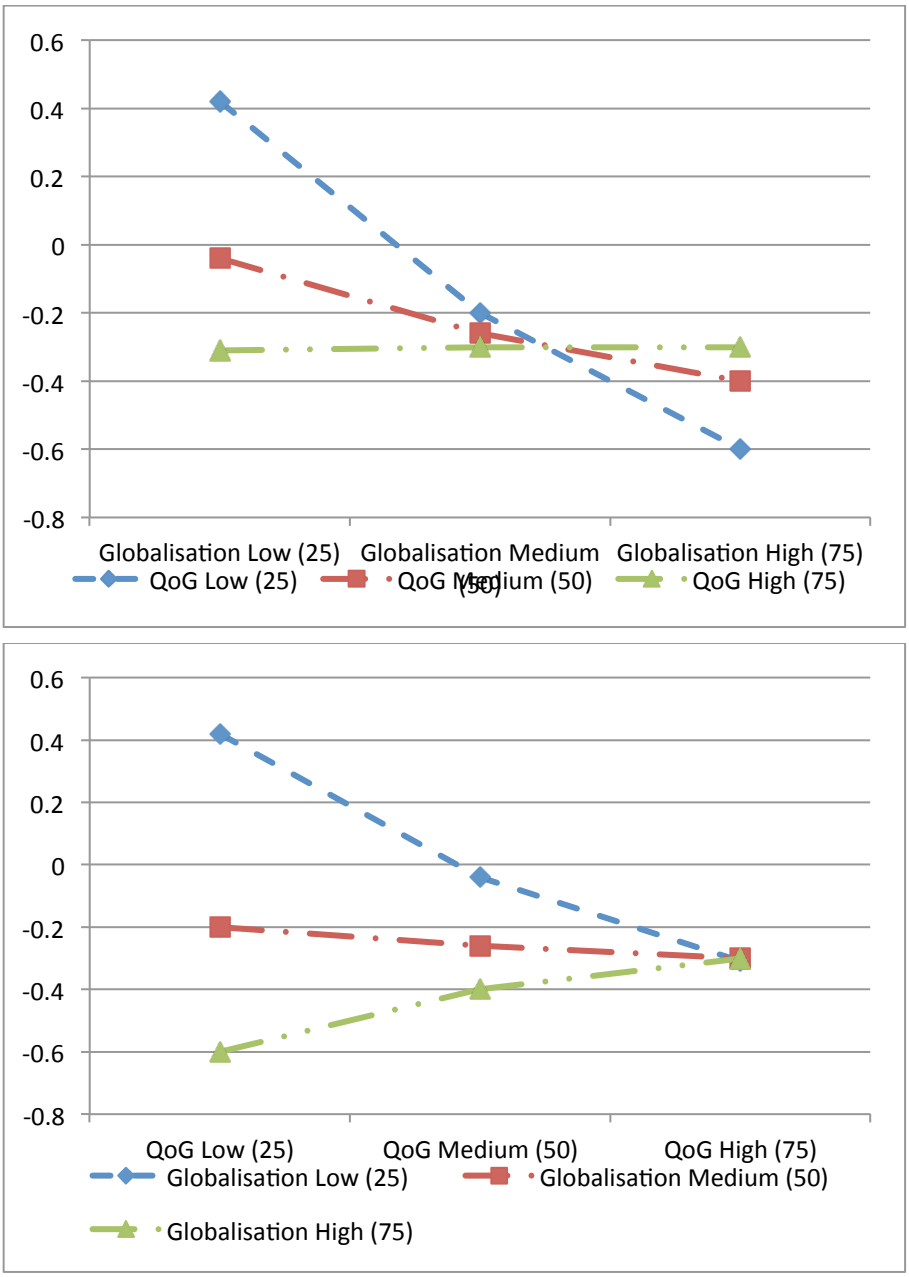


Table Error! No text of specified style in document.**1: Determinants of Changes in Subsidy/Tax Levels**

Dependent Variable: Subsidies/Taxes

	OLS	LDV	D&K L(1)	Newey-West L(1)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
kyoto	-0.226***	0.002	-0.146*	-0.146***	-0.154***	-0.202***	-0.100*
	(0.035)	(0.022)	(0.068)	(0.032)	(0.031)	(0.033)	(0.039)
imfwb_gdp	-1.060***	0.009	-0.875	-0.875	-0.796	-0.220	0.444
	(0.259)	(0.292)	(0.520)	(0.499)	(0.484)	(0.440)	(0.881)
global	0.002	0.005**	0.007	0.007*	-0.018**	-0.023***	-0.015
	(0.002)	(0.002)	(0.004)	(0.003)	(0.006)	(0.005)	(0.008)
fis(lag)	0.009***	0.004*	0.010**	0.010***	0.010***	0.005*	0.008*
	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
qog	-0.440***	-0.030	-0.429***	-0.429**	-2.849***	-1.843***	-1.409*
	(0.089)	(0.101)	(0.107)	(0.141)	(0.513)	(0.465)	(0.684)
veto	0.022	0.107*	0.206	0.206**	0.195**	0.195**	
	(0.039)	(0.044)	(0.106)	(0.073)	(0.074)	(0.070)	
glob_qog					0.041***	0.030***	0.021*
					(0.009)	(0.008)	(0.010)
polity							-0.012
							(0.013)
left							-0.009
							(0.041)
right							0.017
							(0.042)
marj							-0.001
							(0.001)
asia				-0.428	0.506	-0.330	1.853*
				(1.010)	(0.964)	(0.628)	(0.821)
europe				-2.584*	0.242	-0.269	-1.114
				(1.056)	(1.147)	(0.884)	(1.198)
mena				-0.139	0.157	-0.347	0.000
				(0.843)	(0.809)	(0.703)	(0.690)
samerica				0.038	0.152	-0.345	-0.021
				(0.928)	(0.886)	(0.720)	(0.396)
gdp_wr	1.347***	-3.501*	-14.679**	-14.679***	-14.367***	-11.955***	-28.422***
	(0.227)	(1.667)	(4.038)	(3.222)	(2.782)	(3.060)	(3.834)
crude	-0.003***	-0.003***	-0.005***	-0.005***	-0.004***	-0.003	-0.006
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.011)	(0.019)
oil_imp	0.000	0.000	0.000	0.000	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
oil_res_bb	0.002***	0.000	0.001*	0.001**	0.001***	0.001*	0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
gas_res_tcf	0.000**	0.001***	0.002**	0.002***	0.001**	0.001**	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
industry	0.008***	0.006**	0.010	0.010**	0.010**	0.009*	0.001
	(0.002)	(0.002)	(0.005)	(0.003)	(0.003)	(0.003)	(0.004)
intensity	0.000***	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ln_gdp_pc	-0.135***	0.014	0.041	0.041	0.038	-0.034	0.284
	(0.020)	(0.071)	(0.162)	(0.112)	(0.106)	(0.115)	(0.215)
LDV		0.691***					
		(0.033)					
F	110.53	145.83	1482.60	259.53	236.15	2176.65	712.02
p	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N	820	791	820	820	820	820	476
State FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	Yes	Yes

Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$;