

# Industry segmentation and the market for protection: Evidence from oil\*

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## Abstract

Empirical work on the politics of trade increasingly emphasizes firm heterogeneity as a source of variation in trade policy preferences. Yet we have limited knowledge on when and how firm heterogeneity affects policy outcomes. We use congressional hearings to examine when firm heterogeneity is associated with diverging policy preferences in the oil industry. Oil is a useful case to analyze the role of firm heterogeneity in trade politics because there is variation in the characteristics of firms operating across discrete market segments. Oil firms also differ in three relevant dimensions: productivity, the degree to which they participate across industry segments and their degree of internationalization. We identify two policy instruments that have different effects in the relative price of oil produced in the U.S., and then examine the position firms took towards these instruments.

We find substantial and predictable differences in intra-industry preferences across instruments. Variance in the preferences for import restrictions is explained by firms' characteristics: productivity, position within a market segment, and degree of integration across segments. Yet we also find that there are no intra-industry differences on the preferences towards a tax on oil production. Next, we evaluate whether the differences in revealed preferences tabulated from Congressional testimony are politically consequential. We analyze roll call votes on the two policy instruments for which we had tabulated the preferences of all market participants: an amendment to the Energy Bill of 1979 to repeal the President's authority to set tariffs and quotas on oil imports, and the Windfall Profits Tax Bill of 1980. For the roll call analyses we map the preferences upstream producers to final consumers, onto the employment structure in electoral districts. This provides a metric of the political demand faced by Congress members. We find that industry, not firm, characteristics are good predictors of the votes. These findings have important implications for our understanding of the role of firm heterogeneity on policy-making.

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## Introduction

Studies on the political economy of trade traditionally focus on ownership of factors of production and sectors of employment as the salient dimensions along which policy cleavages arise. In doing so these accounts often assume that firms' policy preferences are homogeneous within single industries, or even as a factor of production. Yet recent developments in international economics suggest that there are important differences in the characteristics of firms within single industries (Melitz, 2003; Helpman et al., 2004). In particular, the rise in vertical specialization of production – defined as the disintegration of productive processes into discrete segments – as documented by Feenstra (1998) and others, implies divergent policy preferences within and between single market segments. Scholars in IPE have also started to look at the role of firm heterogeneity on trade policy preference formation, documenting differences in firm productivity that correlate with varying degrees of support for protection (Jensen et al., 2015; Kim, 2013). However, there is to date little research examining when these differences matter, and how they affect policy outcomes.

In this paper we use the oil industry to examine empirically the effects of intra-industry heterogeneity on firm preferences, and on policy outcomes. The oil industry offers an ideal setting for analyzing how firm heterogeneity affects trade politics. Firms operating in the sector differ across several relevant dimensions: firms differ in the degree to which they integrate across upstream and downstream market segments, and whether they operate internationally. There is also large variance in firm size and productivity within and across market segments. The sector also offers a contrast between producers and consumers of inputs and final outputs, which are likely to be pitted against each other in their support for policy interventions that affect the price of traded products (Hillman, 1982; Grossman and Helpman, 1994). Focusing on oil thus allows us to investigate how and to what extent intra-industry firm heterogeneity affects the demand and supply for protection.

Consistent with our expectations, we find substantial – and predictable – intra-industry variation in the revealed policy preferences of firms and industry associations representing groups of firms. In particular, we find that firm heterogeneity manifests itself strongly in debates over taxes at the border: independent producers that operate in the upstream segment of the industry express

strong support for imposing tariffs and quotas; refiners, integrated firms, and major international oil producers expressed varying degrees of opposition. The mapping from firm characteristics onto policy preferences also varies across policy instruments in intuitive ways. In the case of an excise tax placed on domestically produced oil we present evidence that the most important political cleavage was along industry lines, with producers of oil and their by-products – independent and integrated firms alike – arrayed against consumers. This suggests the link between intra-industry heterogeneity and trade policy preferences depends on the distributive effects of the policy instrument itself, with some instruments pitting heterogeneous firms within industries against one another, while other instruments unite them.

We also show that tabulating policy preferences is not enough to explaining policy outcomes. The political economy of trade literature theorizes that politicians' incentives to respond to the demands from different actors also depends on the supply side of politics (Grossman and Helpman, 1994; Rodrik, 1995). Accordingly, in the second section of the paper we examine whether the recorded pattern of preference heterogeneity is reflected on legislative voting behavior. We focus on contemporaneous legislative initiatives which are related to the policy preferences examined in the first part of the paper. Our analysis of roll call vote data for the same instruments and from the same period allows us to hold constant market conditions and interest group activity. We find evidence that despite the considerable heterogeneity in firms' preferences tabulated from their congressional testimony, a simple consumer versus producer framework goes a long way in explaining voting behavior in the Senate.

Our analysis has two important implications for our understanding of the political economy of protection. First, while intra-industry heterogeneity has long been a component of industrial organization in the case of oil, it has only recently been addressed in theoretical approaches to the political economy of trade. We show that the degree of heterogeneity of firms within single industries has a substantial and predictable influence on their revealed preferences for policies that affect the relative price of crude oil. An important advance in the paper is to show also that the way intra-industry firm heterogeneity affects policy preferences depends on the effects of the relevant policy instrument of choice. Amid a global reduction in tariffs, and shift in emphasis towards Non-Tariff Measures (NTMs) as important factors shaping international trade flows, these findings emphasize the importance of identifying the precise distributive effects of different policy

instruments on politically-relevant actors when analyzing the politics of trade.

Second, our findings suggest that sectoral cleavages between producers and consumers remains a salient dimension when shifting from identifying policy preferences to explaining outcomes. One possible reason for this may be that policymakers weigh the aggregation of the relevant policy interests to advance their political careers. Future analyses could examine the effects of intra-industry heterogeneity in other jurisdictions, in order to examine the extent to which this holds true at different levels of interest aggregation.

The paper is organized as follows: in the next section we review the literature on endogenous tariff formation. We then summarize the characteristics of the oil industry, and identify our expectations of firms towards two policy instruments: an oil import tariff, and an excise tax on domestic oil production. In the empirical section that follows we analyze the policy preferences of firms using data drawn from congressional committees. We then analyze congressional votes on the repeal of import restrictions on oil and the imposition of the windfall profit tax, before concluding in the fifth and final section.

## **Intra-Industry Heterogeneity and Firm Preferences: What We Know**

The endogenous tariff formation literature is built around a canonical framework where policy outcomes arise from the intersection of political demand and supply.<sup>1</sup> Actors' interests and their ability to overcome collective action problems figure prominently on the demand-side of politics; on the supply-side, politicians' preferences and political institutions are the key analytical constructs. Political actors are construed as having clearly defined objective functions associated with their material well-being. Those actors are assumed to be able to identify the policy outcomes that would benefit them. Actors' whose expected benefits from a policy intervention are above a minimum cost threshold for collective action usually mobilize politically (Grossman and Helpman, 1994; Rodrik, 1995).

Scholars rely on models of economic activity to derive actors' preferences for a specific policy instrument. From those models we can assess equilibrium conditions relating quantities and prices

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<sup>1</sup>The endogenous tariff formation literature in its original form was reductionist: it focused on the correlation of observable characteristics of interest groups to levels of protection, and hence bracketed the role of political actors and institutions. See Caves (1976); Baldwin (1985); Nelson (1988); Rodrik (1995); Gawande and Krishna (2003).

of goods and services supplied and demanded in the market place. When policy interventions are added to those models as affecting prices or quantities we are able to theoretically derive the choices that would be optimal for different economic agents depending on their attributes and position in the economic system. For instance, trade theory predicts that under general conditions reducing trade barriers results in changes in the relative price of tradable goods and services, which in turn affects the real income of different groups of economic agents (Stolper and Samuelson, 1941; Jones, 1971; Samuelson, 1971; Mussa, 1974; Rogowski, 1989).

Agents are commonly assumed to have homogeneous preferences depending on whether they are linked to the industry that expands or contracts in response to the policy change. Yet recent developments in international economics suggests that this assumption is untenable in industries populated by firms of different productivity that are active in international markets (Milner, 1988) or vertically integrated across different segments of the industry (Melitz, 2003; Antràs, 2003).

Depending on their cost structure, firms weigh differently the tradeoff between integrating or sourcing production at home and abroad (Coase, 1937; Williamson, 1975, 1985; Grossman and Hart, 1986).<sup>2</sup> The tradeoff varies for firms of different productivity: their marginal cost is a cutoff that sets internationally and domestically integrated firms apart from their counterparts, who only operate domestically and/or participate in one segment of the market. These productivity differentials determine the ability of firms to absorb policy induced changes in relative prices (Melitz, 2003).

Given the well-established link between the characteristics of firms and their policy preferences, increasing heterogeneity in firm organization implies divergent policy preferences within single industries. We should expect, for example, that firms that integrate upstream and downstream production processes differ in their policy preferences from firms that operate in single industry segments. Yet there are limited empirical studies on the relationship between industry specialization, preferences, and policy outcomes. Using industry as the unit of analysis, for example, Gawande and Bandyopadhyay (2000) finds that lobbying expenditures increase as a function of competition between producers and consumers. Feenstra (1998), focuses on labor, arguing that

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<sup>2</sup>This literature points to industry and firm-level variance in the incentives to integrate rather than conduct transactions at arms'-length (Williamson, 1985; Grossman and Hart, 1986; Hart and Moore, 1990; Hart, 1995; Antràs, 2003). Building on property rights theories of the firm Grossman and Hart (1986); Hart and Moore (1990), Antràs (2003) argues that incomplete contracts shape the firm's decision to outsource or integrate stages of the global supply chain. See Pinto and Weymouth (2013).

vertical specialization lowers the wages of unskilled workers, with implications for individual preferences over trade along factor lines. Hummels and Yi (2001) measures the growth in industry specialization using data on trade in intermediate goods, and regresses this against a measure of tariff or NTMs. Yet this emphasis on individual and firm level preferences “black boxes” the policy process itself, assuming rather than demonstrating a relationship between agent, industry and firm-level heterogeneity, preferences, and policy outcomes.

In this paper we use the case of the oil industry to examine empirically the relationship between industry, market segment and firm-level heterogeneity, on one hand, and trade preferences and policy outcomes on the other. The oil industry is useful because firms operating in the sector demonstrate substantial variation in terms of their characteristics. In particular, firms tend to vary across three dimensions: i) the number of industry segments they operate in; ii) the degree of internationalization; and iii) their productivity, which is likely to vary both within and across market segments. In addition, while the focus on intra-industry firm heterogeneity is a recent phenomenon in theoretical and empirical analyses of trade, in the oil sector there has been substantial debate over the use of tariff and NTMs in the industry historically. The industry in the US in particular provides a detailed record of the preferences firms and other actors towards different policy instruments, as well as a legislative voting record. The existence of substantial intra-industry firm heterogeneity, combined with data on the revealed preferences of firms, and voting behavior, offers a unique opportunity to investigate empirically the relationship between industry and firm-level heterogeneity, preferences, and policy outcomes in a more controlled setting.<sup>3</sup> In the next section we describe the characteristics of firms operating in the oil industry, with descriptive data drawn from the time-period when the empirical tests in the paper are focused. We then examine empirically whether the characteristics of firms predicts the positions they adopt towards two policy instruments that have different distributional effects.

## **Overview of Characteristics of Oil Industry**

The oil industry is populated by firms with different characteristics. Most broadly, we can distinguish firms involved in the production of crude oil from those firms that use crude oil as an input into a process that transforms crude into refined products. In addition, we can distinguish

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<sup>3</sup>We discuss the generalizability of these findings in the conclusion.

producers and refiners from firms that market or consume refined products. A second dimension is the extent to which firms operate across more than one market segment (see Table 1). Thus vertically specialized firms operate in single market segments, focusing only on producing, refining, or marketing oil products, or primarily consuming oil products, while vertically integrated firms operate across multiple market segments. Finally, firms can be distinguished by their degree of internationalization, with some operating only within the United States, and others operating both within the United States and internationally.

The categorization of firms by market segment and degree of vertical integration and internationalization leads to a complex series of corporate forms. In practice only a subset of these recur within the industry. There are few firms that are pure marketers of oil products and that operate both within the United States and internationally, for example. There are also few firms that focus solely on refining oil but that have a domestic and international presence. Differences in degree of integration and internationalization are, to a great extent, determined by differences in productivity: more productive firms are more likely to integrate production across market segments, and the most productive firms in the sector are likely to participate in global production networks. Below we discuss each market segment, focusing on prevalent forms of industrial organization (Melitz, 2003; Helpman et al., 2004). We then move on to discuss how these differences in characteristics should effect the policy preferences of firms.

## **Producers**

A first distinction can be made between firms that only explore for and produce crude oil, and those that use crude oil as an input or market and consume products refined from it. The most important difference between crude oil producers and other firms is whether oil is an output, or whether it is an input into a productive process that transforms it into refined products sold to marketers and final consumers.

Firms that explore for and produce crude oil in the United States - which is the empirical setting of this paper - differ across the dimensions identified above: some firms are integrated vertically, while others are specialized in oil production alone. Firms that produce oil also differ according to whether they operate purely domestically or also operate internationally, as well as the size of the firm. The most common difference in the industrial organization of firms is between those that are

integrated across market segments and that also operate in multiple countries, (“the majors”), and those that are vertically segmented and operate only in the United States (the “independents”). These firms also differ in size. Data from the Independent Petroleum Association of America (IPAA) – the major association for firms operating as producers only – reports that the mean number of member firms operating internationally between 1994 and 2008 was 12.88 percent, with a standard deviation of 2.59 percent. Mean net production for these firms stood at 360 and 350 barrels per day between 1996 and 1998 (Independent Petroleum Association of America, 2009). The profile of the major U.S. oil producers differs substantially. The top ten oil producing firms domestically had a mean production of 462,000 barrels per day, with a standard deviation of 166,000 barrels in 1981, and 318,000 barrels per day in 2000, with a standard deviation of 205,000 barrels. These larger firms also tend to operate internationally, and be integrated in refining, as described below. Some measures show they also tend to be more productive, although this varies over time. One measure of this is the crude finding rate, defined as the amount of oil discovered for each exploratory well drilled. Data shows that rates tend to be higher for large, integrated oil producers, relative to vertically-specialized oil producing firms (Bohi, 1998, 22).

## **Refiners**

The second market segment is refining. Firms that operate in the refining segment use crude oil as an input to produce a variety of products that are usable by final consumers, such as gasoline, diesel, heavy oil, and lubricants. Like oil producing firms, the industrial organization of the refining segment in the United States centers on the large, integrated majors, described above, that produce oil and then refine it into products for sale to consumers, and vertically specialized firms that focus only on refining, and tend not to invest internationally (Committee on Energy and Commerce, 1980, 5).<sup>4</sup> A congressional study into the state of the refining industry notes that – in contrast to the large, multinational, vertically integrated major oil firms – the vertically specialized refiners tend to be heterogeneous, but with the modal firm small and specialized in the production of a small number of products. The structure of the industry associations representing this market segment re-

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<sup>4</sup>Refinery capacity operated by firms is also clustered geographically, which is relevant for congressional voting behavior, with greater capacity near the Great Lakes and Midwest, the Gulf Coast, and the Pacific Coast, in contrast to the East Coast, which has less refining capacity (Office of Technology Assessment, 1983).

flects this difference: the national association is the American Fuel & Petrochemical Manufacturers (AFPA),<sup>5</sup> with the Independent Refinery Association of America, and regional chapters such as the Independent Refiners Association of America, representing refiners that are vertically specialized within this market segment (Committee on Energy and Commerce, 1980, 169).

### **Marketers and Consumers of Final Products**

The final market segment in the oil industry is marketers and consumers of final products. A variety of products are created using crude oil, including asphalt, jet fuel, propane, lubricants, and fuel oil. Gasoline is the largest volume of product consumed in the United States.<sup>6</sup> Many oil products do not have perfect substitutes available at competitive prices, and demand is price inelastic. Oil product costs also constitute an important cost in trucking and aviation, making it likely these industries will have strong preferences towards the price effects of government intervention on the products. Other uses of crude products are distillate fuel oil (including diesel), and fuel oil, which continues to play a role in the electricity generation mix despite being partially replaced by substitutes such as natural gas and nuclear power.

### **Multinationality**

Together, this summary suggests firms producing oil and oil products can be classified across two dimensions. The first is the degree of *multinationality*. The production of oil is divided between firms that have an international presence and those that do not.<sup>7</sup> There is some heterogeneity in the balance of domestic and international operations for those that operate multinationally. Exxon, for example, which is the largest of the majors, earned 2.31 billion dollars in 1980 from oil and natural gas exploration and production in the United States, against 1.87 billion US dollars internationally. In terms of revenues, it earned 2.11 billion dollars in the United States in 1985, against 2.83

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<sup>5</sup>Previously called the National Petroleum Refiners Association and the National Petrochemical & Refiners Association.

<sup>6</sup>In 2011 the transport sector used 13.22 million barrels a day of oil, against 4.45 million barrels in industry, 670,000 barrels in the residential sector, 360,000 in commercial buildings, and 130,000 in electric power.

<sup>7</sup>Although rare, some independent refiners also operate facilities across multiple countries. Valero, for example, operated the majority of its refineries within the United States, but also owned and operated the Pembroke refinery in Wales. In contrast, Marathon Petroleum operates six refineries, but all are located in the United States.

billion dollars internationally.<sup>8</sup> In terms of capital employed, Exxon employed 7.3 billion dollars in 1980 against 5.1 billion dollars internationally, rising to 12.3 billion dollars in the United States in 1985, against 4.8 billion dollars internationally (Exxon, 1980, 1985). In contrast, Conoco – another multinational oil firm – was weighted more heavily towards international oil, producing 134 thousand barrels daily domestically, against 241 thousand barrels internationally in 1980 (Conoco, 1980). A third major – Amoco – was more focused on the United States: revenues stood at 1.33 billion dollars within the United States in 1985, against 779 million dollars internationally. Amoco also spent 3.2 billion dollars in capital and exploration expenditures within the United States, compared to 1.35 billion dollars internationally (Amoco, 1985). Data suggests that the larger, integrated firms, tend to be more productive than smaller, vertically-segmented firms. One measure of this focuses on exploratory success rates, which records finds as a ratio of the number of exploration oil wells drilled. The success rate for offshore wells in the Gulf of Mexico, where a larger number of multinational, vertically-integrated firms operate due to high capital costs, was significantly higher than for onshore domestic exploratory wells (Bohi, 1998, 81).<sup>9</sup>

### **Vertical Integration**

A second dimension of variation is the degree of *vertical integration*, defined as the number of market segments in which a firm operates. As noted above, the industry has a smaller number of vertically integrated firms that are engaged in oil production, refining, and marketing, and a much larger number of firms that are engaged in single market segments, which also tend to be wholly domestic in focus.

The most important forms of industrial organization are summarized in Table 1. In the next section, we discuss the implications of intra-industry firm heterogeneity for policy preferences.

### **Implications for Policy Preferences**

What are the implications of intra-industry firm heterogeneity for policy preferences? We expect firms to respond to the distributive implications of a given policy instrument; variation in the

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<sup>8</sup>Exxon's annual reports do not break earnings out between petroleum and natural gas.

<sup>9</sup>The finding rates and dollar value of discoveries also tended to be higher for the multinational, vertically-integrated "majors" also tended to be higher than for vertically segmented firms specialized in crude oil production. See Bohi (1998, 35).

Table 1: Major Forms of Industrial Organization in the US Oil Industry

Type	Market Segment			Location
Independent Producer	Produce			Domestic
Independent Refiner	Refine			Domestic
Multinational Integrated Firm	Produce	+	Refine	Domestic + Foreign
Consumer	Market Consume			Domestic

distributive effects of a specific policy instrument on firms operating in a single industry should thus lead them to respond differently. Firm productivity and organization are also likely to be reflected in the intensity of their preferences: integrating production presence across market sectors and borders demands additional setup and management costs, which less productive firms cannot afford. More productive and integrated firms are better at adjusting to changes in relative prices, at least in the middle to long run; their long term prospects do not depend so heavily on policy changes of the kind we analyze. Still we should not expect them to be completely indifferent: when summoned by policy-makers they have an incentive to voice their short term preferences, and may side with less productive firms in their policy demands.

In this section we test hypotheses regarding the relationship between the characteristics of firms and their policy preferences. An advance in the paper is to use data on firm characteristics from the same time-period and industry to examine firm preferences towards two policy instruments with distinct distributive effects. In the case of oil, both tariff and NTMs have been used to influence the supply of – and demand for – oil and oil products. Subsidies such as the depletion allowance have been used to reduce costs for oil producers (Sherlock, 2011). Licenses for drilling rights in federal lands have also been used to promote, or slow, oil production. In addition, quotas and tariffs – through the 1953 Trade Agreements Adjustment Act, and Section 232 of the 1962 Trade Extension Act – have changed the supply and demand for both oil and oil products. Section 232 enables the president to impose limits on imports that threaten national security interests.<sup>10</sup>

We examine two policy instruments with different distributive effects, with the goal of exploring whether and how intra-industry differences matter for firms’ policy preferences. The first policy

<sup>10</sup>Between 1962 and 2004, eight of twenty-six investigations conducted by the Department of Commerce under Section 232 focused on the national security implications of oil imports (Department of Commerce, 2004).

we examine is an oil import tariff. The second is an excise tax on the production of domestic oil. We describe each instrument below, and then outline our expectations for the policy preferences of different firms.

### **Case 1 - Oil Import Tariff**

The first case examined is a tariff applied against imports of crude oil. U.S. policy currently applies a small tariff on the import of both oil and oil products under the Harmonized Tariff Schedule of the United States (HTSUS): oil with an API gravity of 25 degrees or more has a tariff of 10.5c/barrel applied against it, while oil with an API gravity of under 25 degrees incurs a 5.25c/barrel tariff.<sup>11</sup> Some oil products also have tariffs applied against them. Naphthas, for example, incur a tariff of 10.5c per barrel, while light oil motor fuel incur an import tariff of 52.5c per barrel (Nerurkar, 2011). The value of these tariffs relative to the final price is small. More costly trade barriers have also been debated, however. A quota was applied against oil imports between 1959 to 1971 leading to billions of dollars of transfers to domestic producers from consumers. In the 1980s, a five dollar per barrel tariff on crude imports was debated in Congress as the world price of oil collapsed. We use data drawn from congressional testimony over this proposed policy change to examine actor preferences.

#### *Producers*

What are our expectations for the policy preferences of firms, given that a tariff increases the price of imported oil relative to domestically produced oil? If we focus on crude oil production, we expect firms that produce only oil, and do so only domestically, to have intense preferences in favor of the tariff. Industry associations that represent firms with this characteristic should also take this position. Domestically-focused firms also tend to be less productive than multinational firms because of the economies of scale that exist in the oil industry, which should magnify this effect. As the ratio of international to domestically-produced oil increases, on the other hand, we expect the intensity of firm support for an import tariff should fall. We thus expect firms that have their production strongly weighted towards international production, or that produce oil wholly outside the United States, to oppose a tariff. We expect the preference for protection to be less intense

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<sup>11</sup>API gravity is a measure of the specific gravity of oil. A higher number represents a lighter-quality oil.

among the integrated majors, given their higher productivity and their international presence. Size and number, however, make them more likely to mobilize politically. Taken together, this suggests that we can expect a lower probability of collective action by crude oil producers in the import tariff case.

*Refiners*

We expect the position of independent refiners, on the other hand, to depend on their ability of refiners to pass costs onto consumers. If we assume consumer demand is unaffected – which is reasonable given the short-term inelasticity of demand for many products – then we expect refiners to be relatively indifferent towards a tariff. On the other hand, a tariff on imports represents an increase in input costs, and refiners also consume crude oil in the refining process.<sup>12</sup> Our expectation is thus that refiners will bear some of the costs associated with a tariff, and thus should oppose it.

*Marketers and Consumers*

If we assume that demand is inelastic in the short run with respect to the price of final products then we expect consumers to express a preference against the imposition of an import tariff on both crude oil and oil products, although this effect should be constrained by the level of competition. In a less competitive market, producers and refiners can be expected to pass along a share of the costs to final consumers. If the market is more competitive, on the other hand, then this limits the ability of these firms to pass costs along to final consumers.

Table 2: Oil Import Tariff - Expectations

	Domestic	International	Integrated
Independent Producer	Strongly Support		
Independent Refiner	Oppose		
Multinational Producer		Strongly Oppose	
Multinational Integrated Firm			Mixed
Marketer or Consumer	Oppose		

<sup>12</sup>A simple rule of thumb is that it takes one barrel of oil-equivalent energy in order to refine ten barrels of crude oil (Office of Technology Assessment, 1983).

## Case 2 - Excise Tax

The second case we examine is an excise tax. The distributional effects of an excise tax differ from an import tariff. Instead of being applied at the border, an excise tax is imposed on the sale of a good. In the case of oil, an excise tax – called the Windfall Profits Tax – was placed on domestically-produced oil in March 1980.<sup>13</sup> Rather than allowing oil producers to capture all the rents associated with the rise in oil prices, the tax redistributed revenues away from producers and towards the government. The tax was terminated in January 1991.<sup>14</sup>

The basic effect of the tax was to increase the marginal cost of producing oil domestically. It was not applied evenly, however. Oil produced in “stripper” wells (wells producing small amounts of oil) were exempted after 1981, lessening the collective burden on independent producers. The tax was also applied on a differential basis against multinational integrated firms. For firms operating in the domestic oil production segment only, 50 percent of the “excess” profits – as calculated according to a formula linking prices to historical production costs – was taxed for wells that produced oil prior to 1979. The equivalent rate for the integrated majors was 70 percent.

The distributional effects of the tax were substantial. Net revenues flowing to the government between 1980 and 1990 reached almost 38 billion dollars, after deducting 37 billion dollars from gross revenues because the tax was deductible. The tax also reduced the domestic production of oil by cutting investment, thus increasing demand for imported oil. Further, crude oil prices were set in the world market following price liberalization, meaning domestic producers were unable to pass costs along given the ability of refiners to substitute internationally produced oil for domestic oil. The tax is estimated to have reduced domestic production by between 1.2 and 4.8 percent, relative to what it would have been in its absence. The Congressional Research Service noted that “since the tax was imposed on oil production – i.e., upon its removal and sale – extraction (and other upstream operations) was penalized and other aspects of the business (refining and marketing), the downstream operations become relatively favored (Lazzari, 2006).

### *Producers*

What are our expectations of the policy positions of firms operating in different market segments towards the excise tax? Most obviously, firms producing crude oil within the United States are

<sup>13</sup>The implementation of the tax was concurrent with the liberalization of oil prices.

<sup>14</sup>This section draws from Lazzari (2006).

likely to oppose the imposition of the tax. Firms producing oil both internationally and within the United States are likely to have less intense preferences, however our expectation is that they nevertheless oppose it given that the tax was designed to impose greater costs on them. Their preferences are likely to be less intense, however, as the ratio of international to domestic oil-produced increases, and refinery operations are unlikely to suffer because the price of inputs will not change. The intensity of preferences against the tax depends on their ability to switch supply from foreign to domestic. Together, this suggests a greater probability of independent producers and multinational firms coalescing in the case of the excise tax, when compared to the import tariff.

*Refiners*

Our expectation for independent refiners, on the other hand, is that they are indifferent towards the tax. This is because the price for oil is set according to the world price, meaning it is unlikely to lead to an increase in the cost of inputs. There are two caveats, however. First, it is plausible that refiners should support repeal because the administrative burden associated with the tax fell on them. Second, it is also possible that refiners will oppose the tax because of switching costs, given that the need to substitute internationally produced for domestically produced oil is not costless in the short-term.

*Marketers and Consumers*

Finally, we expect consumers are indifferent towards the excise tax. As with refiners, this is because the price of oil is set in a global market, making it implausible they would bear the costs of the tax.

Table 3: Excise Tax on Domestically Produced Oil - Expectations

	Domestic	International	Integrated
Independent Producer	Strongly Oppose		
Independent Refiner	Indifferent		
Multinational Producer		Oppose	
Multinational Integrated Firm			Oppose
Marketer or Consumer	Indifferent		

To summarize, we expect to observe different political alignments across the two policy instruments. In the oil import tariff case, we should observe a split between domestic oil producers, and integrated, multinational firms, with the latter indifferent or in opposition to the tariff. Consumers

should also oppose the tariff because of its implications for final product prices. Refiners, on the other hand, should be indifferent, assuming they are able to pass costs along to final consumers. In contrast, in the excise tax case we expect a different set of political alignments. Refiners should once again be indifferent. Domestic producers and integrated firms should be unified in opposition to the tax, however, although the intensity of the preferences of the latter should strictly fall as the ratio of international to total crude production increases. Unlike in the tariff case, consumers should be indifferent to the excise tax.

## **Analysis Part I - Industry Segmentation and Policy Preferences**

We use a revealed preferences approach, following Magee (1977), to examine the policy preferences of firms and industry associations towards the two instruments. We draw the data used to identify the policy preferences of the relevant actors from congressional hearings. For the tariff case, we extracted all oil-related hearings, as categorized in the *Policy Agendas* database.<sup>15</sup> We then used hearing titles to identify hearings focused on oil imports for the years 1979 and 1987. This yielded eight hearings across the House and Senate, and a total of 133 statements by firms or industry associations within these hearings.<sup>16</sup>

We coded two types of data. In the first instance, we identified the characteristics of the firms and industry associations offering testimony, identifying which market segment they operated in, whether they were integrated across market segments, whether they held international assets or were focused domestically, and whether they were representing marketers or consumers of final products. We also coded whether the testimony was offered by an individual firm or an industry association. The second piece of information we coded was whether the testimony offered support for a quota or tariff on crude oil, and/or a quota or tariff on oil products.

We applied the same procedure for the excise tax case, using the *Policy Agendas* database to identify hearings from 1979 to 1987 focused on the excise tax. This yielded a total of seven hearings across the House of Representatives and the Senate, for a total of 82 statements. We then hand-

<sup>15</sup><http://www.policyagendas.org>, accessed December 4, 2012.

<sup>16</sup>We ignored testimony by actors without a substantive interest in distributive outcomes in the sector, such as consultants and law offices. We also did not code the policy positions given by members of the executive branch. See appendix for coding rules.

coded the actors giving testimony according to their industry profile, and identified their position towards the excise tax. Hand coding testimony is more time consuming than automated text parsing approaches; yet at the current level of technological development of text parsing programs, hand coding provides a major advantage: it allows to identify the direction and intensity of preferences towards the policy instrument.

## **Results - Oil Import Tariff**

We expect firms producing oil within the United States alone, and the industry associations that represent them, to overwhelmingly support the imposition of an oil import tariff, because the policy increases the price of internationally produced oil relative to domestic oil. More productive oil producers with international production assets, on the other hand, have mixed incentives: increasing the price of international relative to domestically produced oil reduces the profitability of oil produced internationally and imported into the United States for refining or direct sale to an independent refiner. Yet, these firms produce some oil within the United States, implying the profits associated with this production should be increased by the tax. These firms also have access to international markets, and thus have the opportunity to redirect international production to international markets, while profiting from the increased rents available within the domestic market.

Oil producing firms with an international presence are commonly integrated across market segments. We thus expect these firms to weakly oppose the imposition of an oil import tariff, given that it has an effect on refining assets in addition to domestic production. Independent refiners, on the other hand, are likely to oppose the measure as it implies an increase in costs, if we assume short-run transaction costs and take into account the consumption of oil used in the refining process. Finally, we expect marketers and consumers to oppose the imposition of an oil import tariff because they cannot shift to substitute goods meaning an import tariff implies an increase in the price of oil products.

What do the results show? As expected, domestic producers of crude oil overwhelmingly supported the imposition of an oil import tariff. Of the 20 instances of testimony between 1979 and 1987, .85 supported an import tariff. This understates the degree of support given that 11 of the

Table 4: Support of Import Tariff on Oil - Results

Category	Type	Example	Support	N	No. of IAs
Producer	Domestic	Independent Petroleum Association of America	.85	20	(11)
Integrated Producer	Multinational	Chevron Corporation	.50	4	(1)
Refiner	Domestic	Independent Refiners Coalition	.43	7	(4)
Consumer	Domestic	National Ski Areas Association	.00	92	(69)

Note: The unit of analysis is instances of congressional testimony. “Position” is the ratio of total entries supporting the imposition of a crude oil import tariff. “N” is total number of recorded entries. “No. of IAs” is number of industry associations within total instances of congressional testimony.

20 instances of testimony were industry associations, which have multiple members.<sup>17</sup>

The summary of testimony presented in Table 4 also shows firms with both an international presence, and integrated across the supply chain, had mixed views on the oil import tariff. This is consistent with the mixed incentives they face, although the result is tempered by the small number of instances of testimony. The position of independent refiners is also mixed, with three of seven instances of testimony supporting the imposition of a tariff, and four indifferent or against. One way to interpret this that firms were unsure about their ability to pass the costs of the tariff along to final consumers, with greater confidence associated with indifference towards the tariff. Finally, independent marketers and consumers of final products, as expected, were overwhelmingly opposed to the imposition of an import tariff, with uniform opposition across the ninety-two firms and industry organizations offering testimony.

The lobbying coalitions implied by this analysis are clear: the most important political cleavage for the proposed import tax was between domestic oil producers and final product consumers. Domestically focused producers strongly supported the imposition of a tariff on oil imports, but had limited allies among the independent refiners and the integrated multinational firms, which faced mixed incentives. They also strongly opposed by the marketers and consumers of final products.

<sup>17</sup>Given that the unit of analysis is individual instances of congressional testimony, there are multiple statements recorded by the same association, somewhat reducing the downwards bias of the result. See data description for details.

## Results - Excise Tax

The second instrument we examine is an excise tax. As with the oil import tax, we hand coded the position of firms and industry associations towards the instrument. In this case, we recorded those giving testimony in favor of the imposition of tax, as a ratio of the total number of firms or associations within a particular market segment giving testimony. Where no firms or industry associations of a given type were found to be giving testimony, we recorded “No Entry.” The results are shown in Table 5 below.

Table 5: Excise Tax on Domestically Produced Oil - Results

Category	Type	Example	Support	N	No. of IAs
Producer	Domestic	North Texas Oil and Gas Association	0	36	(34)
Integrated Producer	Multinational	Chevron Corporation	0.3	10	(2)
Refiner	Domestic	Independent Refiners Coalition	No Entry	No Entry	No Entry
Consumer	Domestic	National Association of Manufacturers	.11	9	(6)

Note: The unit of analysis is instances of congressional testimony. “Position” is the ratio of total entries supporting the imposition of a crude oil import tariff. “N” is total number of recorded entries. “No. of IAs” is number of industry associations within total instances of congressional testimony.

The results in Table 5 show that the preferences of firms and industry associations match expectations, with the exception of consumers. Domestic producers strongly opposed the imposition of the excise tax, which is unsurprising given the distributive burden of the tax fell largely on them. Once again, while thirty-six entries were recorded from the hearings in this category, a large number of these entries were from regional and other industry associations representing the consensus of member firms.

A plurality of integrated majors also opposed the imposition of the tax. All but three instances of testimony entered testimony opposing the tax. One of the instances of testimony records the preference of the American Petroleum Institute, which has the broadest membership profile of the oil industry associations. Of the remaining instances of testimony, two expressed no explicit view, while the third – Exxon Mobil – is recorded as opposing the tax in a different instance of testimony. One way to interpret this result is that the costs of switching domestic and international production outweighed the potential benefits in terms of increasing imports. This is particularly

likely if the firms were segmented operationally (i.e., using domestically produced oil to serve the domestic refining market, and internationally produced oil to serve the non-US refining market). In addition, the weight of the tax was designed to fall more heavily on these firms, increasing the likelihood they would oppose the tax.

Examining the content of the testimony suggests a second reason for this opposition. Firms that made their position clear appeared to place more weight on the importance of the policy's effect on the profitability of investments already made in domestic production than on any potential benefit in terms of greater imports. An Exxon representative, for example, emphasized the effect the tax would have on its domestic operations in Alaska, and argued that the tax would affect the firm's interest in investing in projects within the United States, given the effects of the tax on the profits of a project already invested in: "the bill will adversely affect ultimate recovery and production levels from the Prudhoe Bay field...it will adversely affect investment in other large expensive high-risk energy ventures throughout the United States and [it] is both discriminatory and inequitable and in fact constitutes a rollback in the price of Prudhoe Bay crude" (Slick Jr., 1979, 220).

Concentrated consumers – such as manufacturing and other industries – largely opposed the imposition of the tax; our expectation was that consumer organizations would be relatively indifferent. What explains this difference? Once again, testimony offers a suggestion: the difference emerges not because of the expectation of higher costs, but rather because many feared that it would lead to spillover effects through similar taxes being imposed on other industries. The representative of the Chamber of Commerce of the United States, for example, which claimed 85,000 members, argued that it "would set a harmful precedent that could lead to similar taxes on other commodities, such as beef, sugar, timber, or wheat" (Carlson, 1979, 266). The National Association of Manufacturers, which claimed 12,000 member countries representing 75% of manufactured goods produced nationally, made a similar argument: "We oppose the principle of punitive tax measures applied to one sector of the economy...we are very concerned that such taxes would establish a precedent for using tax policy as a club against other industries which are highly visible and have been made politically unpopular" (Bixler, 1979, 226).

Thus the opposition of consumers appears not to have been shaped by the distributive effects of the tax itself, but rather concern that the imposition of the tax increased the likelihood that other industries could face similar taxes in the future. Lastly, no testimony was recorded for refiners or

marketers. While this does not provide direct information on the position of refiners towards the excise tax, the frequency of testimony is associated with more intense preferences for (against) a given policy instrument. This is consistent with expectations that they should be largely indifferent to the excise tax.

The coding exercise of congressional testimony provides sensible and intuitive evidence that firm heterogeneity affects trade policy preferences. We find that heterogeneity manifested itself more strongly in debates over taxes at the border: independent producers that operate in the upstream segment of the industry almost uniformly supported the imposition of import tariffs; refiners, integrated firms, and major international oil producers, on the other hand, express opposition to tariffs, and the evidence supports the contention that the intensity of their opposition depended on their degree of integration across market segments and borders. On the excise tax debate, the most important political cleavage emerged along industry lines: producers of oil and their by-products were unified in opposition the measure. In combination the results suggest that heterogeneity manifests itself differently depending on the distributional consequences of the policy instrument at hand.

Identifying actors' preferences is usually not enough to explaining policy outcomes. On one hand, the translation of those preferences into policy demands depends on traditional collective action problems. The supply side of politics, on the other hand, is a function of process of preference aggregation. In the ensuing sections we analyze whether the structure of employment in the states affects the propensity of legislators to vote for two bills aimed at repealing tariffs and quotas on oil, and imposing a windfall profit tax on oil production respectively.

## **Analysis Part II – Industry Preferences and Voting Behavior**

In the previous section we examined the policy preferences of industry actors towards an oil import quota and an excise tax on domestic oil, two instruments with distributive implications for firms operating in the oil industry. We found evidence that firms' preferences varied across segments within the same industry: actors operating in different stages of the oil supply chain preferred an effective rate of protection that was strictly positive for their own segment, and lower for other segments of the industry. We also found differences within segments among firms with different production and organizational structures. These differences become salient when the policy intervention affected

prices between segments of production. While all firms preferred lower prices upstream and higher prices downstream, the evidence suggested integrated firms were less sensitive to policy instruments that affected relative prices of a product that is traded within the firm. These integrated firms are also more productive, which could also explain their lower sensitivity to relative price changes.

While identifying actors' preferences is important, we still need to understand how those preferences relate to changes in policy. In addition to demands from industry groups policy outcomes reflect policymakers' ideological predispositions, and their incentives to cater to voters while supporting specific firms, groups, industries and regions. In this section we examine the relationship between industry preferences and the policy preferences of legislators, revealed through their voting behavior. Our empirical strategy centers on an econometric study of votes held in the U.S. Senate on measures related to the imposition of an excise tax on domestic oil, and the likelihood of tariff barriers being placed on imports of refined oil products.

Translating preferences into expectations about voting behavior poses challenges because of the need to incorporate the relative influence of industry groups and other political actors on legislators' maximand. There are a number of plausible arguments concerning the relative influence of industry organizations focused on the ability to overcome obstacles to collective action.

The first of these focuses on the intensity of industry preference towards a given policy instrument. Other things being equal, firms within a given industry segment should have stronger preferences towards a policy that has a greater impact on their bottom-line, and hence they should be more likely to expend resources in order to achieve their preferred outcome. Thus we can expect domestic oil producers to have strong preferences in favor of a crude import tariff, relative to oil producers that have an international presence or that operate across different market segments, and also be more willing to expend resources in order to influence voting outcomes on this measure. The evidence gleaned from congressional testimony confirms this is a reasonable assumption.

A second potential factor concerns industrial organization. Hart (2004) notes collective action problems tend to be more severe among small firms given that they are more numerous. Small firms, such as the independent crude producers in the case of the US oil industry, are also less likely to retain the resources to invest in shaping policy outcomes relative to large firms. If small producers are able to overcome their collective action problem, on the other hand, they have more votes with which to influence congressional behavior relative to larger and more diversified firms. Multinational

firms, on the other hand, are likely to be larger and more productive and thus have greater resources to apply to in seeking to change policy outcomes in their favor. They are, however, likely to espouse less intense preferences towards the policy, since they may not expect sufficient gains that would justify the cost of engaging in political action to influence policy outcomes. These firms are also likely to face a broader range of public policy issues than small firms, forcing management to judge the appropriate allocation of resources across each of these activities.

Combining preferences and incentives for collective action, our general expectation is that producers are more likely to be successful in lobbying for their preferred outcome and wield more political influence when they are unified. Thus policy instruments that benefit some producers while providing limited benefits, or imposing costs, on others, are less likely to generate collective action by producers. If we take the case of the oil tariff, for example, the division between domestic producers of crude and vertically integrated multinational firms that produce crude over the merits of imposing a crude import tax should – other things being equal – make firms in this market segment less likely to succeed in shifting the voting behavior of a legislator, relative to when they are unified. Similarly, the excise tax imposed greater costs on integrated, multinational firms than small producers, thus decreasing the intensity of opposition to the bill.

Our focus on two votes with substantially different distributional effects provides an opportunity to examine the relative importance of a number of these explanations. The votes selected for analysis occurred within a three year time span. This means theoretically relevant variables such as industrial organization, market structure, and thus political influence – in terms of votes or financial resources – of firms in each market segment are held relatively constant across the two votes. This means differences in voting behavior across the two bills can be attributed to the differential effects of the proposed bills on each group.

In the next section we describe each of the votes used in the analysis and summarize our expectations for the policy preferences of firms operating within and across industry segments.

## **Description of Votes**

The excise tax case involves a vote on the Senate conference report on the Crude Oil Windfall Profit Tax Act in the 96th Congress. The vote occurred on March 27, 1980. The vote centered on whether to adopt the conference report to the Senate on the Crude Oil Windfall Profit Tax

Act. It was the final vote before the measure was presented to the president for signing into law, meaning the vote was meaningful in distributive terms. It also coincided with the decision by the president to decontrol domestic oil prices. Lazzari (2006) notes passage of the tax was negotiated between the Carter Administration and congress. Oil prices were controlled in 1971 in order to limit inflation, and had the effect of holding domestic prices for crude oil and oil products below the world price. Price liberalization was expected to lead to a rise in the prices of crude oil and oil products to the world price.

The excise tax was designed to capture the “windfall” profits accruing to oil producing firms as domestic oil prices were decontrolled. These were considered to be a “windfall” because the world price for oil was influenced by the Organization of Oil Producing Countries (OPEC), rather than the marginal cost of oil production at home. The windfall tax was popular among the public because high gasoline prices were blamed in part on oil companies. Reflecting this, the structure of the excise tax was weighted towards oil produced by integrated oil majors: heavier tax rates were levied on these firms than on independent producers, although it was also treated as a deductible expense which lessened the burden to a degree (Lazzari, 2006).

The second vote is a proposed imposition of an import barrier on petroleum products. Section 232 of the Trade Expansion Act of 1962 gives the president the authority to limit imports of commodities that threaten national security. The vote analyzed here was a proposed as an amendment to the Energy Tax Act, which became law in 1978. It occurred on October 29, 1977, in the 95th Congress, and failed by a margin of 30–47. The Energy Tax Act became law in 1978 (Public Law 95-618), and included a range of measures designed to affect the demand for, and supply of, energy products. These included tax measures on inefficient automobiles, income tax credits for residential energy costs, and subsidies for solar, wind and geothermal energy equipment purchases.

The merits of imposing a tariff on imports of oil products was also proposed during debate over the law. The 1977 proposed amendment sought to withdraw from the president the authority to “impose or adjust tariffs, fees or quotas on the imports of refined petroleum products.” By removing this authority from the president, the amendment would have reduced the likelihood of barriers being placed on the import of oil products.<sup>18</sup>

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<sup>18</sup>Many bills were introduced into congress involving the oil industry, however the majority did not pass the committee stage. The “oil and natural gas” subcategory from the Policy Agendas Project

We utilize the same empirical model for both votes in order to maximize our ability to compare the effects of intra-industry heterogeneity on policy outcomes across the two policy instruments. In general terms, we propose that a legislator’s vote is determined by three factors: i) the ideological position of the legislator; ii) the welfare effects of the legislation on the legislator’s constituency; iii) the preferences of producers and consumers with interests in the oil industry. We thus state our empirical model as:

$$y_i = \mathbf{x}_i\mathbf{B} + \mathbf{z}_i\mathbf{\Gamma} + \mathbf{q}_i\Psi + \epsilon_i \tag{1}$$

The dependent variable  $y_i$  is a binary indicator of the support or opposition of legislator  $i$  to the measure;  $x_i$  is a measure of the ideological characteristics of the legislator;  $z_i$  is a vector of constituency characteristics; and  $q_i$  is a vector of industry characteristics.

We use party identification to capture the influence of the legislators’ ideological characteristics on the likelihood to support (oppose) the instrument. Ideology and party allegiance are identified as important factors affecting the voting behavior of legislators. In the excise tax case, for example, we expect Democratic Party legislators to be more likely to support adopting the conference report because the Democratic Party is considered to be more likely to support government intervention in economic markets and is less associated with the oil industry traditionally. We expect Republican Party legislators to be less supportive of government intervention and thus more likely to oppose the measure, holding constituency and industry characteristics constant. By the same intuition, in the case of the amendment proposing to remove from the president the ability to impose tariffs, quotas, or other measures on the import of oil products, we expect membership of the Democratic Party to be associated with opposition to the measure, while we expect membership of the Republican Party to be associated with support, after controlling for constituency characteristics and industry influence.

The second group of independent variables are designed to capture the characteristics of constituency  $i$ . Our expectation is that states with a substantial share of oil contributing to the local economy, or in which oil is a significant contributor to domestic employment, should oppose the

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Hearings Data Set shows that between the 80th and 108th terms of the House of Representatives there were 2,566 bills introduced to the House of Representatives, and 1,020 bills introduced to the Senate, that focused on oil and natural-gas related policies.

imposition of the excise tax given its long-term distributional effects, after controlling for ideology and other factors. Although price liberalization occurred at the same time as the Windfall Tax, which is expected to increase the contribution of the sector to the economic wellbeing of the state, this effect is likely to be muted in the short-term given the long time-lag between investing in new wells, and an increase in oil production.

In order to capture the importance of the sector to the economy we measured the total number of employees in the oil industry within state  $i$  in the vote-year, calculated as the ratio of state employees working in oil, refining, and pipeline employment to the total number of state employees. As an alternative measure we also calculated oil production in oil production, measured in thousands of barrels of oil production per day.

The third group of independent variables is intended to capture the influence of industry on legislators' voting behavior. Given that the demand is price inelastic due to the the lack of substitutes for many oil products, we expect both oil producers and consumers of oil products to be politically relevant. Building on the analysis of policy preferences in the previous section, we also expect that legislators' voting behavior reflects differences in the characteristics of producers operating within their districts. While many studies of intra-industry heterogeneity focus on levels of trade in intermediate goods, we develop more fine grained industry-specific measures intended to capture differences in the most prevalent forms of industry interests identified in the analyses of Congressional testimony presented above.

The first measure (*Presence of Independent Producers*) is a dummy variable that captures whether an independent oil producing firm is operating in state  $i$ . It is calculated using data compiled from the integrated majors' annual reports, combined with production data from the EIA, and codes oil producing states in which the integrated majors are not active. The second variable designed to capture variation in producer characteristics on a state basis measures the importance of the state to integrated oil producers (*Integrated Firms Producing in State Ratio*). Once again we use annual reports of the most important integrated oil producing firms, as identified by the U.S. Department of the Commerce, and coded whether they produced oil in the relevant state. Rather than use a dummy variable, which does not differentiate between states in which integrated production was important and those in which was not, we instead calculated the ratio of total integrated firms producing in the state as a ratio of all integrated firms, with the intuition

that more integrated firms producing in the state is likely to suggest an increased importance of the state to integrated firms production, as well as an increased influence of integrated firms on voting behavior.

A third group identified as important in the oil sector are vertically-segmented refiners focused on the domestic market. We capture this group by measuring the refinery capacity of refiners operating in the state that are not affiliated with integrated majors (*Ln Independent Refinery Capacity*). This was calculated using data drawn from the Mineral Industry Survey of the U.S. Department of the Interior.

Finally, we disaggregate consumer interests into two groups, depending on the likely intensity of preferences towards the policy instrument and the significance of the collective action problem faced by consumers. Analysis of the demands from industry on members of congress typically focus on the interests of producers, under the assumption that consumers interests are less organized. In the case of oil, however, demand for oil products is price inelastic. Oil products also are a significant share of total costs in the transport sector and a number of industrial sectors.

Reflecting this, we include measures intended to capture the interests of both concentrated and unconcentrated consumers of oil products. The first is a composite measure of industrial and transport consumers (*Ln Concentrated Consumption*). We expect firms with these characteristics to have more intense preferences towards refined product prices given the importance of oil within their industry. Additionally, these groups are also expected to face fewer collective action problems. The second captures the interests of residential and commercial consumers (*Ln Non-Concentrated Consumption*). In contrast to concentrated consumers of oil products, these groups are expected to face more significant hurdles to engaging in collective, given their less concentrated industry structure. They are also likely to have less intense preferences towards the policy, given that oil products are a smaller share of costs when compared to industrial and transport users.

In the table below we summarize our expectations across two dimensions for each of these votes: i) the expected direction of influence of the variable; ii) its intensity.

In summary, in the excise tax case we expect relative unanimity between crude producers and consumers, while refiners should be indifferent. If industry preference translates directly into voting behavior, then states that have a higher number of producers and consumers should thus be more likely to oppose the measure. In the case of the removal of executive authority to impose an oil

Table 6: Expectations - Excise Tax

Industry Segment	Type	Effect	Intensity
Producer	Domestic	-	weak
me Producer	Integrated	-	strong
Refiner	Domestic	i	0
Consumer-concentrated	Domestic	-	weak
Consumer-unconcentrated	Domestic	-	weak

Note: + indicates support for the measure, - indicates opposition, i indicates indifference.

Table 7: Expectations - Product Import Quota

Industry Segment	Type	Effect	Intensity
Producer	Domestic	-	weak
Producer	Integrated	-	weak
Refiner	Domestic	-	strong
Consumer-concentrated	Domestic	+	strong
Consumer-unconcentrated	Domestic	+	weak

Note: + indicates support for the measure, - indicates opposition, i indicates indifference.

product import quota, on the other hand, we expect that consumers should be set against producers and refiners, with producers opposing removal of the quota given that its imposition would lead to higher price for their output (which is an input in the production of refined products); the intensity of this preference, however, should be lower than if the quota was on imports of oil. Congressional members from more industrial states should thus vote in favor of the measure, while those weighted towards oil producing and refining districts should be more likely to oppose.

## Results of Empirical Analysis of Roll Call Votes

### Crude Oil Windfall Profit Tax Act of 1980

There are a number of findings worth highlighting in the analysis of the voting data associated with the adoption of the report in the Senate.<sup>19</sup> First, in terms of ideological predisposition, the coefficient is both positive and significant, and hovers around the same value across each of the model specifications. Democratic senators were more likely to vote in favor of the measure, even after holding other factors constant. This matches the intuition that Democratic Party members

<sup>19</sup>See appendix for full results.

were more willing to countenance taxing industry. It is also unsurprising given that the measure was promoted by a Democratic Party president who had staked political capital on the twin issues of oil price decontrol and the imposition of the excise tax on oil producers.<sup>20</sup>

What does the data suggest about the relative influence of producer firms on voting behavior? The simplest measure of oil production – which does not differentiate between the different characteristics of firms producing crude – suggests greater oil production is associated with a lower likelihood of voting in favor of the measure. It is possible that legislators themselves feared the economic impact of the tax on the state economy because of reduced re-investment by producer firms, and so were less likely to support the measure as oil increased as a share of the local economy. It is also possible legislators were influenced by producers themselves. Regardless, this is consistent with the unified opposition of domestic producers to the measure, in addition to a number of integrated firms, found in congressional testimony.

If we decompose the broad measure of producers into integrated producers and non-integrated producers, then the sign is negative in both cases, as expected. However, while the presence of integrated producers is significant across each of the specifications, it is not significant in the case of independent producers in any of the specifications, and turns marginally positive in the last model. There are two plausible explanations for this. Substantively, the structure of the tax was weighted more heavily against integrated firms, making it possible that the design of the tax reduced the intensity with which domestic producer firms sought to influence the voting behavior of congressional members. The imposition of the law was also concomitant with the liberalization of oil prices. Given the importance of price liberalization to domestic oil production, domestic producers may have accepted the quid-pro-quo of the Windfall Tax – given that it was weighted towards integrated firms – and so opposed it less intensely.

For integrated firms, on the other hand, price liberalization was likely to benefit them less given their international presence, and they were also penalized more heavily domestically. Their incentive to lobby members was therefore stronger than domestic firms. Technically, the locations that independent and integrated firms produce oil are sometimes, though not always, similar, making it more difficult to separate their independent influence on legislators' votes.

Turning to the refining segment, we find no statistically significant relationship between the

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<sup>20</sup>Results are substantively the same when using DW Nominat scores.

capacity of independent refining firms and the voting behavior of congressional members. This is also in line with expectations. While only indirect evidence, refiners did not offer testimony on the excise tax, which is expected given that the law targeted producers: if demand is relatively inelastic then refiners could also expect to be able to pass any increases in the cost of inputs onto final consumers. A second possibility is that refiners opposed the measure but were less able to influence legislators themselves. Supporting this interpretation, refiners tend to be capital intensive with fewer employees than other segments, and refiners' contribution to state GDP is also lower than for the producer segment of the supply chain. It is not consistent, however, with the lack of testimony by independent refiners - we would expect them to give testimony regarding issues they had intense preferences over. We are unable to separate these two possibilities from one another in the empirical model used here.

If we move to consider consumers, our expectation – drawn from the congressional testimony examined above – was that concentrated consumers, in particular, should oppose the measure. If we examine the broadest measure of consumers – which does not differentiate between different types of consumer groups – we find that the measure is not significant across the models. If we decompose the measure into concentrated and non-concentrated consumers, the results suggest a higher number of non-concentrated consumers in the district were associated with a greater likelihood of voting for the measure. This position differs from that adopted by concentrated consumers such as industry associations in the transport sector, which testimony shows almost uniformly opposed the imposition of the excise tax.

Ultimately the Crude Oil Windfall Profit Tax was signed into law after the conference report was adopted in both the Senate and the House of Representatives. How can we understand this outcome, given the position of producers and the testimony from concentrated consumers? One interpretation focuses on the timing of the vote. Oil prices increased markedly in the wake of the Iranian Revolution of 1978-1979, and there was significant consumer anger at the increase in prices. This anger was also directed at oil firms. Voting behavior is thus plausibly affected by policymakers' incentive to respond to consumer unhappiness at the perceived profiteering of oil firms. This interpretation is supported by the data, which suggest that a larger number of non-concentrated consumers in the district was associated with a greater likelihood of voting for the measure. Further, while a secondary effect of the excise tax may have been to increase consumer

prices, gasoline costs are a smaller component of residential users, making it more possible for them to support punishing oil firms without suffering significant costs.

### **Amendment to Remove Presidential Authority to Impose Oil Product Tariffs, Fees or Quotas**

The proposed amendment to the Energy Tax Act sought to remove from the president the authority to “impose or adjust tariffs, fees or quotas on the imports of refined petroleum products.” The distributive implications of the instrument thus differed from a tariff on crude oil imports because it focused on imports of final products such as gasoline. Our expectations were that domestically focused and vertically segmented producers, as well as international and vertically integrated firms, would combine with refiners to oppose the amendment, while consumers would support it. For domestic firms operating in the refining segment, on the other hand, we expected them to have intense preferences against the measure given that it reduces the likelihood that the president would increase the barriers to imports of refined products, thereby increasing the economic rents for refiners. This suggests that members of congress should oppose withdrawing this presidential authority as a function of the increasing importance of independent refiners within the local economy. Against this, as noted above, refiners tend to contribute a small amount to state GDP, and do not employ large numbers of employees. Data from the Bureau of Economic Analysis shows, for example, that there were only four states (Louisiana, Mississippi, Texas, and Wyoming) where refining contributed more than 1.1 percent to state output in 1977 – or two standard deviations above the mean. Thus while independent refiners may have intense preferences in opposition to the proposed amendment, their relative influence over legislators’ voting behavior is likely to be less than that of producers and consumers.

Beginning once again with the ideological predisposition of congressional members, the sign is negative across all models, which is consistent with expectations. Interestingly, the data show no statistically-significant relationship between membership of the Democratic Party and opposition to the measure across the models, in contrast to the excise tax. If we consider producers, on the other hand, a simple measure that aggregates all producers suggests that a higher weight of producer interests in the state is associated with a lower likelihood of support to the measure. This result is statistically significant in both in aggregate terms, as well as when it is decomposed into

vertically segmented and integrated firms. Thus despite differences in the distributional effects of the proposed change on the interests of domestically focused and vertically segmented producers and international and vertically integrated firms, on the one hand, and independent refiners, on the other, the results suggest that states with crude oil production tended to vote against the measure after controlling for other factors.

This conclusion is reinforced by the results that decompose refining interests. Our expectation is that given the lower economic importance of refining at the state level, measures of refining activity should not be a significant predictor of outcomes, even when independent refiners oppose the repeal of the authority to impose import restrictions. Although the sign is positive, it is not statistically significant, which is consistent with our expectations. Aggregating refining interests using the log of refining capacity by state is also not significant across the models. Thus the findings suggest that while independent refiners may have had intense preferences in opposition to the proposed amendment, their influence over legislators' voting behavior appears to have been superseded by other influences on legislators' vote choices. Refining also tends to produce fewer profits relative to the production of crude oil, making it likely that integrated firms are also less likely to seek to influence policymakers based on the effect of a given instrument on profits from the refining segment.

Finally, the aggregate measure of consumption of final products per capita was associated with a greater likelihood of a vote against the measure across most of the models, as expected. If we decompose consumers, however, the data suggests some differences between concentrated and non-concentrated consumers, although this must be considered tentative given the presence of collinearity between some of the production and consumption variables, as is shown in Figure A.1 in the Appendix. In particular, states with a higher degree of industrial and transport-related consumption were more likely to vote against the measure, while those with higher numbers of residential and commercial consumers were more likely to vote for it.

## **Conclusion**

Evidence of heterogeneity among firms within single industries implies the policy preferences of firms operating within single industries will diverge as those policies have different distributional effects on them. In this paper we examined empirically how patterns of within-industry specialization affect

the firms demands for protection, using the case of oil industry. In particular, we examined whether firms adopt different preferences within single industries, in accordance with the distributional effects of a policy. As we described, integrated firms are more likely to internalize the effects on downstream and upstream activities since they are present on both ends of the market segment. Thus they are likely to espouse policies that maximize the joint profits of the different units, weakening support for instruments that affect the prices of the inputs that are transferred among different units of the firm. Domestically-focused producers who sell to third parties, on the other hand, are more likely to support policies that increase the domestic crude price. Domestic producers who are also present in refining, on the other hand, are likely to espouse weaker preferences towards protecting oil production than domestic producers, and are also likely to mitigate the intensity of demands for and against protection. Refiners – and downstream consumers of oil products – on the other hand, would prefer policies that lower the price of oil, which they consume but do not produce. Changes in the relative price of a good or service resulting from a policy intervention can also plausibly pit producers against consumers.

We found substantial evidence of variation in the policy preferences of firms. An innovation in the paper is to examine how differences in the distributional effects of policies on firms operating in different segments of the supply chain. By examining two different instruments, we showed that the extent which which intra-industry differences are politically salient depends on the distributional effects of the relevant instrument. As expected, we found firm preferences differed depending on the particular effects of the proposed policy change on their material interests. As reflected in the testimony-related evidence, firm heterogeneity mattered in the crude oil tariff case, with firms operating in production and refining, major international producers and independent producers who only operate domestically, adopting different positions towards protectionism, whereas they presented a more unified front when the the instrument of choice is a tax on domestically produced oil. This was consistent with our expectations, and demonstrates that intra-industry firm heterogeneity matters for trade policy preferences, but also shows that the salience of these differences also varies depending on the distributional implications of the policy instrument itself. One implication of this is that, given the prevalence of NTMs in shaping trade flows, studies should pay careful attention to the distributional effects of individual NTMs, in addition to industrial organization-related factors, when investigating the correlates of political behavior in the political economy of trade.

In the second part of the paper we examined the implications of intra-industry heterogeneity for policy outcomes. In addition to producer interests, we also included the interests of consumers, and disaggregated these into concentrated and non-concentrated consumers of oil products. Traditional political economy accounts suggest producers who organize politically are better at exerting influence on policy-makers, although the relative political influence of producer can also be expected to be balanced against consumers of their output are organized. We found that even when dealing with highly heterogenous actors with differences in productivity the degree of integration at home and abroad, and other differences, we found that models of traditional sectoral or producer against consumer cleavages perform well in explaining policy outcomes.

Taken together, these findings are consistent with the idea that intra-industry firm heterogeneity matters for the politics of trade, but the degree to which it is likely to effect policy outcomes varies according to the distributional effects of the policy instrument in question. It is also consistent with the idea that some cleavages become more salient than others in the process of preference aggregation that policymakers engage in. Indeed, evidence shows that differences in how political institutions aggregate the preferences of interest groups also has substantial implications for trade policy outcomes (Lohmann and O'Halloran, 1994). Future research could therefore probe whether and how the degree of political salience of intra-industry firm heterogeneity varies not only by policy instrument – as we have shown above – but also according to different levels of interest aggregation. Districts in the U.S. House of Representatives, for example, are geographically smaller than those of the Senate, and one expectation might be that intra-industry firm heterogeneity matters more for voting behavior at lower levels of interest aggregation.

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Table 8: Probit Analysis: Windfall Profit Tax Vote (Consumers v. Producers)

Vote for Windfall Profit Tax	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Democrat	1.453*** (0.326)	1.525*** (0.310)	1.474*** (0.324)	1.455*** (0.343)	1.456*** (0.325)	1.478*** (0.327)	1.453*** (0.324)	1.472*** (0.337)
Ln Oil Production	-0.258*** (0.070)	-0.325*** (0.071)	-0.211*** (0.063)	-0.252*** (0.072)	-0.282*** (0.075)	-0.242*** (0.065)	-0.259*** (0.070)	-0.224*** (0.065)
Ln Total Consumption	0.214 (0.157)	0.118 (0.185)						
Ln Refining Capacity		0.059 (0.047)						
Ln Residential Consumption			0.152 (0.125)					
Ln Commercial Consumption				0.307* (0.161)				
Ln Industrial Consumption					0.207 (0.138)			
Ln Transportation Consumption						0.160 (0.123)		
Ln Concentrated Consumption							0.188 (0.152)	
Ln Non-Concentrated Consumption								0.280* (0.157)
Constant	-2.097 (1.719)	-1.437 (1.892)	-1.084 (1.077)	-2.115* (1.227)	-1.668 (1.289)	-1.447 (1.304)	-1.777 (1.633)	-2.278 (1.393)
Observations	100	100	100	100	100	100	100	100
<i>pseudo</i> - $R^2$	0.304	0.319	0.300	0.326	0.305	0.302	0.301	0.318

Standard errors in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 9: Probit Analysis: Windfall Profit Tax Vote (Market Segments)

Vote for Windfall Profit Tax	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Democrat	1.453*** (0.326)	1.564*** (0.300)	1.312*** (0.301)	1.452*** (0.316)	1.311*** (0.291)	1.421*** (0.318)	1.451*** (0.320)
Ln Oil Production	-0.258*** (0.070)	-0.318*** (0.070)					
Ln Total Consumption	0.214 (0.157)	0.118 (0.182)	0.093 (0.188)	0.428** (0.199)	0.146 (0.173)	0.239 (0.165)	0.448** (0.184)
Presence of Independent Producers		0.423 (0.358)			0.080 (0.332)	0.223 (0.344)	0.633 (0.409)
Ln Refining Capacity		0.050 (0.047)	0.012 (0.043)	0.079 (0.050)	-0.016 (0.044)		
Oil Employment Ratio			-0.422*** (0.121)				
Ln Oil Employment				-0.531*** (0.123)			-0.370*** (0.134)
Ratio of Integrated Firms in State					-2.049** (0.911)	-1.466* (0.854)	-0.057 (0.939)
Ln Independent Refining Capacity						-0.084** (0.040)	-0.017 (0.042)
Constant	-2.097 (1.719)	-1.473 (1.859)	-1.073 (1.911)	-1.654 (1.887)	-1.538 (1.745)	-2.258 (1.704)	-2.445 (1.679)
Observations	100	100	100	100	100	100	100
<i>pseudo</i> - $R^2$	0.304	0.328	0.294	0.329	0.234	0.286	0.330

Standard errors in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 10: Probit Analysis: Repeal Tax and Quota (Consumers v. Producers)

Vote for Drop Quota	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Democrat	-0.073 (0.306)	-0.075 (0.309)	0.029 (0.348)	0.045 (0.326)	-0.079 (0.302)	-0.080 (0.303)	-0.080 (0.303)	0.034 (0.348)
Ln Oil Production	-0.113*** (0.027)	-0.093*** (0.033)	-0.083** (0.034)	-0.112*** (0.030)	-0.107*** (0.028)	-0.105*** (0.026)	-0.106*** (0.027)	-0.098*** (0.032)
Ln Refining Capacity		-0.049 (0.039)						
Ln Total Consumption	0.316* (0.170)	0.423** (0.186)						
Ln Residential Consumption			0.729*** (0.169)					
Ln Commercial Consumption				0.601*** (0.167)				
Ln Industrial Consumption				0.174 (0.150)				
Ln Transportation Consumption					0.185 (0.168)			
Ln Concentrated Consumption					0.184 (0.167)			
Ln Non-Concentrated Consumption								0.770*** (0.180)
Constant	-3.733* (1.923)	-4.599** (1.985)	-6.910*** (1.608)	-5.159*** (1.381)	-1.882 (1.445)	-2.176 (1.811)	-2.221 (1.844)	-7.544*** (1.751)
Observations	100	100	100	100	100	100	100	100
<i>pseudo</i> - $R^2$	0.125	0.141	0.297	0.229	0.106	0.105	0.105	0.293

Standard errors in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 11: Probit Analysis: Repeal Tax and Quota (Market Segments)

Vote for Drop Quota	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Democrat	-0.103 (0.319)	-0.036 (0.301)	-0.073 (0.306)	-0.080 (0.309)	-0.252 (0.330)	-0.286 (0.338)	-0.212 (0.338)
Oil Employment Ratio	-1.144** (0.472)						
Ln Oil Employment		-0.252*** (0.095)					-0.246** (0.115)
Ln Oil Production			-0.113*** (0.027)	-0.092*** (0.032)			
Ln Refining Capacity	-0.049 (0.037)	-0.072** (0.034)		-0.048 (0.039)	-0.041 (0.039)		
Presence of Independent Producers				-0.084 (0.360)	-0.826** (0.389)	-0.975*** (0.373)	-0.752** (0.376)
Ratio of Integrated Firms in State					-0.059** (0.024)	-0.071** (0.031)	-0.061** (0.026)
Ln Independent Refining Capacity						-0.001 (0.036)	0.003 (0.039)
Ln Total Consumption	0.369* (0.201)	0.500** (0.194)	0.316* (0.170)	0.428** (0.186)	0.465** (0.224)	0.371* (0.223)	0.524** (0.234)
Constant	-4.026* (2.169)	-3.961** (2.015)	-3.733* (1.923)	-4.648** (1.981)	-4.977** (2.432)	-4.171* (2.497)	-4.348* (2.516)
Observations	100	100	100	100	100	100	100
<i>pseudo</i> - $R^2$	0.162	0.151	0.125	0.141	0.179	0.169	0.218

Standard errors in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Figure 1: Scatterplot Matrix

