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Explaining Government Spending on Industrial Subsidies

In plurality systems, geographically concentrated interest groups enjoy a political advantage because of the (re)election incentives politicians face. Politicians win office by securing a plurality of votes in their electoral district. To achieve this goal, politicians target benefits to groups concentrated in their district. In contrast, politicians in proportional systems have fewer incentives and little opportunity to selectively target benefits to their own district. Politicians in PR (proportional representation) systems work instead to garner votes for their political party. Parties work to assist geographically diffuse groups to maximize the number of seats they control in the legislature. Given these incentives, I hypothesize that geographically diffuse interest groups will enjoy greater political influence in proportional electoral systems, as compared to plurality systems.

Although the logic of my argument is general and can be applied to a variety of policy areas, I focus here on economic policy, and specifically on government-funded subsidies. A subsidy is a financial contribution by a government or agent of a government that confers a benefit on its recipients. Although governments subsidize many types of different groups, I focus here on government subsidies to businesses and specifically to producers. I investigate how much money governments spend on producer subsidies. Government spending on subsidies provides an expedient test of my argument. Nothing speaks louder about a government's priorities than how it spends its money. The more money governments spend on producer subsidies, the less money is available for other programs, such as education and health care. As an economist in the Indian government said, "every subsidy I am giving is money that the government could have spent elsewhere. Every subsidy means a primary healthcare centre I cannot build."[1]

[1] Economist Bibek Debroy from the National Institution for Transforming India, a Government of India policy think-tank. Quoted in the Economic Times, India

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Recipients of producer subsidies vary meaningfully across space; some recipients are geographically dispersed across an entire country while others are concentrated in small geographic areas. Given this, producer subsidies are almost infinitely malleable (Verdier 1995). They can be more or less narrowly targeted depending on the geographic distribution of potential beneficiaries and the eligibility criteria fashioned by the government. Governments can make subsidies automatic in nature with few, if any, eligibility criteria. For example, a government could subsidize the cost of energy for all businesses, regardless of their geographic location or sector. Such subsidies would be broadly beneficial. Alternatively, governments could impose restrictive eligibility criteria that effectively limit subsidies to select producers. Such targeted, selective programs are sometimes referred to as "pork barrel" spending Persson and Tabellini (2003: 14).

In this chapter, I focus on subsidies targeted by the government to the manufacturing sector. Manufacturing subsidies benefit people employed in the manufacturing sector. To ascertain the geographic distribution of these beneficiaries, I measure the geographic concentration of manufacturing sector employment. The geography of manufacturing employment varies between countries and this cross-national variation allows me to empirically test my argument about the interactive effect of geography and institutions on particularistic economic policy.

MEASURING PARTICULARISTIC ECONOMIC POLICY

To test my argument, I examine government spending on subsidies in developed countries. Specifically, I focus on the amount of money governments spend on subsidies for the manufacturing sector. Before reporting my empirical findings, I begin by justifying each part of my empirical strategy. First, I describe what subsidies are and why they are worthy of investigation. Second, I explain my focus on sector-specific subsidies – that is subsidies provided to a specific sector of a country's economy. Third, I explain why I focus on subsidies to manufacturing. Finally, I discuss the advantages of subsidies, as compared to other types of government spending, as well as potential drawbacks.

Times, May 7, 2017. "Scrap all production subsidies" http://economictimes.indiatimes.com/news/economy/policy/scrap-all-production-subsidies-niti-aayogs-bibek-debroy/articleshow/58560312.cms.

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What Are Subsidies?

Disagreement abounds about the precise definition of subsidies. "The word subsidy derives from the Latin word *subsidium*, which means 'help, support, or assistance' and in medieval times referred to a payment made to the king" (Fryde 1983, Steenblik 2017).[2] Today, subsidies cover a wide range of government policies. Subsidies include: cash grants, tax breaks, loans at below-market interest rates, loan guarantees, capital injections, guaranteed excessive rates of profit, below-cost or free inputs including land and power, and purchasing goods from firms at inflated prices.[3] The breadth of possible policy options generates confusion about exactly what constitutes a subsidy. The World Trade Organization provides one of the only internationally agreed upon definitions, which delineates a subsidy as a financial contribution by a government that confers a benefit on its recipients (WTO 2006). I adopt this definition.

Just as many definitions of subsidies exist, there is also a striking array of synonyms for subsidies. Frequently used terms include industry assistance, industrial policy, industrial strategy, corporate welfare, and government support programs. The European Union uses the term "state aid" to describe subsidies provided to producers by member state governments. Another increasingly common term is "economic incentive" (e.g. Jensen 2017), which typically refers to subsidies that take the form of a tax incentive. Tax incentives reduce companies' tax burdens thereby allowing businesses to keep a larger share of their revenue. Quantifying tax incentives is notoriously difficult and few, if any, cross-nationally comparable measures of tax incentives exist.

Like tax incentives, many other types of subsidies are also difficult to measure. Such difficult-to-measure subsidies include those provided through government procurement (e.g. Rickard and Kono 2014, Kono and Rickard 2014), policies that raise prices artificially (i.e. market price support), credit subsidies and government guarantees – just to name a few. An illustrative example of a difficult-to-measure subsidy comes from Norway, where the national government provides e-certificates to renewable energy producers.[4] Producers earn money from selling the e-certificates to electricity suppliers who then pass on the costs to

[2] www.iisd.org/gsi/getting-know-subsidies. For example, King Edward I of England provided large subsidies to potential enemies of France (Fryde, 1983: 1170). The most generous subsidies were paid by Edward I to the German king Adolf of Nassau (Fryde, 1983: 1170).

[3] This list is not exhaustive, but includes the most frequent types of support.

[4] www.regjeringen.no/en/topics/energy/renewable-energy/electricity-certificates/id517462/.

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consumers. These e-certificates are valuable; they were estimated to be worth 0.7 billion Norwegian krone (NOK) in 2013 and are expected to increase in value to 2.8 billion NOK by 2020.[5] Via these e-certificates, the government confers a valuable benefit on producers without incurring a financial liability. As a result, the subsidies provided via the e-certificates do not show up on the expenditure side of the government's budget. Such subsidies are extraordinarily difficult to identify and measure – especially in a systematic and cross-nationally comparable fashion.[6]

To sidestep these difficulties, I measure subsidies that generate financial commitments for governments and are therefore visible in government budgets. Subsidy schemes on the expenditure side of the fiscal budget include direct payments, grants, loans, or guarantees granted on preferential terms. A grant refers to a time-limited payment, either in connection with a specific investment, or to enable an individual, company, or organization to cover some or all of its general costs, or costs of undertaking a specific activity, such as research (Steenblik 2017)[7]. Other direct payments to producers may be linked to the volume of production or sales. By measuring subsidies that show up on expenditure side of the fiscal budget, I construct a cross-nationally comparable measure of governments' subsidy spending. This measure, however, represents a lower bound for total government support for producers.

Why Study Subsidies?

Subsidies are worthy of investigation because they have profound and long-lasting effects on the economy, the distribution of income in society, and the environment (Steenblik 2017).[8] Subsidies also provide valuable information about questions that lie at the heart of democracy: how responsive are politicians to narrow interest groups? When do governments privilege the interests of a few over the good of many? Government spending on subsidies and the variation in subsidy spending between democracies can help to provide answers to these important questions.

Democratically elected governments spend a sizeable amount of money on subsidies for business. In the European Union, subsidies to the

[5] Lone Semmingsen, Deputy Director General, Ministry of Finance, Norway, Written communication, January 20, 2015.
[6] However, the correlation between expenditure subsidies and total subsidies in Norway equals 0.6.
[7] www.iisd.org/gsi/getting-know-subsidies.
[8] www.iisd.org/gsi/getting-know-subsidies.

manufacturing sector accounted for 2 percent of value added in the sector in 2003 or approximately €1,000 per person employed in manufacturing (Sharp 2003).[9] In 2003, twenty-one developed countries spent nearly $250 billion on subsidies. Subsidies likely account for an even greater share of government expenditures in developing countries (IMF 2001, Fan and Rao 2003). In India, subsidies amounted to around 14 percent of GDP in 2016.[10] Total global spending on subsidies was more than $300 billion in 2003 and since then, subsidy spending by governments around the world has increased (Thomas 2007). Given the prominence of subsidies in governments' budgets and their significant effects, it is important to understand the politics behind these programs.

Governments spend more and more money on subsidies in response to the growing number of international agreements that limit tariffs. To assist domestic producers that face growing competition from foreign imports as a result of lower tariffs, governments often provide subsidies (Ford and Suyker 1990, OECD 1998, Rickard 2012b). For example, the Japanese government promised to increase subsidies to pig farmers in order to offset the reduction in pork tariffs agreed as part of the Trans-Pacific Partnership (TPP) multilateral free trade agreement.[11] As this example illustrates, governments may provide subsidies as a substitute for tariffs (Rickard 2012b). Subsidies are, in fact, one of the few tools policy-makers have remaining at their disposal to assist domestic industries. World Trade Organization (WTO) commitments restrict the use of tariffs and capital markets restrict exchange rate manipulation (Blomström, Kokko, and Mucchielli 2003, Thomas 2007). Given these international restrictions, subsidies may become the universal mode of state intervention in industry (Verdier 1995).[12]

Subsidies reveal valuable information about governments' spending priorities. Subsidies typically benefit a minority group (i.e. an industry or sector) at the expense of a majority of citizens (taxpayers). In other words, subsidies tend to provide concentrated benefits with diffuse costs. Subsidies to the US sugar industry, for example, uphold a domestic sugar

[9] Down from 3 percent in 1995 and 4 percent in 1990.

[10] This estimate includes budgetary and off-budgetary subsidies and those relating to consumption and production and comes from the National Institution for Transforming India, a Government of India policy think-tank. Times, May 7, 2017, "Scrap all production subsidies" http://economictimes.indiatimes.com/news/economy/policy/scrap-all-production-subsidies-niti-aayogs-bibek-debroy/articleshow/58560312.cms.

[11] The Japan News, May 21, 2014, S Edition, Business Section, p. 8 (accessed via Lexis Nexis).

[12] Some international restraints exist on subsides. However, theses "are either voluntary or do not bind in a significant way" (Rodrik, 2004: 32).

price two to three times higher than the world's market price (Mortensen and Pissarides 2001). As a result, sugar cane farmers in the United States receive, on average, an extra $369 million a year above the internationally determined value for the commodity (Beghin et al. 2003, Frieden et al., 2010: 234).[13] These benefits come at a cost to American taxpayers and consumers who pay $2.3 billion a year more for sugar due to government subsidies and other economic policies designed to support the industry (Beghin et al. 2003).

Because subsidies, like those to the US sugar industry, benefit select groups at the expense of many, government spending on subsidies provides valuable information about how leaders weigh narrow demands against broader societal interests. This is especially true when subsidy spending is reported as a percentage of total government expenditures, as it is here.[14] The ratio of subsidy spending to total government spending indicates the relative importance of subsidies among governments' myriad spending priorities. This ratio provides a novel, direct measure of how politicians weigh narrow demands against broader societal interests.

Estimating governments' responsiveness to narrow or special interests is notoriously difficult. Imperfect proxies have been used in earlier studies. National price levels, for example, have been used to estimate the responsiveness of politicians to narrow producer interests (Rogowski and Kayser 2002). Similarly, industry stock prices have been employed to measure industries' political influence (McGillivray 2004). These indirect measures, while creative, capture many factors that have nothing to do with governments' responsiveness to narrow interests, such as transportation costs, market size, and consumer demand (Rodriguez and Rodrik 2000).

To estimate how elected leaders weigh narrow demands against broader societal interests, some scholars investigate government spending patterns. However, the spending measures examined to date are far from ideal. Spending on social security payments and other transfers to families, plus subsidies to firms, has been used as a proxy

[13] Calculations are for 1998 converted into 2006 US dollars.

[14] Excluding interest payments. These spending data come from the International Monetary Fund's *Government Financial Statistics*. These data include all fiscal outlays targeted to the manufacturing sector. For example, all subsidies, grants, and subsidized loans provided to the manufacturing sector to support manufacturing enterprises and/or development, expansion, or improvement of manufacturing are included. Although conventional government accounts are generally not suitable for comparisons among countries and over time because they reflect the organizational structures of governments, these data, uniquely allow meaningful cross-national comparisons over time. For additional information, see IMF (2001).

narrowly targeted transfers (Milesi-Ferretti, Perotti, and Rostagno 2002). Broadly targeted transfers have been estimated using government spending on education, transportation, and order and safety (Persson and Tabellini 1999). Yet, both measures conflate programs that may be more or less narrowly targeted depending on the precise eligibility criteria outlined by the government. In contrast, subsidies provide a more accurate measure of governments' spending priorities. Using subsidies, it is possible to know exactly how targeted a given government program is by identifying the subsidy's eligibility criteria and the geographic distribution of eligible recipients. In sum, subsidies present a novel way to measure governments' responsiveness to narrow interest groups, which may or may not be geographically concentrated.

Why Focus on Sector-Specific Subsidies?

In this chapter, I focus on sector-specific subsidies – that is, subsidies targeted to a specific sector of a country's economy. Governments often specify their subsidy priorities in terms of sectors (Rodrik, 2004: 23; Chapter 7). Sector-specific subsidies are often voted on by legislatures and consequently provide a useful test of my theory. What's more, sector-specific subsidies are comparable between countries because of internationally accepted accounting rules. International accounting rules require governments to report total budget support to certain sectors of the economy, including manufacturing (IMF 2001). As a result, it is possible to measure how much governments spend on sector-specific subsidies in a cross-nationally comparable manner. In contrast, it is virtually impossible to measure government support for individual firms or industries in a cross-nationally comparable fashion. Governments have no international obligations to report how much money they spend on a given firm or industry. And individual industries are often aided by multiple budget items. The Australian wine industry, for example, was assisted by at least four different items in the 2003–2004 national budget including drought assistance, preferential excise rate, tax deductions for grape vines, and direct fiscal transfers to the Grape and Wine R&D Corporation.[15] These support programs are scattered throughout the budget and are managed by different government ministries.

Given the multitude of budget items that could potentially support a single industry, it is difficult, and arguably impossible, to calculate the total amount of financial support provided to an industry in a given country. As the UK government admits: "[t]here is no definitive source

[15] Author's calculations from government budget documents.

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of data about spending on subsidies to businesses in the UK."[16] As a result, aggregating total governmental budget support for individual industries in a cross-nationally comparable manner is virtually impossible. This empirical challenge likely explains the dearth of large-N, cross-national studies of government aid to individual industries.[17] In contrast, international accounting rules make it possible to compare spending on sector-specific subsidy programs between countries. For this reason, I focus on government spending on sector-specific subsidies in this chapter.

Governments in many countries have direct control over the amount of money spent on sector-specific subsidies. Legislatures often vote on how much money to allocate to particular sectors of the economy in the annual budget. In Norway, for example, the government specifies how much money will be allocated to the agriculture sector, the manufacturing sector, etc., in the annual budget, which is subsequently voted on by parliament.[18] Similarly, in Mexico, the initial allocation of funding for subsidies to the agriculture sectors is made by Congress.[19] Because national legislatures often decided how much money to spend on sector-specific subsidy programs, the political dynamics I theorize about likely impact sector-specific subsidy spending. In contrast, most governments

[16] www.theguardian.com/politics/2015/jul/07/corporate-welfare-a-93bn-handshake.

[17] Of course, some efforts have been made to overcome this data limitation. For select agricultural products, the OECD calculates producer support estimates and Anderson and Swinnen (2008) calculate "nominal rates of assistance." While these data are commendable, their usefulness for my purposes is limited. First, both measures are limited to agriculture products only, while my focus here is on manufacturing. Second, not all products are covered for all countries. Nominal rates of assistance were estimated for less than a dozen products per country on average (Anderson, 2009: 7). Wine, for example, is covered in some, but not all European countries. Wine is not covered in countries such as Australia, New Zealand, Chile, or South Africa. The lack of coverage does not reveal an absence of government assistance. The Australian wine industry, for example, is heavily subsidized via a multitude of government programs. Yet, wine is not included in either the OECD dataset or in Anderson and Swinnen (2008). Given the limited coverage, it is difficult to use these data to make cross-national comparisons of support to an individual industry or producer group. Finally, the measures of nominal rates of government assistance include non-product-specific forms of assistance or taxation in addition to industry or product specific aid. By combining both forms of assistance, these measures cannot be used to draw inferences about government support targeted to a single producer group.

[18] Once the sector-specific budget allocations have been set by the government, bureaucrats disperse the money. Bureaucrats are, however, constrained by elected leaders, as described in Chapter 7.

[19] The State Councils for Sustainable Rural Development (CEDRS) are formally vested with the authority to decide how to allocate agriculture-sector program resources (Palmer-Rubin 2016).

only have indirect control over the amount spent on subsidies for individual firms or industries. For these reasons, I focus here on sector-specific subsidies and how they vary between countries.

Why Manufacturing?

In this chapter, I focus on subsidies provided by governments to the manufacturing sector. I focus on the manufacturing sector for several reasons. First, data on manufacturing-sector subsidies are widely available and comparable between countries. Second, most research to date focuses exclusively on agriculture subsidies, and as a result the substantial variation in *manufacturing* subsides has gone largely unexamined. Third, governments in many developed countries face increasing demands to assist the manufacturing sector as employment in the sector declines. Government support for manufacturing was a key issue in the 2016 US presidential election campaign. Donald Trump's promise to bring "manufacturing back to America"[20] helped him win votes in historically Democratic areas and ultimately the election. As more and more governments come under pressure to aid manufacturing, my theory can help to explain why governments in some countries choose to spend more money on manufacturing aid than others.

Benefits and Weakness of Subsidy Measure

Examining subsidies brings many benefits. Subsidies illustrate governments' spending priorities and have long-lasting effects on a country's economy and the distribution of income within society. Yet, no empirical measure, including subsidy spending, is without weaknesses. One potential drawback of studying subsidies is the increasing number of international restrictions on subsidies. International agreements, including the EU and WTO, increasingly restrict governments' use of subsidies. International restrictions on subsidies may make it difficult to observe the domestic politics behind such programs. Although governments often have electoral incentives to provide subsidies, they may stop short of doing so because of international restrictions. This type of behavior would make it difficult to find evidence in support of my argument. In other words, international rules regulating subsidies may bias against finding any evidence of the theorized interactive effects of domestic institutions and economic geography.

[20] www.whitehouse.gov/the-press-office/2017/02/23/remarks-president-trump-meeting-manufacturing-ceos.

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In practice, however, many governments continue to subsidize domestic producers – even as members of the EU and WTO (OFT 2009). One reason for the continued use of subsidies is that most international restraints on subsides are "are either voluntary or do not bind in a significant way" (Rodrik, 2004: 32). As Rodrik points out, "[i]t is easy to exaggerate the significance of the [international] restrictions [on subsidies]. There remains much scope for coherent industrial policy" (Rodrik, 2004: 32). Most international agreements provide exemptions that allow for certain types of subsidies, including subsidies for research and development, small and medium-sized enterprises, innovation, training, regional development, employment, environmental protection, as risk capital, and for promoting entrepreneurship (OFT 2007). EU state aid rules also allow governments to provide subsidies to failing firms in the form of rescue and/or restructuring aid (European Commission 2009). Government use these exemptions to subsidize domestic producers. Their willingness to do so, I argue, depends on a country's electoral institutions and economic geography.

MEASURING ECONOMIC GEOGRAPHY

Given the strikingly uneven dispersion of economic activity, it is surprising how few empirical measures of economic geography exist. But measuring geographic patterns of economic activity is difficult. Doing so requires vast amounts of highly disaggregate data. Information about producers' geographic location is needed and such data are often unavailable or confidential – even in an era of ever increasing data transparency.

An illustrative example of the challenges involved in measuring economic geography comes from Austria – where measuring the geographic distribution of even a single industry proved difficult. I set out to measure the geographic distribution of Austrian wine production by collecting data on the geographic location of wine producers. Neither the government nor the industry itself had accurate data on the location of wine producers. A comparison of the wine industry organization's data for Vienna (*Wien*) in 2014 with data from the municipal authority revealed myriad discrepancies in the location of production sites.[21] As this example illustrates, it is difficult to measure economic geography – even for a single industry in one country.

Going forward, improvements in data transparency may make it easier to accurately measure economic geography. In Austria, for example, the wine marketing board wrote in 2014 that it hoped to have a new database

[21] Austrian Wine Statistics Report 2014.

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"based on a geographical information system which will allow an annual snapshot to be taken of the [geographic] distribution by grape variety in Austria's wine regions ... over the next few years."[22] Although this goal has yet to be fully realized, economic geography will likely become easier to measure as more accurate geographic data are compiled and shared.

Improved data-sharing among European countries allowed me to estimate the geographic distribution of manufacturing employment using entropy indices, which I describe in detail below. First, I begin with a brief discussion of the handful of existing empirical measures of economic geography.

Early studies used Gini indexes to measure the geographic concentration of an industry's regional and national employment shares (e.g. Krugman 1991). A Gini coefficient measures the inequality among values of a frequency distribution (for example, levels of employment in regions). A Gini coefficient of zero expresses perfect equality, where all values are the same while a coefficient of one expresses maximal inequality among values. Following Krugman (1991), Gini indices became the standard measure of geographic specialization patterns. The Gini index has strong intuitive appeal. These indices are straightforward to compute and relatively manageable in their data requirements. However, Gini indexes are limited in their usefulness because they cannot be decomposed into within-country and between-country components. The Gini index is only decomposable if the range of the values taken by the variable of interest does not overlap across subgroups of individual observations (Cowell 1980).[23] Yet, regions in different countries may have similar degrees of specialization in a particular sector. As a result, it is often not possible to accurately construct within-country and between-country components of geographic concentration using Gini indexes. This challenge may explain why virtually all existing research on the political consequences of geographic concentrated using Gini indexes is limited to single-country studies. To compare the effects of geographic concentration between different countries, decomposed values are needed.

Improvements on the Gini indexes emerged from the growing literature on economic geography. One such improvement was the "dartboard approach," developed by Ellison and Glaeser (1997). This approach controls for variation in the size distribution of plants in an industry and the size of geographic areas. However, this approach cannot distinguish between industries with concentration in parts of a country far apart from

[22] Austrian Wine Statistics Report 2014.
[23] Also see Cowell (1995) for a discussion of problems related to the Gini.

one another or in contiguous areas. For example, this approach could not distinguish an industry with employment in northern Wales and southern England from one with employment in two contiguous counties near London, even though the latter is clearly more concentrated topographically – a problem often referred to as the "checkerboard problem."

Some scholars have attempted to address the "checkerboard problem." For example, Busch and Reinhardt (2000) calculate geographic concentration by measuring the distance between each employee and the national "centroid" or midpoint for a given industry (p. 708). However, the center of a given industry is determined in an ad hoc fashion, which raises questions about the construction of this variable. Furthermore, calculating this variable requires a vast amount of data. As a result, it exists for only two countries both of which have plurality electoral rules: the United States and the United Kingdom.

Most recently, entropy indices have been used to measure geographic concentration.[24] These indices have several distinct advantages over earlier measures. One key advantage lies in their suitability for decomposition analysis. Using entropy indices, it is possible to compute within-country sector concentration measures in a conceptually rigorous fashion. Using entropy indices, I calculate the geographic concentration of manufacturing employment. More precisely, I calculate the degree to which employment in a country's manufacturing sector is geographically concentrated compared to a "no-concentration" benchmark. Two possible no-concentration benchmarks can be used. The first no-concentration benchmark is calculated by dividing the sector's total employment by the number of subnational units, or regions, in a given country. The resulting value reports how many people would be employed in each subnational unit if sector employment was equally distributed within the country. This value serves as a baseline no-concentration benchmark. For example, in 2014 there were 83,779 employees in the Norwegian petroleum and petroleum-related industries (Statistics Norway 2015). If employment in this sector was evenly dispersed across the country's nineteen electoral districts, each district would have 4,409 petroleum employees. This number is the no-concentration benchmark for topographical concentration. The no-concentration benchmark obtains where an activity is spread evenly over physical space. Any departure from such an even spatial spread will register as geographic concentration, irrespective of the spatial distribution of

[24] Prior to Brülhart and Traeger (2005), the use of entropy indices in studies of economic geography was relatively rare. However, entropy indices were common in the income distribution literature (see e.g. Cowell, 2000).

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endowments or of other economic sectors. I refer to this concept of geographic concentration as "topographic" concentration.

However, economic activity is not equally distributed topographically. In Norway, for example, some regions are sparsely populated and have little employment or economic activity of any kind. To account for this, I calculate a second measure of geographic concentration where I weight sector employment by total employment in each region. In other words, I condition physical space by the distribution of aggregate employment. If employment in the petroleum industry was perfectly distributed relatively to total employment, it would account for 5 percent of employment in each electoral district in 2014 (Statistics Norway 2015). This value represents the no-concentration benchmark. In reality, however, the petroleum industry it is concentrated geographically. In the western region of Rogaland, for example, the petroleum industry employs nearly 40 percent of the population. The deviation from the no-concentration benchmark indicates a high level of "relative" concentration. Relative concentration measures the degree to which sector employment is concentrated *relative* to the geographic distribution of aggregate employment. This concept of concentration is often (implicitly) invoked when theorizing about the political effects of economic geography. I use relative concentration measures throughout this book given its political relevance.[25]

While entropy indices have appealing characteristics, their computation requires disaggregate sector-specific employment data for subnational geographic units. These data are only rarely available in developed countries (and virtually nonexistent in developing countries). Given the large amounts of disaggregated data needed to construct entropy indices, my sample is necessarily limited. It includes only those countries that report disaggregated employment data for subnational regions in a cross-nationally comparable format. Fortunately, the European Union requires member-states to report data on employment by sector and subnational regions in a cross-nationally comparable format to Eurostat. These reporting requirements make possible the construction of entropy indices for fourteen European countries over two decades. Although this limited sample raises potential questions about the external validity of the results, it allows for direct comparisons with previous studies of electoral institutions that use similar samples (e.g. Bawn and Rosenbluth 2006,

[25] Although relative concentration captures a theoretically different concept than topographic concentration, the two are often highly correlated. In Norway, for example, the two measures of concentration are correlated at 0.9 over the period from 1999 to 2014.

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Persson, Rolland, and Tabellini 2007). As data transparency improves, it may be possible to construct entropy indices for additional countries in the future.

To calculate country-specific sector concentration measures, I use the following equation:

$$GE(1)_s = \frac{1}{N}\sum_{i=1}^{N}\frac{y_{si}}{\bar{y}_s}\log\frac{y_{si}}{\bar{y}_s}$$

where N is the number of NUTS-2 units in a given country. NUTS units refer to subnational geographic areas defined by the European Union's Nomenclature of Territorial Units for Statistics (NUTS). This classification scheme was designed for the purpose of the collection, development, and harmonization of statistics within the union, which makes it ideal for constructing cross-nationally comparable measures of employment concentration.

The NUTS classification is a hierarchical system for dividing up the economic territory of the European Union (EU). NUTS level zero corresponds to the country level. Increasing numbers indicate increasing levels of subnational disaggregation. The most disaggregated observed spatial units for which employment data are available for all sample countries over this period are NUTS-2 units. The EU defines NUTS-2 units as "basic regions for the application of regional policies."[26] The aim is to ensure that regions of comparable size all appear at the same NUTS level.[27] EU regulation defines minimum and maximum population thresholds for NUTS-2 regions. In Belgium, for example, the NUTS-2 units correspond to the country's eleven provinces.[28] In Austria, the NUTS-2 units correspond with the country's nine states or *Bundesländer*.

Despite population thresholds, NUTS-2 regions differ somewhat in terms of size, which generates a "unit" problem or what economic geographers refer to as, the "modifiable areal unit problem" (MAUP). This problem refers to the possibility that the results of statistical analysis of data for spatial zones can vary as a result of changing the zonal boundaries (Arbia 2001). In other words, using different levels of disaggregation can produce different results. To address this problem, I use NUTS-2 regions for all countries and years in my sample. Additionally, I condition physical space by the distribution of aggregate activity, which helps to minimize the modifiable areal unit problem.

[26] http://ec.europa.eu/eurostat/web/nuts/overview.
[27] http://ec.europa.eu/eurostat/web/nuts/principles-and-characteristics.
[28] http://ec.europa.eu/eurostat/web/nuts/national-structures-eu.

In the entropy index equation, y_{si} refers to employment in sector s in NUTS-2 unit i. Employment data come from Cambridge Econometrics.[29] For topographical concentration, $\overline{y}_s$ equals employment in sector s summed across all NUTS-2 units and divided by N. If sector employment is evenly distributed across N, the value of GE(1) will equal zero. For relative concentration, I calculate the percentage of employees in the manufacturing sector for each NUTS 2 unit. I then take the average across all NUTS-2 units in a given country. This value equals $\overline{y}_s$ for relative concentration calculations. The measure captures the degree of a sector's employment concentration relative to the geographic distribution of aggregate employment. The concentration variable ranges from zero to one with higher values indicating more geographic concentration.

MEASURING ELECTORAL INSTITUTIONS

I classify countries as being "PR" if proportional electoral rules apply to most of the seats in the lower house. More precisely, the variable *PR* equals 1 if proportional electoral rules are used to select most of the seats in the lower house and zero if most of the seats are filled via plurality. The data used to construct this variable come from the World Bank's Database of Political Institutions (Beck et al. 2001). As a robustness check, I also use an alternative data source to identify countries' electoral institutions (Golder 2005). Fortunately, Golder (2005) and Beck et al. (2001) are in complete agreement about the electoral institutions used in my sample countries.[30]

Although Germany has a mixed-member proportional electoral system, I code it as being PR. Mixed-member electoral systems, like Germany's, typically combine nominal-tier elections with list-tier elections (Shugart and Wattenberg 2001, Thames and Edwards 2006). In the former, citizens vote for individual candidates who accrue votes independently of party affiliation. In the latter, the distribution of legislative seats is according to votes for multiple candidates nominated on party lists. Germany's system is characterized as a mixed-member proportional system (MMP) by Shugart and Wattenberg because the total number of legislative seats received by a party is proportional to its list-tier results (Shugart and Wattenberg 2001). Since linking the tiers obtains outcomes that are proportional, MMP systems, like Germany's,

[29] For further information about the construction of the entropy indices, see Brülhart and Traeger (2005).

[30] There is one exception: Golder (2005) codes the French legislative elections in 1986 as being held via PR. This single difference does not change the results reported here.

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often resemble pure PR systems. In fact, several previous studies of the effects of mixed-member systems have demonstrated the similarity between MMP and PR systems (e.g. Moser 2001, Cox and Schoppa 2002, Ferrara and Herron 2005, Thames and Edwards 2006). I therefore include Germany together with the pure PR systems in my sample.

Several additional measures of electoral institutions are used to test the robustness of the results. First, Gallagher's (1991) least-squares index, which measures the disproportionality between the distributions of votes and seats, is used.[31] This variable (*Disproportionality*) ranges, in theory, from zero to 100. Lower values indicate less disproportionality (Gallagher 1991). An electoral system where the legislature perfectly matches the distribution of votes would receive a score of zero. A legislature scoring 100 would consist only of individuals for whom not a single member of the electorate voted. Usefully, Gallagher's disproportionality index provides greater cross-national variation than the dichotomous measure of electoral systems (PR).

Second, the variable *Ballot,* measures parties' control over access to the ballot (Johnson and Wallack 2012). Access to the ballot determines, in part, the extent to which an electoral system is candidate or party centered. Politicians competing in candidate-centered systems tend to have geographically defined constituencies and thus an incentive to cater to geographically concentrated interests. In contrast, politicians competing in party-centered systems tend not to have geographically defined constituencies. Instead, candidates' electoral fortunes are determined by their party's national electoral success. Thus, politicians in party-centered systems have fewer incentives to cater to geographically defined interests.

Third, *Mean District Magnitude* refers to the number of representatives elected per district (Johnson and Wallack 2012).[32] Many arguments linking electoral institutions to policy outcomes focus on the importance of district magnitude. Indeed, many political scientists, including Duverger (1964), argue that district magnitude is the single-most important dimension by which electoral systems differ. Districts with only one representative, frequently referred to as single member districts

[31] This measure is calculated for each country-election-year. For nonelection years, the least-squares index is from the most recent previous election. If two elections occur in the same year, the average of the least-squares index (LSq) for that country-year is used.

[32] District size is distinct from district magnitude – although they are often conflated.

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or SMDs, allow voters to assign credit to politicians for providing particularistic economic policies, such as subsidies. In multimember districts, voters observe the total amount of economic benefits provided to the district but not the amount produced by individual legislators. As a result, voters do not know which of their representatives to credit with providing particularistic policies (Ashworth and Bueno de Mesquita 2006). This reduces the electoral benefits of providing policies, such as subsidies, in multimember districts. If many legislators can claim responsibility for a policy with local benefits, each individual's incentive to provide such policies decreases (Lancaster 1986). Politicians in multimember districts may therefore provide fewer narrowly targeted economic policies than politicians in single-member districts (Magee, Brock, and Young 1989).

Some evidence exists to support this logic. Democracies with single-member districts face more allegations of providing narrowly beneficial trade protection at the World Trade Organization than democracies with multimember districts, holding all else constant (Rickard 2010). The number of GATT/WTO disputes filed against democracies with single-member districts is 186 percent higher, on average, then democracies with multimember districts (Rickard 2010). Moving from a multimember district system with an average of seven seats per district to a single-member district system increases the probability of being named as a defendant in a GATT/WTO dispute by more than six percentage points in a given year (Rickard 2010). This evidence suggests that district magnitude impacts economic policy. District magnitude may also have an indirect effect on economic policy by mediating the influence of electoral formulas (Carey and Shugart 1995, Carey and Hix 2011).[33] I examine this possibility in Chapter 6. In my sample, mean district magnitude ranges from one to 150. The variable *Mean District Magnitude* is logged to minimize the potential impact of outliers.

[33] For example, the effects of a proportional electoral formula may depend on the district magnitude. When district magnitude is high, electoral systems are relatively more proportional because smaller parties are more likely to win seats (Rae 1967, Taagepera and Shugart 1989, Cox 1997). A party would need to win more than 25 percent of the vote to guarantee a seat in a three-seat district but it would need to win only a little more than 10 percent of the vote to guarantee winning seat in a nine-seat district. The electoral system is likely to be disproportional whenever the district magnitude is small, irrespective of the particular formula used to translate votes into seats. For example, when PR is used in very small districts, as in Chile for example, its effects become similar to those of plurality elections.

EMPIRICAL MODEL

To investigate whether the effect of electoral systems on subsidies is conditional on the geographic distribution of voters with a shared interest in subsidies, the estimated models include an interaction term equal to the product of electoral systems and *Concentration*, along with both constitutive terms. More precisely, a partial-adjustment regression is estimated by ordinary least squares (OLS) with the following form and robust standard errors:

$$\text{Subsidies}_{it} = \beta_0 + \beta_1 PR_{it-1} + \beta_2 \text{Concentration}_{it-1} + \beta_3 PR_{it-1} {}^{*}\text{Concentration}_{it-1} + \beta X_{it-1} + \lambda_t + \varepsilon_{it}$$

where λ_t is a year fixed effect, and ε_{it} is an error term. The coefficient on β_3 is expected to be negatively signed. In other words, politicians in plurality systems will become relatively more responsive to demands for manufacturing subsidies as the geographic concentration of manufacturing employment increases.

Control Variables

X_{it-1} refers to a vector of control variables, which are lagged by one year to minimize concerns about endogeneity and take into account the fact that government budgets generally go through the legislative process and are voted on prior to the year in which spending occurs (Bawn and Rosenbluth 2006). All estimated models include three key control variables. The first is a measure of trade openness. Since manufacturing subsidies assist domestic producers in competing with lower cost foreign imports, countries more open to trade may spend more on subsidies. This is problematic if trade openness systematically relates to electoral institutions. Rogowski (1987) argued that countries dependent on international trade are more likely to have proportional electoral rules. To minimize the potential for a spurious correlation, a variable measuring trade openness as the sum of imports plus exports divided by GDP is included as a control.

A second important control variable is country size, measured by the natural log of a country's land area in square kilometers. Large countries will tend to have bigger manufacturing industries, which may increase government spending on manufacturing subsidies. Country size may also relate systematically to electoral systems; larger countries are more likely to have plurality electoral rules (Blais and Massicotte 1997). Controlling for country size minimizes the possibility of finding a spurious correlation between electoral rules and manufacturing subsidies.

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The third control variable included in all estimated models is *GDP per capita*. Electoral support from lower-income voters may be relatively cheaper to "buy" using subsidies (Lindbeck and Weibull 1987, Dixit and Londregan 1996). Manufacturing subsidies may, therefore, be higher in countries whose voters have lower incomes as a result of strategic vote-maximizing spending by national governments.

Despite the potential relationship among the three control variables, standard tests show acceptable levels of multicolinearity.[34] Introduction of additional control variables one-at-a-time further minimizes multicolinearity. These additional control variables are:

Federalism, a dichotomous variable coded 1 for federal systems and zero otherwise. This is a potentially important control since the spending data refer only to central government expenditures. Data on general government spending, including that from local and regional governments, are often missing, and when available it tends to be less reliable than central government spending data (Persson and Tabellini 2003). Furthermore, the precise definition of local and regional governments' outlays are often not comparable among countries and time periods (Persson and Tabellini 2003). Given this, I use subsidy spending data for central governments.

Central government expenditures on subsidies may be lower in federal systems than nonfederal systems if some of the burden of subsidizing industries falls to regional and local governments. This would be particularly problematic if federal systems co-vary with electoral systems. In other words, if plurality electoral systems occur more often in federal systems, identifying a spurious negative correlation between plurality electoral rules and subsidy spending may be possible. To minimize this possibility, *Federalism* is introduced as a control variable.

Sector Employment equals the number of people employed in the manufacturing sector as a percentage of the total labor force. This is a potentially important control variable because the number of people employed in manufacturing may influence both the amount spent on manufacturing subsidies and the geographic distribution of manufacturing employees.

Left is a dichotomous variable coded one if the largest governmental party is left of center and zero otherwise. In general, governments' industrial policies tend to have only a minimal ideological component (Verdier 1995, McGillivray 2004, Rickard 2012c). Given this, the effect

[34] The variance inflation factor (VIF) is less than four for all variables included in the estimated models, as recommended by Huber, Ragin, and Stephens (1993).

of a government's ideology on total subsidies to the manufacturing sector is unclear. However, controlling for ideology is important because left-leaning governments tend to be associated with proportional electoral systems (Iversen and Soskice 2006, Rodden, unpublished manuscript). Failure to control for the ideological tendency of a government could result in mistakenly assigning explanatory power to electoral rules rather than ideology.

Concentration (squared) tests for the possibility that maximum political influence occurs at some intermediate level of geographic concentration. The existing literature on interest group politics in plurality systems hypothesizes a positive coefficient for the nonsquared concentration term and a negative coefficient for the squared term (Grier, Munger, and Roberts 1994). In other words, concentration may increase a group's political influence only up to some point. Beyond that point, any additional increase in geographic concentration may reduce the group's political influence.

EMPIRICAL RESULTS

Table 4.1 reports the coefficient estimates for the OLS regression of manufacturing subsidies on *PR*, *Concentration*, the key interaction term, and the control variables.[35] The coefficient estimates provide evidence that the geographic distribution of voters with a shared narrow interest matters for accurately specifying the effects of electoral rules. Subsidies for the manufacturing sector constitute a larger share of government expenditures in plurality systems than in PR systems when manufacturing employment is geographically concentrated. However, when employment is geographically diffuse, governments in PR systems assign relatively more of their budgets to subsidies than governments in plurality systems, holding all else equal.

The key interaction term, which equals the product of *PR* and *Concentration*, is included in columns 2 through 8. As a result, the estimated coefficients for *PR* in columns 2 through 8 report the marginal effect of *PR* for the unique case when *Concentration* equals zero (Brambor, Clark, and Golder 2006, Kam and Franzese 2007).[36] When *Concentration* equals zero, the effect of proportional electoral rules on

[35] See also Rickard (2012b).

[36] The unconditional (or average) effect of proportional electoral rules (PR) on manufacturing subsidies is positive and statistically significant as reported by the coefficient for *PR* in column 1 of Table 4.2. This finding may be interpreted as being consistent with results reported by Chang et al. (2010). They show that proportional systems are associated with higher consumer prices. If subsidies increase consumer

Table 4.1 *Effects of institutions and geography on subsidy budget shares*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.PR	0.300**	1.547***	1.548***	1.962***	1.421***	2.169***	1.032**	1.578***
	(0.118)	(0.480)	(0.480)	(0.463)	(0.469)	(0.472)	(0.481)	(0.504)
L.PR*L.Concentration		−40.72***	−40.72***	−47.90***	−34.91**	−55.89***	−26.05*	−43.64***
		(14.646)	(14.683)	(12.989)	(14.528)	(13.792)	(14.357)	(15.593)
L.Concentration	−15.61***	24.63*	24.63*	26.13**	18.34	32.18**	19.34	15.04
	(2.69)	(14.31)	(14.36)	(11.82)	(14.333)	(12.96)	(14.28)	(15.11)
L.Trade	0.017***	0.017***	0.017***	0.016***	0.017***	0.016***	0.010**	0.019***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)
L.GDP per capita (log)	−1.863***	−1.875***	−1.875***	−1.797***	−1.846***	−2.008***	−0.937***	−1.740***
	(0.196)	(0.195)	(0.193)	(0.191)	(0.190)	(0.194)	(0.278)	(0.203)
L.Area (log)	0.259***	0.272***	0.272***	0.277***	0.288***	0.302***	0.181***	0.314***
	(0.057)	(0.057)	(0.062)	(0.071)	(0.060)	(0.084)	(0.068)	(0.065)
L.Federal			−0.000					
			(0.130)					
L.Employment				−0.479				
				(2.064)				
L.Left government					−0.168*			
					(0.099)			
L.Number of government parties						0.083		
						(0.071)		
L.Labor Mobility							5.965	
							(4.032)	

(*continued*)

L.Concentration^2								134.71***
								(50.325)
Constant	14.43***	13.17***	13.17***	13.37***	13.08***	14.71***	6.51**	11.41***
	(2.287)	(2.322)	(2.336)	(2.736)	(2.295)	(2.540)	(2.788)	(2.621)
Observations	227	227	227	169	227	169	209	227
R-squared	0.46	0.46	0.46	0.49	0.47	0.55	0.18	0.48

Robust standard errors appear in parentheses. All models include year fixed effects. Year coefficients are not reported due to space constraints.
*** $p < 0.01$,** $p < 0.05$,* $p < 0.1$.

manufacturing subsidies is positive and statistically significant. In other words, governments elected via PR spend more of their budgets on subsides than governments in plurality systems when the geographic diffusion of manufacturing employees is exactly proportional to total employment.

The marginal effect of *PR* is positive and significant whenever *Concentration* is less than 0.033. When *Concentration* is less than 0.033, as it is for 67 percent of the sample, governments in proportional rule systems assign relatively more of their budgets to manufacturing-sector subsidies than governments in plurality systems, holding all else equal. Arguably, this is because manufacturing subsidies provide greater electoral benefits to politicians in PR systems than politicians in plurality systems when voters employed in the sector are geographically diffuse. If the geographic diffusion of manufacturing employees is exactly proportional to total employment (i.e. *Concentration* equals zero), politicians cannot use manufacturing subsidies to target voters in select electoral districts. In proportional systems where voters' geographic locations are relatively unimportant for the electoral success of parties, this is not a problem. However, in plurality systems where elections are won district-by-district, parties and politicians seek to target benefits to voters in geographically defined electoral districts.[37] Given this, subsidies are relatively less valuable to politicians competing for office in plurality systems when the beneficiaries of subsidies are geographically diffuse. Therefore, manufacturing subsidies account for a smaller share of government expenditures in plurality systems than in proportional systems when manufacturing employment is diffuse.

As expected, the positive marginal effect of *PR* on subsidies declines and eventually becomes negative as *Concentration* increases. The marginal effect of *PR* on subsidy budget shares is calculated across the observed range of *Concentration* using the relevant elements from column 2 in Table 4.1.[38] Figure 4.1 graphically reports these results. The solid line in Figure 4.1 represents the marginal effect of *PR* on

prices, the unconditional positive effect of PR on subsidies reported here is consistent with Chang et al. (2010).

[37] A large debate exists over precisely which electoral districts are most likely to be targeted by parties competing in plurality systems. See, for example, Cox and McCubbins (1986) and Dixit and Londregan (1996). Yet, all theories agree that parties and politicians in plurality systems want to target benefits to geographically defined constituents.

[38] The coefficient matrix and the variance-covariance matrix from column 2 are used to calculate the marginal effects of PR. For a complete description of these matrixes and the precise formulas used to calculate the marginal effects and standard errors, see Brambor et al. (2006). See also Rickard (2012b).

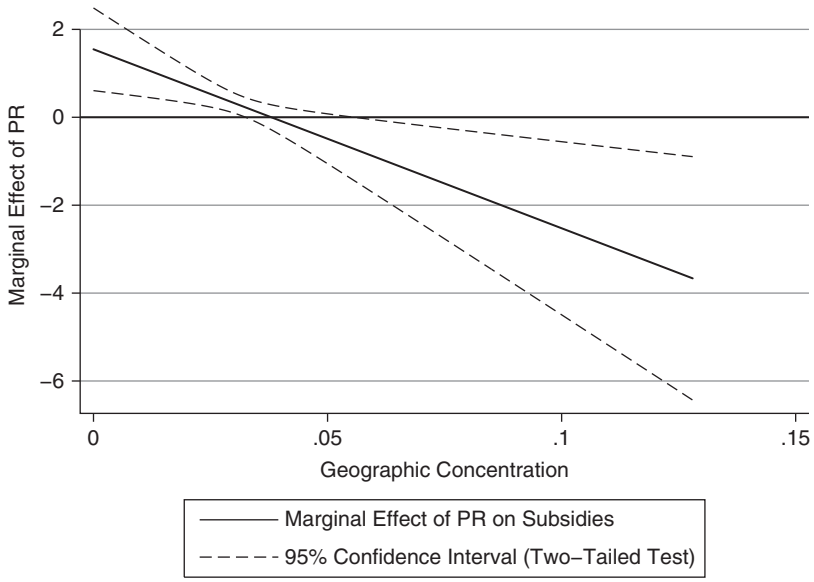

Figure 4.1 Marginal effect of proportional representation (PR) on subsidy budget shares

subsidy budget shares. The broken lines represent the 95 percent confidence intervals for two-tailed tests. Whenever both the upper and lower bounds of the confidence interval appear above (or below) the zero line, the marginal effect of *PR* is statistically significant at the 0.05 level (Brambor et al., 2006: 76).

Subsidies constitute a larger share of government expenditures in plurality systems than in proportional systems when voters with an economic interest in subsidies are geographically concentrated. When *Concentration* is greater than 0.054, proportional electoral rules have a negative marginal effect on the share of government spending devoted to subsidies. The reductive effect of plurality electoral rules on subsidy spending shares holds for nearly 15 percent of the sample.

At intermediate levels of concentration, no statistically significant difference exists between PR systems and plurality systems. The marginal effect of proportional electoral rules is not statistically different from zero when *Concentration* falls between 0.033 and 0.054. When manufacturing employment is neither concentrated nor diffuse, governments elected via different electoral systems allocate similar percentages of their budgets to manufacturing-sector subsidies, all else equal. In other words, there are some conditions under which electoral rules *do not* matter for governments' subsidy spending. This is an important finding – it suggests that existing theories about the economic

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effects of institutions must be revised in order to account for economic geography. Failing to account for economic geography generates incomplete, and at times inaccurate, conclusions about the effects of electoral rules on economic policy.

A few words about the control variables are in order. Countries more open to foreign trade spend relatively more on manufacturing subsidies, all else equal. This suggests that governments fund subsidies at least in part to shield domestic manufacturers from the effects of international trade (Rickard 2012b). Typically, the assumption in much of the literature on globalization and spending is that governments respond to trade openness by increasing spending on social welfare programs (e.g. Garrett 2001, Rudra 2002). However, the results reported here suggest that governments use multiple fiscal policies to offset the costs of trade, including subsidies. Understanding when and under what circumstances governments choose a particular fiscal policy in response to globalization is an important question for future research (Rickard 2012b).

Country size, measured by the natural log of a country's land area in square kilometers, is consistently positive and significant. Apparently, larger countries spend relatively more on subsidies for their manufacturing sectors as a share of total government expenditures (minus interest payments), all else equal.

GDP per capita has a negative effect on subsidies. A possible explanation is that richer voters have greater abilities to self-insure against price volatility and income risk. Alternatively, lower-income voters may be less costly to attract with subsidies (Dixit and Londregan 1996). Consequently, governments in countries with lower levels of GDP per capita spend more on subsidies.

A number of sensitivity analyses evaluate the robustness of the current study's key findings.[39] First, several different measures of electoral institutions are used to test the robustness of the results to alternative specifications of countries' institutions. Gallagher's (1991) disproportionality index is substituted for the dichotomous variable, *PR*. Results found using Gallagher's disproportionality index show that more proportional electoral systems favor geographically diffuse interests, while less proportional systems favor more concentrated interests. These results are reported in Table 4.2.

[39] For example, excluding the United Kingdom from the sample does not change the key results. Similarly, the key results are robust to alternative model specifications including OLS models with Driscoll-Kraay standard errors and the Newey and West estimator with lag length one.

Table 4.2 *Effects of various features of countries' electoral systems on subsidy budget shares*

	(1)	(2)	(3)	(4)	(5)	(6)
L.Disproportionality	−0.001	−0.033*				
	(0.011)	(0.017)				
L.Disproportionality*L. Concentration		1.058**				
		(0.442)				
L.Ballot			-0.298***	-0.999***		
			(0.070)	(0.202)		
L.Ballot*L.Concentration				19.493***		
				(5.388)		
L.MDM					-0.122**	0.315
					(0.0527)	(0.229)
L.MDM*L.Concentration						−14.40**
						(7.001)
L.Concentration	−15.12***	−23.56***	−23.21***	−36.71***	−18.64***	7.952
	(2.740)	(4.960)	(3.740)	(5.861)	(3.395)	(13.99)
L.Trade	0.018***	0.021***	0.015***	0.017***	0.017***	0.021***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
L.GDP per capita (log)	−1.879***	−1.801***	−1.988***	−2.215***	−1.849***	−1.993***
	(0.202)	(0.203)	(0.195)	(0.202)	(0.183)	(0.199)

(*continued*)

Table 4.2 (*continued*)

	(1)	(2)	(3)	(4)	(5)	(6)
L.Area (log)	0.231***	0.287***	0.212***	0.272***	0.0995	0.163*
	(0.057)	(0.069)	(0.063)	(0.057)	(0.087)	(0.092)
Constant	15.144***	13.746***	18.070***	19.978***	17.07***	16.90***
	(2.374)	(2.588)	(2.353)	(2.376)	(2.458)	(2.505)
Observations	227	227	194	194	180	180
R-squared	0.44	0.46	0.51	0.54	0.493	0.506

Robust standard errors appear in parentheses. All models include year fixed effects. Year coefficients are not reported due to space constraints. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

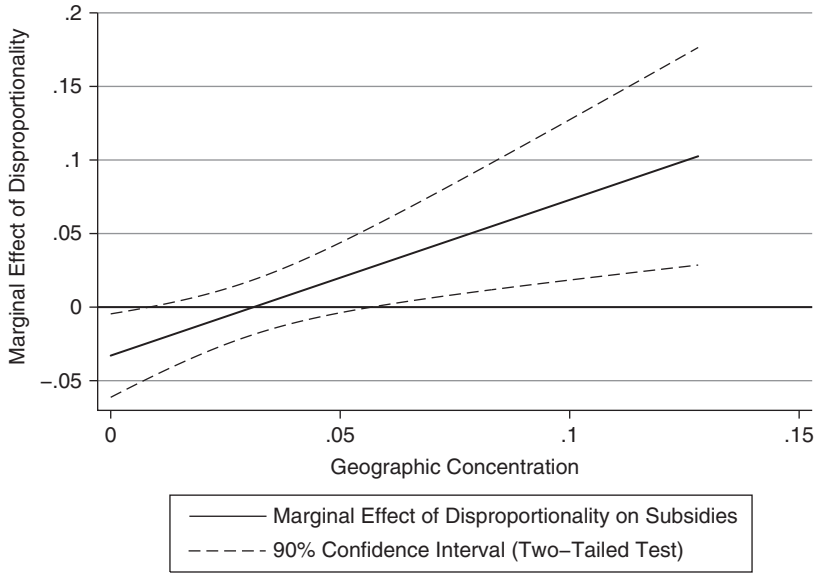

Figure 4.2 Marginal effect of disproportionality on subsidy budget shares

Using the relevant elements of the variance-covariance matrix from column 2 in Table 4.2, the marginal effect of *Disproportionality* is calculated across the entire range of *Concentration*. The marginal effect of disproportionality is displayed graphically in Figure 4.2. When beneficiaries are geographically diffuse, the marginal effect of disproportionality is negative. More precisely, the marginal effect of *Disproportionality* is negative and statistically significant at the 90 percent level of confidence for a two-tailed test when *Concentration* is less than 0.009.[40] This result suggests that when beneficiaries are geographically diffuse, governments in more proportional systems, such as Austria, tend to spend more on subsidies than governments in less proportional systems, such as Spain. More precisely, an increase in the disproportionality of electoral outcomes decreases subsidy spending shares when manufacturing employment is geographically diffuse. As employment becomes more and more concentrated, the negative marginal effect of *Disproportionality* decreases in magnitude and eventually becomes positive and statistically significant. When *Concentration* is greater than 0.055, an increase in disproportionality increases government spending on subsidies. In other words, governments elected via less proportional systems tend to spend more on subsidies for

[40] This holds for approximately 10 percent of the sample.

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concentrated groups than governments elected via more proportional systems, all else equal. These results corroborate those found using the simple dichotomous measure of electoral rules. More proportional systems tend to spend more on geographically diffuse groups, all else equal.

Table 4.2 also reports the estimated coefficients on *Ballot* and *Mean District Magnitude*. The estimated coefficients on *Ballot* demonstrate that geographically concentrated sectors win more subsidies in candidate-centered systems than in party-centered systems. Geographically diffuse sectors win more subsidies in party-centered systems than in candidate-centered systems. Arguably, this is because relevant constituencies are not geographically defined in party-centered systems. Candidates maximize their chances of being in office by working to increase the party's share of the national vote. In contrast, politicians' best electoral strategy in candidate-centered systems is to appeal directly to their geographically defined constituents.

The estimated coefficients on *Mean District Magnitude* show that governments elected from multimember districts allocate less government money to subsidies than governments elected from single-member districts when manufacturing employment is geographically concentrated. More precisely, when *Concentration* is greater than 0.27, *Mean District Magnitude* has a negative and significant marginal effect on subsidy budget shares, all else equal. The magnitude of the reductive effect of *Mean District Magnitude* increases as *Concentration* increases. Interestingly, MDM does not have a significant effect when looking only at PR systems.[41]

In sum, different measures of electoral institutions report strikingly consistent results. Taken together, these results demonstrate that economic geography is a necessary consideration needed to accurately specify the effects of electoral rules on policy outcomes.

The OLS models estimated thus far do not account for the fact that the choice of electoral institutions is unlikely to be random (Boix 1999). However, it seems improbable that the choice of electoral rules would be endogenous to manufacturing subsidies in the short- to medium term. Similarly, it seems unlikely that electoral rules would be endogenous to changes in the geographic concentration of manufacturing employment in recent decades. In fact, there is no significant difference between the average levels of geographic concentration in PR systems and plurality systems.[42] The sample mean value of *Concentration* is equal to 0.035 in

[41] See Chapter 6.

[42] This may be because no direct relationship exists between geographic concentration and electoral systems. Instead, as Cusack et al. (2007) argue, the effects of geographic concentration on electoral rules may be conditional on the type of asset investment.

PR countries and 0.031 in plurality countries. The difference (–0.004) is not statistically significant, as demonstrated by a two-sample *t*-test with equal variances. The fact that the geographic concentration of manufacturing employment is no higher in plurality systems than in PR systems, on average, helps to minimize concerns about the potential endogeneity of electoral institutions.

To further allay concerns about endogeneity, I estimate a two-stage least-squares model. Following Persson and Tabellini (2003), Evans (2009), and others, I used indicators of the historical periods during which a country's current electoral rules were adopted as instruments in the first stage of the model. The distribution of current electoral rules vary with the age of the rules (Persson and Tabellini 2003). Experience of other democracies and prevalent political and judicial doctrines shift systematically over time and may explain why the distribution of current electoral rules vary with the age of the rules. To exploit this temporal pattern, I construct three dummy variables that correspond to the periods 1921–1950, 1951–1980, and post-1981, which take a value of 1 if the current electoral rule originated in the respective period, and zero otherwise.[43] Although countries' electoral systems are associated with the year in which countries' constitutions were adopted, the date at which a country adopts its constitution is unlikely to directly affect manufacturing subsidies.

The results from the second-stage of the 2SLS model are reported in Table 4.3. As before, the marginal effect of *PR* on subsidies is positive and statistically significant at low levels of geographic concentration. As *Concentration* increases, the positive marginal effect of *PR* declines and eventually becomes negative. At high level of *Concentration*, the marginal effect of *PR* is negative, substantively large, and statistically significant. In sum, the key results are robust to an alternative model specification that relaxes the assumption that electoral systems are exogenous.[44]

Before concluding, I briefly discuss possible alternative explanations for the reported results. Production factors employed in geographically concentrated sectors may confront higher adjustment costs than factors in geographically diffuse sectors. This raises the possibility that asset specificity rather than *Concentration*, per se, explains the reported results. To test for this possibility, a measure of labor mobility is introduced as

[43] Persson and Tabellini (2003) demonstrate that these particular time periods best describe the pattern of electoral system adaptation.

[44] If anything, correcting for potential endogeneity appears to reduce the standard errors on the estimated marginal effect of *PR*.

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Table 4.3 *Second stage results of the effects of PR on subsidy budget shares*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.PR	0.562***	3.834***	3.929***	3.633***	3.755***	3.991***	3.343***	4.000***
	(0.179)	(0.579)	(0.575)	(0.569)	(0.587)	(0.541)	(0.582)	(0.600)
L.PR*L.Concentration		−107.78***	−111.86***	−95.80***	−103.96***	−108.99***	−94.02***	−114.94***
		(19.933)	(19.981)	(17.581)	(20.617)	(17.343)	(19.384)	(20.957)
L.Concentration	−19.98***	86.56***	89.46***	68.24***	82.21***	78.82***	80.80***	78.80***
	(2.720)	(19.326)	(19.381)	(15.729)	(20.209)	(16.268)	(18.719)	(20.221)
L.Trade	0.014***	0.015***	0.015***	0.013***	0.014***	0.013***	0.009**	0.016***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)
L.GDP per capita (log)	−1.935***	−1.981***	−2.067***	−1.881***	−1.961***	−2.124***	−1.271***	−1.823***
	(0.171)	(0.171)	(0.175)	(0.176)	(0.168)	(0.166)	(0.270)	(0.186)
L.Area (log)	0.317***	0.338***	0.405***	0.341***	0.354***	0.391***	0.272***	0.389***
	(0.053)	(0.056)	(0.061)	(0.067)	(0.058)	(0.083)	(0.063)	(0.062)
L.Federal			0.419***					
			(0.122)					
L.Employment				0.091				
				(1.964)				
L.Left government					−0.138			
					(0.102)			
L.Number of government parties						0.141**		
						(0.069)		

(*continued*)

L.Labor Mobility							1.130	
							(3.735)	
L.Concentration								158.86***
								(48.54)
Constant	15.46***	12.41***	12.30***	12.24***	12.25***	13.27***	6.88***	10.17***
	(1.88)	(1.96)	(2.05)	(2.55)	(1.95)	(2.26)	(2.47)	(2.33)
Observations	203	203	203	155	203	155	185	203
R-squared	0.53	0.51	0.54	0.54	0.52	0.61	0.22	0.53

Notes: From 2SLS Model. Robust standard errors appear in parentheses. All models include year fixed effects. Year coefficients are not reported due to space constraints. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. In the first stage model, *PR* is predicted using historical periods, as described in the text.

a control variable. This measure estimates the adjustment costs facing workers in the manufacturing sector by calculating the rate of labor movement between industries in the sector (Wacziarg and Wallack 2004). The rate of movement varies according to the costs to workers of voluntarily entering and exiting different industries. Higher rates of movement indicate lower adjustment costs. Including *Labor Mobility* in the estimated model does not change the key results and suggests that geographic concentration is, in fact, the mechanism linking economic geography to policy outcomes rather than adjustment costs.

Another plausible alternative explanation is the number of parties in government. I argue that electoral systems affect politicians' incentives to cater to certain constituencies and that these incentives influence spending on subsidies. Alternatively, electoral systems may influence subsidy spending via the number of parties in government. Single-party governments are most common in plurality systems, while PR systems are more likely to foster multiparty governments. Multiparty governments tend to spend more money than single-party governments because multiparty governments negotiate less efficient logrolls (Bawn and Rosenbluth 2006). This raises the possibility that multiparty governments will spend more on subsidies than single-party governments. If this is the case, the reported results may not be the consequence of the electoral dynamics or reelection incentives but rather the accountability and bargaining dynamics induced by multi- versus single-party governments.

To test for this possibility, I included the number of parties in government as an additional control variable. The addition of this control variable does not change the key results. Electoral systems affect subsidy spending independent of their effects on the composition of government.

CONCLUSION

Economic geography interacts with electoral institutions to shape government policy. Governments elected via proportional rules spend more of their budget on subsidies to geographically diffuse groups as compared to governments elected via plurality rules. In contrast, governments elected via plurality rules spend more of their budget on subsidies to geographically concentrated groups as compared to governments elected via PR, all else equal. In the following chapter, I supplement the large-N quantitative results reported here with qualitative evidence from two cases that illustrate the political mechanisms linking geography and institutions to economic policy.