State Competition in the Market for Firms

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Abstract

In the U.S., states compete to attract firms by offering discretionary subsidies, but little is known about how states choose their subsidy offers, whether such subsidies affect firms' location choices, and what effect the subsidies have on economic growth. In this dissertation, I leverage a unique, hand-collected dataset on state incentive spending and subsidy deals to provide new evidence on state subsidy-giving and economic development policies.

In Chapter 1, I use an oral ascending (English) auction to model the subsidy "bidding" process and estimate the efficiency of subsidy competition. The model allows state governments to value both the direct and indirect (spillover) job creation of firms when submitting bids, and firms to take both subsidies offered *and* state characteristics into account when choosing their location. I estimate both the distribution of states' (revealed) valuations for firms that rationalizes observed subsidies, and firms' valuations for state characteristics. In order to allow states to value potential spillovers, I estimate the effect of subsidy-winning firms' locations on the entry decision of smaller firms. I provide the first empirical evidence that states use subsidies to help large firms internalize the positive spillovers, in the form of indirect job creation, they have on the states. Moreover, subsidies have a sizable effect on firm location. With subsidies, total welfare (the sum of state valuations and firm profits) increases by 22%, but the welfare gain is captured entirely by the firms.

In the second chapter, I study political motivations for subsidy-giving. I identify the effect of corporate campaign spending on state subsidy-giving to firms by exploiting variation created by the 2010 *Citizens United v. FEC* Supreme Court case, which allowed corporations to spend on elections in 24 states that previously had spending bans. I find that treatment states are 23 percentage points more likely to give a second subsidy to a firm that is already located in the state. My results suggest that campaign spending is likely a factor in states' subsidy-setting decisions.

Lastly, in joint work with Owen Zidar, I spend more time describing the structure of state business incentives, and provide some preliminary analysis on whether or not they work. We compare "winning" and runner-up locations for each subsidy deal, and do not find strong evidence that discretionary subsidies increase employment and economic growth within a county. Overall, firms make location and investment decisions to maximize after-tax profits, which depend strongly on non-tax factors such as wages, market access, productivity, and amenities. Although larger establishment shares are associated with higher per capita incentive spending at the state level, increases in incentive spending do not lead to increases in establishment entry, as poorer places are more likely to provide larger incentives.

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Contents

Chapter 1

Bidding for Firms: Subsidy Competition in the U.S.

> *Tax incentives seem to be a permanent part of the urban economic landscape. However, economists do not yet know why these incentives occur and whether they are in fact desirable.*
>
> "The Economics of Location-Based Tax Incentives" Glaeser (2001)

As state governments compete to attract large firms and create new jobs in their jurisdictions, discretionary incentives have become a mainstay of local economic development policy. In 2016 alone, states promised $7.3 billion in tax incentives and subsidies to just 36 firms.[1] There are opportunity costs of spending on incentives for only a few large firms, and some policymakers have proposed a ban on subsidy competition, arguing that it is a zero-sum game that creates a race to the bottom.[2] However, discretionary subsidies can be welfare improving if they compensate firms for locating where they will have the largest positive spillovers. Which of these forces dominate is a priori unknown. Therefore, determining whether subsidy competition is welfare enhancing or a zero-sum game is a necessary first step in evaluating the effectiveness of current economic development policy.

[1] This amounts to approximately $200 million per firm and $177,000 per direct job promised by the firm. Source is *Good Jobs First* (Mattera and Tarczynska, 2019), calculations made by the author. All numbers in this paper are calculated by the author unless otherwise stated.

[2] For example, see Badger (2014).

To address this question, I develop a tractable model of the subsidy competition "market," create a new dataset on state incentive spending and subsidy deals, and use the new data to estimate the model. In the model, states compete for large mobile firms, where the states' value for a firm can depend on both direct jobs promised by the firm and indirect jobs the firm may induce by attracting smaller firms, i.e., the spillover effect.[3] States bid for each firm in an oral ascending (English) auction, and firms locate in the state that gives the highest payoff, which is their profit in the state plus the subsidy. The model captures the most salient features of subsidy competition: states submit multiple bids for a single firm, and firms do not necessarily locate in the state with the highest bid because they also care about other state characteristics that affect their profits, like human capital, wages, and labor laws.

To estimate the potential spillover of large subsidized firms on firms that do not get discretionary subsidies, I also model the location choice of the non-subsidized, medium-sized, firms. Thus, states can internalize the indirect job creation spillovers that large firms might have when choosing their subsidy. Accounting for spillovers is crucial to evaluating the welfare effects of subsidy competition, which hinges on states compensating firms for location-specific externalities. Estimating this model will answer both: (1) How important are subsidies to a firm's location decision? and (2) How do states value firms?

Understanding what works in local economic development policy is a growing concern, given the marked increase in geographic economic inequality within the United States.[4] States that struggle to grow their local economies, and might benefit more from the entry of a new firm, are eager to attract more firms to their area. However, they must compete with more attractive locales, where the firm would be more profitable. Discretionary subsidies are one economic development policy tool that can be used to allocate firms to states where they have greater positive externalities (Garcia-Mila and McGuire, 2002). If instead, political concerns determine subsidy size, competition will not necessarily result in higher externality location choices

[3]In this paper, I consider mobile firms conducting a national search, that is, choosing a location within the U.S.

[4]Moretti (2012) calls this phenomenon "The Great Divergence." Also see Ganong and Shoag (2017).

(Glaeser, 2001). Therefore, the welfare implications of subsidy competition depend on states' valuation for the firms, which is difficult to measure. To the best of my knowledge, this paper is the first to study this problem, and, specifically, the first to provide evidence that states do use subsidies to help firms internalize anticipated spillover effects.

One reason that we do not know enough about subsidy competition is the lack of coherent data on subsidies. To fill this gap, I read state tax and budget documents, news articles, and press releases to build a new dataset of state incentive spending and firm-level subsidy deals. I use this data to estimate the distribution of states' valuation for firms. My estimates provide the first empirical evidence that states use subsidies to compensate firms for their positive externalities; high unemployment states, states which benefit most from property value increases, and states that anticipate large positive spillovers have the highest valuations for firms. I also find that subsidies have a substantial effect on the firm location decision; almost 68% of firms would locate in another state in there was no incentive spending. Eliminating incentive spending would also decrease the total potential spillovers created by large firms by 27,000 jobs, or 32%, which provides more evidence that subsidy competition can increase total welfare.[5] However, total indirect job creation under subsidy competition is only 15% of the total achieved by a social planner who solely maximizes job creation.[6]

The practice of states offering discretionary incentives in exchange for firm locations dates back at least to the 1970s. In 1976, after dozens of governors traveled to Germany to make their pitch to Volkswagen executives, Volkswagen decided to locate their first U.S. plant in Pennsylvania, receiving a subsidy deal worth $100 million.[7] This subsidy included financial (property tax abatement, low-interest loan) as well

[5]The number of indirect jobs anticipated is firm-state specific. Therefore, the total indirect job creation is not fixed, but dependent on the location choices of the large firms. Differences in the anticipated spillover of a large firm in each state are driven by the shape of the relationship between the average profit level of a state and the probabilities of medium firm entry.

[6]This highlights the role of state characteristics in the firm location decision, as well as the fact that states have heterogeneous valuations over job creation and other potential benefits of the firm. Indirect job creation only explains about 25% of the states' valuation of firms — it is not the only determinant of welfare.

[7]$100 million in 1976 converts to roughly $430 million in 2017 dollars. VW chose Pennsylvania after narrowing down their search to thirteen states and receiving multiple rounds of bids.

as in-kind (rail, highway, job training) incentives. Mazda, Mitsubishi, and Toyota followed in the mid-1980s, each spurring a subsidy competition between states. The competition has since expanded beyond the automobile industry (e.g. Amazon HQ2); states currently spend over one-third of their total economic development budget on discretionary subsidies to attract firms to their local areas.

Research on state competition for firms traditionally focuses on the corporate tax rate, and most empirical work finds no effect of corporate tax cuts on business location and activity (for example, Bartik (1985), Ljungqvist and Smolyansky (2014)).[8] This may be because the posted tax rate is not the relevant tax object — the firm also considers tax credits and the tax base (Bartik, 2017; Suárez Serrato and Zidar, 2018). On top of that, only select firms receive specialized tax incentives. In this paper I carefully consider these discretionary incentives, both in terms of how important they are to firms and how states determine them.

Although there is limited evidence to show that taxes can induce firms to chose different states in the U.S., there is strong evidence in other contexts that economic agents respond to changes in tax incentives. See Hines (1996), Wilson (2009), Kleven, Landais and Saez (2013), among others.[9] One important difference between my paper and these papers is that while I endogenize the subsidies — they are a function of the state's value for the firm and competition from other states — these papers take the taxes or subsidies as exogeneously given.

In order to study state subsidy competition, I create a new dataset on total state-level incentive spending and firm-level discretionary subsidies. A state has two ways to spend on firms: they can enact tax credits that lower the tax bill for all firms that qualify, or they can allocate money from their budget for economic development programs. I hand-collect the state-level data from state budget documents and tax expenditure reports. The final product is a rich dataset that tracks all economic development programs and tax credits for firms, in each state, from 2007 to 2014.

[8]Notable exceptions include Ossa (2018) and Mast (Forthcoming), which both study subsidy competition, between counties in New York (Mast) and states, in the aggregate (Ossa).

[9]See Hines (1996) for FDI in the U.S.; Wilson (2009) and Moretti and Wilson (2017), for R&D in the U.S.; Devereux and Griffith (1998) for U.S. multinationals locating in European markets; Becker, Egger and Merlo (2012) for multinational activities in German municipalities; and Kleven, Landais and Saez (2013) for European football players.

States spend almost $20 billion a year in total on incentives for firms, but there is considerable heterogeneity both across states and within states over time.[10] For example, a state spends $171 million per year at the median and $333 million at the mean, with a standard deviation of $520 million.

About one-third of this spending goes to a few large firms each year, in the form of discretionary subsidy deals. The policy group *Good Jobs First* tracks large firm-level subsidies, sourcing data from state documents, FOIA requests, and local newspapers. I use this dataset to assemble the universe of large subsidy deals. I supplement the data by reading articles on each subsidy deal, adding information on jobs promised, industry, runner-up location, and any non-discretionary tax credits the firm qualifies for in the state.[11] I collect details on subsidy deals from 2002 to 2016, which, in the context of state competition for firms, can be thought of a dataset of winning bids.[12] The data contain 485 firm-level subsidy deals. The average firm promises to create 1,700 direct jobs and receives a subsidy worth $156 million, which is about $92,000 per direct job.

According to state policymakers, the primary purpose of giving subsidies for firm locations is job creation. However, I find limited evidence of a positive relationship between direct jobs promised by the firms and subsidy size in the firm-level data. This may be due to differences in state characteristics; a less attractive state needs to offer a larger subsidy than its more attractive counterparts, all else equal. Differences in the number of anticipated indirect jobs created via spillovers, which is not observed, may also explain heterogeneity in subsidy size. Or, it could be that states do not only care about job creation, and have alternative, potentially political, motivations for subsidy-giving.[13]

In order to disentangle differences in firm profits in a given location from the

[10] This does not include local (city and county) incentive spending.

[11] In some cases *Good Jobs First* provides all of this information, except the runner-up location.

[12] These incentive numbers include local contributions, usually in the form of property tax abatements.

[13] Many have found evidence of political variables, such as re-election concerns, affecting policy changes (for example, Besley and Case (1995)). In the aggregate spending data I find that governors who are up for re-election are more likely to increase incentive spending than their term-limited counterparts.

subsidies, I model the state competition as a private valuation English Auction, and I allow firms to locate in the state that gives the highest profit plus subsidy. A state's valuation of a firm can depend on a variety of factors, including the revenue the state anticipates receiving from increased tax collections as well as any positive externalities the firm is predicted to create create via increasing demand for services, attracting other firms, or increasing local housing prices.[14] Therefore, I allow the state valuation to be an unspecified function of state and firm characteristics, such as the number of jobs promised and the anticipated spillover.[15] I use the model to estimate both the conditional distribution of states' valuations for firms and firm preferences over state characteristics.

Subsidies and state characteristics are substitutes, so a winning state need not be the one who offers the largest subsidy. Therefore, the subsidies and characteristics of the winner are insufficient to identify firms' preferences for state's observed and unobserved characteristics. To achieve identification of states' valuations for firms, I also need to identify firm profits. In the English Auction, the winner bids up to the point where the payoff it can give the firm exceeds the payoff in the runner-up location. Therefore, the observed winning bid is the subsidy that sets the payoff in the winning and runner-up states equal. Then, the variation in the winning subsidies and the differences in winning and runner-up state characteristics allow me to identify firms' preferences. To account for the unobserved state characteristics I follow the literature on measurement error and use deconvolution (Carroll and Hall, 1988).

Once I have an estimate of firms' preferences, I predict each firms' payoff in its runner-up state, and use the predicted payoffs to identify the distribution of states' valuations for firms. In the English Auction, the runner-up state ends up bidding their valuation for the firm. Therefore, the payoff the runner-up state gives the firm is the sum of their valuation of the firm and the firm's profit in the state. Because the payoff in this runner-up state is the 2nd order statistic of payoffs, I use the order statistic identity to recover the full distribution of payoffs across states (Athey and Haile, 2002). I then exploit the relationship between valuation and payoffs, and invert

[14]This also allows the possibility that there are costs to providing services to the firm, and negative externalities through congestion.

[15]I assume the state can accurately anticipate the value the firm will create in their jurisdiction.

the distribution of payoffs to recover the distribution of state valuations. Because the identification strategy is constructive, I closely follow the identification steps and use indirect inference for estimation.

I find that high unemployment states, states that would benefit most from property value increases, and states that anticipate large spillovers in the form of indirect job creation, have the highest valuations for firms. A high unemployment state values a firm promising 2,000 jobs $3.1M (5%) more than a low unemployment state.[16] States that rely heavily on property taxes for revenue value a firm $14.2M (23%) more than a state with less potential property tax collection. Lastly, a firm with large anticipated spillover (indirect job creation) is valued $16.8M (27%) higher than a low spillover firm promising the same number of direct jobs.[17] States have a relatively small valuation for direct jobs; a firm promising 20,000 direct jobs is worth only $3M more than one promising 2,000 jobs. Therefore, accounting for differences across states does not explain the lack of correlation between direct jobs promised and subsidy size found in the raw data, instead it is *indirect* job creation that rationalizes observed subsidies. These results suggest that subsidy competition can allow states to compensate firms for heterogeneous externalities across space, thereby increasing the efficiency of firm locations.[18]

Using these estimates, I consider a counterfactual exercise where I eliminate all subsidy spending; large firms locate in the state they prefer the most in the absence of subsidies.[19] I find that at the baseline, 85% of firms choose alternative locations,

[16]The difference grows to $7.3M (12%) when the firm promises 10,000 jobs

[17]To measure anticipated indirect job creation, I estimate the location choice of medium-sized firms that do not receive subsidy deals, as a function of non-discretionary incentives offered by the state and the location of larger firms. I find a multiplier effect of about 0.15 at the median, that is, 10 direct jobs created at a large firm translate to 1.5 indirect jobs created through spillovers. However, there is significant heterogeneity by industry; 10 direct jobs at an automobile plant leads to about 7 indirect jobs created through spillover.

[18]I also find suggestive evidence of politically motivated subsidy offers. Governors who face re-election value firms creating 100 jobs $6.63M (10%) more than term-limited counterparts. An alternative hypothesis is that new governors' do not value firms more in order to get publicity for re-election, but are learning on the job and tend to "over-value" firms more than experienced governors.

[19]The European Commission does not allow member countries to offer discretionary incentives to firms (See EC Competition Policy on State Aid - Part 3, Title VII, Article 107). In the U.S., some legal scholars argue that discretionary subsidies are in violation of the commerce clause of the

the majority to lower-cost (KS, SC, TX) or higher-productivity (CA, NC, VA) states. The number of firms that choose alternative locations decreases significantly, to 68%, when I incorporate the housing cost and wage increases that follow large firm entry. I use the counterfactual location choices to calculate the welfare effects of subsidy competition. With subsidies, total welfare (the sum of states' valuations for firms plus firm profits) increases by 22% ($18B). However, firms capture all of this welfare gain, and more — competition amounts to a 75% ($27B) increase in firms' payoffs.[20]

The paper proceeds as follows. Section 1.1 contains institutional details on subsidy competition in the United States and provides a brief review of the literature. Section 1.2 follows with a discussion of the data and possible determinants of subsidy size. Section 1.3 presents the model and Section 1.4 discusses identification. The estimation and results are together in Section 1.5, and the counterfactual policy analysis is in Section 1.6. Section 1.7 concludes.

1.1 Background: Subsidies and Site Selection

In this section I give a brief history of subsidy competition in the U.S., as well as an overview of the "industry" in its current state. This includes institutional details on the composition of subsidies and the process of bidding for firms.

As noted in the introduction, the earliest evidence I can find of states competing with discretionary tax incentives is in 1976, when Volkswagen received $430 million (in 2017 dollars) to locate their first U.S. plant in Pennsylvania. Perhaps partly enticed by the success of VW, other foreign auto manufacturers followed, each spurring a subsidy competition between states. Mazda located in MI in 1984 for $125M, Mitsibushi and Toyota the next year in Kentucky ($147M) and Illinois ($249M) respectively.[21]

Constitution (Enrich, 1996).

[20] Another way to illustrate this result is that states transfer $4B (80% of total spending), per year, in rents to the firm in competition. If the highest payoff state only had to compensate the firm for not locating in the highest profit (without subsidy) state, states would save $61B over my sample period (2002-2016).

[21] The VW deal is detailed in the book *The Last Entrepreneurs: America's Regional Wars for Jobs and Dollars* (Goodman, 1979). Information on the Mazda, Mitsubishi, and Toyota deals from the *Good Jobs First* Subsidy Tracker (Mattera and Tarczynska, 2019). All of the state-level large deals tracked by *Good Jobs First* before 1987 are for foreign auto-manufacturers.

By the early 1990s the competition had expanded beyond the auto industry, and United Airlines was holding a bidding war for the location of a new maintenance facility. United set up their negotiations at a hotel, where representatives from the airline would meet up with representatives from cities and states. Jim Edgar, the governor of Illinois at the time, called for a truce with the other states. "If you've got some states doing it, it's hard for the others not to do it. It's like unilaterally disarming," Edgar recalls (Story, 2012). Ultimately, not all states would join in the truce, and subsidy competition for individual firms continues to be part of the economic development landscape.

As in the 1980s, many subsidies in the last 20 years have gone to auto-manufacturers and the aerospace industry. Now competition also includes R&D intensive industries such as pharmaceuticals and software, as well as wholesale trade, retail, and corporate headquarters. This may be a result of more companies actively seeking out subsidies from local governments, as "site selection" has become an industry of it's own. A magazine by the same name gives companies information about expansion planning and subsidy deals, with a feature titled "Incentives Deal of the Month," which highlights deals other firms have received.[22] There are also consulting firms that specialize in site selection. Companies looking to relocate can hire a consultant to negotiate subsidies with local governments, advertised as "Public Incentive Identification & Negotiation."

The subsidy that a firm will receive is not a lump-sum payment from the governor, but sourced through various programs and state funds. One subsidy deal may consist of (1) tax credits and programs that the state already has in place to create jobs and investment, (2) tax abatements for the individual firm, (3) infrastructure projects, (4) low-cost loans, (5) job training programs, and (6) exemptions from state regulations. It often consists of more local level incentives as well, such as a property tax exemption. The governor and the state economic development agency, jointly

[22] *Site Selection* is not the only player, there is also *Business Facilities* (`https://businessfacilities.com/`), which markets themselves as "The leading source of intelligence for corporate site selection, expansion, relocation & area economic development solutions" and *Area Development* (`http://www.areadevelopment.com/`), "the leading executive magazine covering corporate site selection and relocation."

with the specific locality in the state, if they are contributing, decide the subsidy offer. The state legislature may need to approve the offer, or pass a bill to enact any specialized legislation for the firm.

There are significant differences across states and firms in the composition of subsidy deals. For example, consider Foxconn, an electronics manufacturing company that received a subsidy worth almost $5 billion dollars to locate a plant in Wisconsin. The deal consists of 15 years of corporate tax abatements, amounting to about $2.85B. Due to two existing tax credits Foxconn would have little to no state tax liability, and would receive the $2.85B in cash from the discretionary tax abatement. The state also agreed to make road improvements worth over $252 million, and give sales tax breaks for construction worth $150 million. The locality created a Tax Increment Financing district, which amounts to an additional $1.5B. Lastly, Foxconn was also exempted from various state environmental regulations, the savings from which are hard to measure.

In California, however, the aerospace and defense company Lockheed Martin received a subsidy composed entirely of two tax credits. California passed a new tax credit specifically for Lockheed, in exchange for locating their production of new bombers for the Air Force in the state. The legislature enacted the *New Advanced Strategic Aircraft Program*, which specifically gives a credit of 17% of wages to "qualified taxpayers that hire employees to manufacture certain property for the United States Air Force." Lockheed also qualifies for California's R&D tax credit on any R&D expenses, which is the highest in the U.S. at 15%.[23] This is worth an estimated $420M to Lockheed.

Next, I discuss what we already know about subsidy competition in the literature, in terms of the theory model and empirical findings.

[23]Unlike at the federal level, state level R&D tax credits are used less to encourage innovation and more to attract businesses. In California, a report to the Council on Science and Technology reads:

> California is perceived as a high-tax business environment by firms contemplating setting up business or expanding...An R&D-related tax measure targets the particular types of firms that California desires to attract in spite of its relatively high position in the "tax" league tables.

Literature: Theory

Much of the public finance literature on tax competition highlights the "race to the bottom" result, and argues that competition between governments for firms is a zero-sum game, redistributing jobs across state lines while leaving the number of jobs in the U.S. unchanged. Theoretical literature that emphasizes that tax competition leads to inefficiently low tax rates and public expenditure levels includes Oates (1972), Zodrow and Mieszkowski (1986) and Wilson (1986).[24] Theoretical literature that highlights benefits to tax competition as a regulator of government policy-makers includes Tiebout (1956) and Brennan and Buchanan (1980).

Black and Hoyt (1989) use a two-city model to show that subsidy competition is not necessarily a zero-sum game but it can actually lead to efficiency gains. In their model firm-specific tax breaks work against the distortions caused by average-cost pricing of public goods. The firm is large enough to decrease the average-cost of providing public goods, which puts downward pressure on the state tax rate, improving welfare for state residents. The state can use a discretionary subsidy to compensate the firm for this positive externality they have in the state. Garcia-Mila and McGuire (2002) highlight the role of agglomeration economies. Heterogeneous spillover effects lead to efficiency gains - cities that have the highest benefit from the firm's spillover effect will pay the most, and firms will be re-allocated to cities where their spillover is the greatest.[25] Bartik (1991) argues that heterogeneity in local labor markets can create value to redistributing jobs across states and cities, which means that even if the subsidy competition does not create additional jobs through spillover it is not zero-sum. However, if states do not compensate firms for externalities but instead try to win firms to increase political capital, competition will not necessarily be welfare maximizing (Glaeser, 2001).

[24] Oates and Schwab (1988) show that when the local government has two policy levers: taxes and environmental quality, competition can increase economic degradation.

[25] Janeba and Osterloh (2013) consider asymmetries across cities and rural areas to explain observed tax rates in a sequential tax competition model, where cities compete for mobile capital, and rural areas compete for capital within the metropolitan area. The model explains differences in tax rates across differently sized jurisdictions.

Literature: Empirical Results

The first contribution of this paper is to create a new dataset on incentive spending in the U.S. I use the data to estimate the effect of incentives, as well as the corporate tax rate, on firm location decisions. There is a large literature on corporate taxes and firm location. Using data on firms and establishments in the U.S., most researchers find very little evidence that corporate tax cuts boost entry (Carlton, 1983; Bartik, 1985; Papke, 1991; Ljungqvist and Smolyansky, 2014).[26] With all the tax credits and subsidies available to larger firms, one reason that researchers haven't found strong evidence of businesses relocating in response to corporate tax rate could be that the corporate tax rate does not reflect the price those larger firms are facing.

Although there is limited evidence to show that taxes can induce firms to chose different states in the U.S., there is strong evidence in other contexts that economic agents respond to changes in tax incentives. In the U.S., the location of FDI, R&D, start-up activity, and highly-productive scientists responds to tax policy across states (Hines, 1996; Wilson, 2009; Curtis and Decker, 2018; Moretti and Wilson, 2017). Taxes, grants, and agglomeration effects affect location choices of multinationals and manufacturing plants in Europe (Devereux and Griffith, 1998; Devereux, Griffith and Simpson, 2006; Becker, Egger and Merlo, 2012). Also, high-earning individuals respond to differences in tax treatments across space (see Kleven, Landais and Saez (2013) for star European football players, Akcigit, Baslandze and Stantcheva (2016) for inventors). One important difference between my paper and these papers is that while I endogenize the subsidies — it is a function of the state's value for the firm and competition from other states — these papers take the taxes or subsidies as exogeneously given.

More recently, tax credits and incentive programs in the U.S. are receiving more focus. Using a panel data base on tax rates and industry specific credits (Bartik, 2017), Suárez Serrato and Zidar (2018) find that tax credits and base explain more of variation in corporate tax revenue than the statutory rates, suggesting the importance of including business incentives in any study of state tax policy. The new database

[26]Firms may respond to tax rates on the intensive margin, Giroud and Rauh (Forthcoming) find that multi-establishment firms respond to tax cuts by reallocating activity to the lower cost location.

tracks marginal tax rates and business incentives for 45 industries in 47 cities and 33 states. This complements the data I have collected, and will hopefully encourage more work in this area, where data has been a limiting factor.[27]

This paper builds on the tax competition and firm location literature by considering how states make subsidy setting decisions. There are three papers that study subsidy competition empirically, and are the closest to my work. Ossa (2018) uses a quantitative economic geography model that he calibrates using total state manufacturing subsidies from the New York Times' Business Incentive database.[28] He finds that states have strong incentives to subsidize firm relocations in order to gain at the expense of neighboring states, which is mostly driven by agglomeration externalities. The analysis uses aggregate data: total manufacturing subsidy spending and employment flows at the state level. This masks the heterogeneity in the subsidies offered to firms within a state.

Mast (Forthcoming) also considers the government decision to offer tax breaks, estimating a model in which towns and counties in New York State compete for mobile establishments by offering property tax breaks. Towns choose their tax break offer to maximize the expected value from a establishment, offering a larger exemption increases the probability the establishment locates in the town, but decreases the benefit. Unlike Ossa (2018) he finds that eliminating tax breaks has a very small effect on equilibrium firm locations. This, he notes, may be because the firms are spatially constrained in their location choices.

Most recently, Kim (2018) uses the *Good Jobs First* data, which I will discuss in the next section, to estimate a model of subsidy competition at the state level. He models state competition as a first-price sealed-bid auction, considers a different sample, and does not focus on the spillover job creation. Despite the differences in

[27]There are also work that looks at the effect of a certain tax credit: e.g. Wilson (2009) studies competition between states with the R&D tax credit, and measures the effect of the R&D tax credit on the location of establishments, workers and research activity. Chirinko and Wilson (2016) analyze the effect of state job creation tax credits, while Suárez Serrato and Zidar (2016) and Fajgelbaum, Morales, Serrato and Zidar (2019) use corporate, payroll, and income tax rates in their spatial equilibrium models to study the effect of taxes on establishment and worker location, but do not account for other incentives available to establishments.

[28]This database is mainly sourced by data collected by *Good Jobs First*.

our two approaches, he also finds that subsidy competition increases total welfare, and that the bulk of this welfare gain is captured by firms.

1.2 Data

A difficulty for empirical research on state incentive spending is the absence of a comprehensive and centralized dataset of state taxes, incentives, and subsidies. States vary widely in the structure of their corporate and individual income taxes and payroll, not to mention their economic development and incentive programs. Also, states do not make the subsidies they offer to individual firms public knowledge.[29] To this end, most empirical work to this point has focused on posted tax rates or a single credit program at a time.[30] In order to evaluate state subsidy competition we need the full picture of all the incentives states are offering, and we need to be able to compare this across states. A major contribution of this paper is the introduction of a dataset that tracks state incentive spending over programs and time, and pairs this data with individual incentive deals. In this section I detail the data collection process and present descriptive statistics.

1.2.1 Data Collection: State-level spending

There are two primary ways a state can create financial incentives for businesses. The first is to offer a tax credit, or to lower the tax rate, which lowers the tax bill of the business. States track the amount spent (revenue foregone) on each credit program in their Tax Expenditure Reports. The second way to provide for incentives is to allocate money for economic development programs in the state budget (e.g. grant, discretionary fund, infrastructure project). States track the amount allocated and spent on each program in their annual (or biennial) budget documents. In Appendix

[29]See this New York Times article on transparency issues "Cities' Offers for Amazon Base Are Secrets Even to Many City Leaders," and the opinion piece by political scientist Nathan Jensen, "Do Taxpayers Know They Are Handing Out Billions to Corporations?"

[30]The notable exception being Suárez Serrato and Zidar (2018), who leverage the new database on tax rates and credits created by Bartik (2017).

5.A I discuss the process by which states set their budgets, and enact or change credits and economic development programs.

In order to create my dataset I download each tax expenditure report and budget document from state websites, for the years 2006-2016. If those items are not available I contact the state Department of Revenue and/or Budget Office. The tax expenditure reports and budget documents vary widely in formatting, not only across states but over time. New economic development programs and tax credits are introduced over the sample period, names often change, and programs can be reorganized between departments. This makes any machine learning technique extremely difficult, so I read each document to identify tax credits and budget items targeted at businesses, and collect the data by hand. I record each program and credit in a state level dataset that covers the years 2007-2014. Based on the text description of the program (if any) I can classify the spending by stated purpose or target: Business Attraction, Jobs, Job Training, Investment, Manufacturing, R&D, High-Tech, and Small Business. In the state-program level data I note that funds are often earmarked for discretionary spending, e.g. "Strategic Attraction," and when states do break out tax credit expenditures by firm, the majority of spending goes to a few firms. Firms receive different tax treatments within one state, thus one needs firm-level data to understand state incentive spending policies.

1.2.2 Data Collection: Firm-level subsidy deals

The *Good Jobs First* Subsidy Tracker (Mattera and Tarczynska, 2019) complements my collected spending data in that it compiles establishment-level incentive spending. The source of establishment-level subsidies in the Subsidy Tracker is often the same state documents that I have collected. States that do not report establishment level data are still present in the *Good Jobs First* dataset, these deals are sourced from news articles, FOIA requests, and press releases. The coverage for these states is not as exhaustive, but the largest deals are tracked. For this reason, the *Good Jobs First* data cannot be used as a measure of the exact amount of tax credits each establishment in a state received, for example, but is used for the data on large discretionary deals. I use the *Good Jobs First* data as a starting point and build out

a dataset with all the variables I need for analysis.

Sample Selection

I start with the set of all entries over $5M. I limit the sample to entries that involve a discretionary program or mention expansion or relocation. I arrive at a sample of 485 establishments receiving discretionary subsidies over the period 2002-2016.

For each of these 485 data points the *Good Jobs First* data provides the variables listed in Figure 1. At a minimum this will include the company name, location, year, agency or program that gave the subsidy, and the value of the subsidy. The higher quality observations also include information on the number of jobs that will be created, wages, planned investment and the industry of the firm, as well as a description of the project and details breaking down the subsidy into it's various components. Take, for example, the entry for Toyo Tire in 2004 (Figure 1(a)). Toyo Tire agreed to locate their tire plant in Georgia and create 900 jobs at an average of $15 per hour. Toyo would also make a capital investment of $392M. In exchange, they would receive $71M from the state and county combined. The subsidy contains infrastructure, land, state tax credits, and exemption from certain state and local taxes. The only additional information that I need is the runner-up location - which state was the last one left in competition with Georgia? I use the runner-up locations to identify the firm preferences over state characteristics.

Additional Data

In this section I discuss how I compile any additional data that is missing or not included in the *Good Jobs First* subsidy entries. Figure 1(b) shows that Microchip received a discretionary property tax abatement from the state of Oregon, worth $13M, in 2002. From the project description I know that Microchip is a semiconductor firm. However, I do not know whether Microchip is a new entry to Oregon or expanding an existing facility, how many jobs they are creating, and whether they qualified for any existing non-discretionary state tax credits or programs.

In order to fill in the number of jobs I take a brute-force approach, and read

articles and press releases about each deal.[31] For this case, there is an article in the trade publication *Site Selection* titled "Oregon Incentives, Idle Plant Are 'Fab' for Microchip's Expansion Plan." From the article I learn how many jobs are planned (688) and the runner-up location (Puyallup, WA).[32] I can also use the state-level data I have collected to do a back of the envelope calculation of non-discretionary incentives a company would receive in a given state, if it is not included in the subsidy entry. In Microchip's case, Oregon has a 5% R&D tax credit for eligible R&D spending, which would mean an additional $2.2M in savings, given the number of jobs and average industry wage.

The runner-up locations are never included in the subsidy entries, so creating an establishment-level subsidy dataset that includes runner-ups is a considerable task. Source include *Site Selection* and other trade magazines, local newspapers, state documents, and company press releases.[33] I was able to find some information about the runner-up location for 95% of the subsidy deals in my sample. Of course, the runner-up "location" is sometimes not a location but a threat to shut-down or not expand. In 77% of cases I can identify a runner-up location in the U.S., for 7% it is outside of the U.S., and the remaining 16% reportedly do not consider other locations.[34]

Lastly, I normalize all the amounts by the length of the subsidy deal. In the majority of deals firms receive tax credits or abatements for a period of 10 years, so I standardize all deals in the data to the 10-year value. Table 1 shows a snapshot of the publicly available data and the finished product. The bulk of the new data comes

[31] When there is no information on the industry of the firm I match the company name to Compustat, if not in Compustat it is also sourced from the articles. About 25% of the observations in the sample have missing jobs, which I fill in.

[32] From the article: "Spurred by US$17.3 million in state incentives, Microchip Technology (www.microchip.com) has hired the first 60 of what may be as many as 688 employees at its newly acquired facility in Gresham, Ore....In 2000, Microchip bought an existing Matsushita fab in Puyallup, Wash., 155 miles (249 kilometers) north of Gresham. The Puyallup fab, which is also currently idle, was the clear frontrunner in Microchip's U.S. expansion plans."

[33] Collecting runner-up locations from *Site Selection* is at the heart of the identification strategy in Greenstone, Hornbeck and Moretti (2010).

[34] This is akin to saying they are not making national searches. The observations with no runner-up location are smaller, with a median of $26M and mean of $74. The observations with documented runner-up locations have a median of $67M and mean of $176M.

in the form of the runner-up states, non-discretionary incentive spending, and direct job numbers.[35]

Limitations of the Data

The ideal dataset would consist of the detailed contract between the firm and state, as well as administrative data on state costs and firm savings for each year following the deal. Of course, those data are confidential, and still might not include all of the variables I would like, for example, the dollar value of in-kind subsidy items to a given firm. In this section I will briefly discuss the limitations of the data I do have.

Good Jobs First takes the value of the deal as given from the source (state documents, news article, press release), and states may calculate the present discounted value differently, and include or exclude certain costs when reporting the value of the subsidy deal. Similarly, certain parts of the subsidy deal are in-kind, for example, the state gives the firm land, a building, builds an exit to the highway. We rely on the estimate from the state on how much that is worth, and no distinction is made between how much it costs for the state to provide and how much it is worth to the firm.

Consider the two examples of subsidy deals I presented in Section 1.1. In the case of Foxconn, the subsidy deal reportedly included exemptions from state environmental regulations. I have no way to estimate how valuable that would be to Foxconn, and it is not included in the dollar amount of the deal. In the case of Lockheed Martin, the *Good Jobs First* data only includes the value of the discretionary tax credit, but Lockheed is also eligible for California's very generous R&D tax credit. I do not know the size of Lockheed's research and development expenses in California, so I will have to estimate the value of the credit using the number of jobs they will create, the expected wages of those jobs, and the proportion of R&D employment in that industry.[36]

Another consideration is the selection of firms that receive subsidies. If a firm

[35]Data on jobs promised was missing in 25% of cases in the publicly available data.

[36]Lockheed Martin is a publicly traded firm, so they do report their R&D expenditure to the SEC in the Form 10-K. However, this is not broken down by location of expenditure, and Lockheed operates "significant operations" in 22 locations across 16 states, according to their 2016 10-K.

relocated without any discretionary subsidy it is not considered in this dataset, because I do not have administrative data on establishment entry. Therefore, all of the analysis is with respect to this subset of "special" firms which receive discretionary subsidies. See Appendix 5.B.1 for a discussion of various checks of the integrity and coverage of the *Good Jobs First* data.

1.2.3 Descriptive Statistics

The number of discretionary subsidies per year has grown over my sample period: from 15 in 2002 to 36 in 2016. There are 32 large subsidy deals made each year, on average, at about $156 million a deal, and promising to create just under 1,700 jobs per deal.[37] There is considerable geographic heterogeneity in subsidy-giving and total spending. Figure 2 highlights patterns in subsidy-giving, total incentive spending, and spending per establishment entry. Note that large states, such as Texas, California and New York are all top incentive spenders (Panel b), but do not necessarily give the most discretionary subsidies (Panel a). When spending is normalized by the number of establishments with at least 100 employees that entered the state (Panel c), it is states such as Idaho, West Virginia and Oklahoma that are the top spenders.[38] These are perhaps less attractive locations to the firms, so the compensation to locate there is higher.[39]

There is also a considerable amount of heterogeneity across industries (Table 2), not only in the size and incidence of the subsidies, but the amount paid per job. For example, automobile manufacturers receive the largest subsidies, at a median of $139.8, but they also create the largest number of jobs. So, the subsidy per job for automobile manufacturers is much lower than in the chemicals or oil and gas industry. What is driving these differences? Why do they value a job in oil and gas more than at an automobile plant? This gets back to the research question, how do states decide

[37]The median number of deals is 35, at $57 million and 775 jobs promised.

[38]I use data on entry of establishments with 100+ employees from the Census County Business patterns.

[39]Table 22 summarizes the data at the state level, considering the corporate tax rate, per-capita incentive spending, and discretionary spending. Note that many smaller states are never observed giving large discretionary subsidies to firms. This may be due to budget constraints, which I discuss briefly in Section 1.3 and in more detail in Appendix 5.A.

how much a firm is worth?

I develop a model to answer this question. Firm locations and subsidy sizes are the equilibrium outcomes of state competition for firms, and the firm location choice problem. Firms do not necessarily locate in the state with the highest subsidy, they also care about how profitable they will be in the state.[40] If I observe a firm receiving a very small subsidy in a state it could be because the state is very attractive to the firm, or because all states had low valuations for the firm. In order to disentangle differences in firm profits in a location from the states' values for the firm, I will model the discrete choice location decision of the firm within the subsidy competition between states.

Before getting to the model I discuss the potential determinants of subsidy size, suggested by the statements of policy makers, theory, and past empirical work.

1.2.4 What determines incentive spending?

The most commonly cited motivation for giving a discretionary subsidy is job creation. This is evident from both the legislative text and interviews with policymakers. For example, the legislation enacting North Carolina's Job Development Investment Grant (JDIG) program states:

> The purpose is to stimulate economic activity and to create new jobs for the citizens of the State by encouraging and promoting the expansion of existing business and industry within the State and by recruiting and attracting new business and industry to the State.

In an interview with the Washington Post about the Amazon HQ2 bidding war, Maryland State Senate President Thomas 'Mike' Miller says:[41]

> Whether in Baltimore City, Prince Georges County or Montgomery County, we need to make it happen. Its jobs, jobs, jobs and more jobs.

[40] A case of this nature occurred in the competition for the Foxconn plant; Michigan offered a subsidy worth $800 million more than Wisconsin, but Foxconn chose to locate in Wisconsin (Press, 2017).

[41] See "Montgomery County lawmakers embracing Hogan's $5 billion effort to woo Amazon," *The Washington Post*, January 22, 2018.

However, when one considers the data, jobs do not go very far in explaining subsidy size. In Figure 3 I plot the number of direct jobs promised by a firm with the size of the subsidy it received. When I use the full sample (on the left) I find that there is a positive relationship, an additional 1,000 jobs is correlated with $46 million more in incentives, or $46,000 per job (also see the first column of Table 3). On the right I restrict to firms that create 5,000 jobs or under, which is 96% of the total sample. The positive correlation between jobs and subsidy size completely vanishes. Therefore, for the most part, it does not appear as though states only value job creation.

However, this is only accounting for the direct jobs promised by the firm. The unobserved indirect job creation of each firm, that is, jobs created through spillover, may help rationalize this lack of correlation. Heterogeneity between states, differing valuations of jobs in certain industries, revenue considerations, and economic conditions also could have a role in explaining subsidy size. I explore various potential determinants for subsidy size in the remainder of the section.

Spillovers: Indirect Job Creation

Spillovers are another oft-cited justification for the size of a subsidy or competition for a given firm, as well as a motivation for subsidy competition in the theory. However, there is limited data on firm-state specific spillovers. North Carolina provides predicted "indirect job creation" in the documentation of their discretionary grant program. They often estimate the indirect jobs created by attracting a given firm will be an order of magnitude greater than the direct jobs.[42]

There is a large literature on measuring the spillover effects between firms, and a smaller one which specifically studies large subsidized firms. Greenstone, Hornbeck and Moretti (2010) quantify agglomeration spillovers by estimating the impact of the opening of a large manufacturing plant on the total factor productivity of incumbent plants, and indirectly through the opening of new establishments. They have the list of runner-up counties, which they use as a control group. They find that the number of manufacturing plants increased by about 12.5% in winning counties after the opening, and there is an almost 15% increase in total output. The authors conclude that new

[42]See the discussion in Chapter 4.

manufacturing establishments decided to locate in the winning counties to gain access to productivity spillovers generated by the large plant.[43]

It is possible that a lack of correlation between jobs promised and subsidy received can be explained by spillover; high-spillover firms that are creating a modest number of direct jobs are receiving the same amount of money as low-spillover firms with a larger number of direct jobs. I test whether states have higher valuations for high-spillover firms, where I estimate spillover as the effect of the large subsidized firm on entry of smaller (medium-sized) firms. Of course, this is not the only channel that spillovers can operate. It may be that a new large firm also increases the productivity of existing firms (as in Greenstone, Hornbeck and Moretti (2010)), and raises property values and local revenues (Bartik, 1991). I use the entry of medium-sized firms because it is publicly available in the data, and because they receive some non-discretionary incentives from the state. This allows me to begin to think about the trade-off of the state, and compare the effect of attracting a large firm on medium firm entry to the effect of increasing incentive spending to medium firms.

Economic Conditions

Local economic conditions may explain differences in how much a state values job creation. It is not immediately clear which way incentive spending varies with the business cycle; a positive shock brings in more tax revenue, which can be spent on economic development programs, while a negative shock creates a demand for jobs and the associated 'job-creation' programs. In column 2 of Table 3 I find a weak correlation between the unemployment rate and the size of a subsidy deal.

[43]This paper (Greenstone, Hornbeck and Moretti, 2010) focuses on the spillover effects created by large, subsidized, firms, not the motivations for subsidizing the firm. However, the model they develop to inform their results provides insights into the subsidy-setting problem of the state. They apply a Roback (1982) style model with spillovers between firms. In the model, the entry of the subsidized firm creates spillovers, which leads to the entry of other firms, who want access to the spillovers. However, this entry increases competition for inputs, increasing land values and wages. Outside of their model, but germane to this project, is the fact that increased land values and wages creates more revenue for the state, in the form of property tax and income tax collection.

Potential Revenue

Another possible determinant of subsidy size is the ability of the state to recoup revenue from the job creation, business activity, and spillover effects created by the new firm. For example, if the state has a high corporate tax rate, it both can gain more from attracting a new firm to the state, and is able to offer a larger subsidy in terms of corporate tax abatements. This also holds for property taxes - a locality with a high property tax rate can both give a larger discount, by abating the property tax, and have more to gain if the firm increases local property values (even if the firm pays no property taxes).

I test for a correlation between subsidy size and three possible sources of revenue for the state: the corporate tax rate, the payroll of the firm, and property tax collection. The payroll of the firm is defined as the number of jobs promised by the firm, multiplied the average wage in the industry of that firm. Since property taxes are usually collected at the city or county level, I use a concept of "property tax reliance." This is defined as the percentage of state and local tax revenues that are generated by property taxes. I also interact this with the number of jobs promised by the firm, in an attempt to capture the magnitude of the investment.

Column 3 in Table 3 shows that all three possible revenue drivers are correlated with subsidy size. A one percentage point increase in corporate tax rate is correlated with almost a $23M larger subsidy, while a one percentage point increase in property tax reliance, holding number of jobs constant, is correlated with a $1.8M larger subsidy. Of course, this could be driven by firm preferences — a firm needs a larger subsidy to locate in a higher cost (higher corporate tax, property tax) state. In order to disentangle the firm preferences over location characteristics from the state's subsidy-setting decision I need a model of both firm location choice and state subsidy competition.

Politics

Lastly, I consider the possibility that state incentive spending and the subsidy-setting process is partly driven by political considerations. Past literature in public economics

has explored political motivations for policy changes. Besley and Case (1995) study the effect of term limits on the policy behavior of U.S. governors, finding that governors who do not have re-election concerns (because of a term limit) levy higher sales, income, and corporate taxes. Meanwhile, Foremny and Riedel (2014) find that incumbent politicians in German city council elections lower business taxes in the year before an election, and raise the taxes in the year after.

I test whether there are correlations between the characteristics of the state governor and whether the state increases incentive spending using a linear probability model, in Chapter 4 (23). The results shows that being a governor in the first term is associated with an increased probability that incentive spending increases in the aggregate. Term-limited governors are associated with a decreased probability of increasing total spending. This is suggestive evidence that governors may be using incentive spending to increase their chances of re-election.[44]

Previous work on subsidy competition (Ossa, 2018; Mast, Forthcoming). does not allow for a revenue-maximizing Leviathan government. I will allow political considerations in the subsidy decision, by estimating the distribution of state valuations for firms conditional on whether the governor is term-limited.[45] There is some work on the role of politics in subsidy competition; Jensen and Malesky (2018) provide evidence that politicians use economic development incentives to pander to voters and Slattery (2019*b*) shows that an increase in corporate involvement in state politics leads to an increase in state subsidy giving. If states do allow political considerations, such as re-election concerns, to affect their valuation of a firm, subsidy competition could lead to inefficient firm locations.

Given the data on total state incentive spending and firm-level subsidy deals, and various motivations for spending which may affect a state's valuation for a firm, I proceed to the model.

[44]I don't find the same correlation in the subsidy-level data (Table 3).

[45]It is also possible that these subsidies are driven by corruption - governors can use discretionary incentives to funnel money to their friends and political supporters. Industries that have greater political influence in a state, such as oil and gas in Louisiana and Texas, may use their political capital to ensure more financial support from the government. I will not be able to speak to these motivations in this paper, but it is a rich area for further work.

1.3 Model

In this section I develop a model of state subsidy competition. I use an private valuation English auction framework to model states bidding for firms. Anecdotal evidence from state economic development agencies and company officials motivates this approach.[46] Bidding for a firm begins when the firm announces it is considering an expansion or re-location, and continues as states learn of other bids and adjust their subsidy offers. The firms that are being "auctioned" have a discrete choice problem; they locate in the state that gives the highest payoff, where payoff is a function of the subsidy offer and the profit they would receive in that state.

The English auction, through which states bid for firms and firms locate in highest payoff state, is the heart of the model. It captures the mechanism through which states compete for firms, and allows me to clearly separate the state valuation for firms and the firm preferences over states. This will allow me to explain how states make subsidy decisions, and how subsidies influence firm location.

I enrich the auction model to capture two additional real world features of incentive competition: (1) spillover effects of subsidized firms (2) non-discretionary incentive spending.

Spillover, or agglomeration economies, is one reason a state would offer a certain firm a tax break. Intuitively, firms that have higher spillovers should get larger tax incentives. Also, the spillover of one firm may differ from state to state. States that will experience the largest spillover, or benefit most from agglomeration, are willing to pay the most for the firm and offer higher incentives. In this case I consider spillover to mean the effect of the subsidized firms in attracting more firms to the state.[47]

In order to incorporate potential spillover effects I model the location decision of firms who do not get discretionary subsidies. I call these the "medium" firms, due to

[46] I will duscuss the modeling choices in detail at the end of the section.

[47] Another type of spillover would be that the new subsidized firm made incumbent firms more productive, so they increased hiring, investment. There are also effects of new large plants on property values, this is heterogeneous, depending on the city the firm locates on. I use data on the state and local reliance on property tax revenues to try and capture the importance of increased property values. All of these potential spillovers are implicitly modeled as part of the private value of the state.

their size.[48] The medium firms also solve a static discrete choice problem: they locate in the state that gives the highest profit, where profit is a function of the number of large firms, non-discretionary incentive spending, and the state characteristics. This occurs after the auction for the largest firms. By backwards induction the expected spillover of the large firm (the effect of the large firm on the medium firm entry) enters the state bid for the large firm.

Thus, with the addition of the medium firms the model allows states to value potential spillover effects of large firms, and encompasses both discretionary and non-discretionary incentive spending.

Model Set-up

There are three types of agents in the model: State Governments, Large Firms that receive discretionary subsidies, and Medium Firms. I outline the timing of the game and then detail the optimization problem for each agent. The timing of the game is as follows:

(t=0) *Large Firms* announce intention to relocate and/or expand

(t=1) *State governments* bid for firms

Large Firms locate in state with highest payoff

(t=2) *Medium Firms* observe the outcome of $t = 1$ and locate in state with highest profit

Multiple large firms can announce searches and choose locations each year (and at different times within a year). The medium firms make the location decision in the second year (t=2) after observing all of the location choices made by large firms in t=1. If more than one large firm locates in state s in t=1, the state considers the spillover of the $(n+1)$-th large firm, taking into account they have n new entrants.

State Problem

A state $s \in \{1, \ldots, S\}$ draws a private valuation for firm i, v_{si}, independently distributed $H(v|x, z, \nu)$. x is a vector of state characteristics, z is firm characteristics,

[48] From the data we know that medium sized firms do not receive discretionary tax breaks from the states, but often qualify for tax-credits and other general incentives.

and ν is the expected spillover of firm i. These state and firm characteristics are publicly observed by all states, but the spillover is firm-state specific and private information to the state.

States compete for the firm in a private valuation English auction. The English auction is a open-outcry ascending auction, which means that a state can announce a bid and then increase their bid once another bid makes a more attractive offer. This is strategically equivalent to the 2nd price auction, in which every bidder bids their value, and the highest value bidder wins the good, paying the price of the second highest bidder. The optimal strategy for the state is straightforward - they bid up to their value, v_{si}, for the firm.

If firm i chooses to locate in state s the state receives a payoff of $v_{si} - b_{si}$, where b_{si} is the bid for the firm.

Large Firm Location Choice

The large firm's objective is to maximize payoffs. This means that unlike a standard auction, the winning state is not always the highest bidder. Instead the firm will locate in the state that gives them the highest payoff, the sum of their profit in the state and the bid (subsidy) offered by the state.

I model firm i's payoff from locating in state s as:

$$w_{is} = b_{is} + \pi_{is} \tag{1.1}$$

where b_{is} is the bid (subsidy offer) of state s, and π_{is} is the profit of firm i in state s. Firm i draws a profit π_{is} in each state s from some distribution $G(\pi)$.[49] This profit is public information to all states.

Firm i locates in s if it gives the highest payoff of all states in S:

$$y_{is} = 1[b_{is} + \pi_{is} > b_{im} + \pi_{im} \; \forall \; m \in S].$$

Medium Firm Location Choice

The medium firm's objective is to maximize profit. Their profit in a state is a function of the expected non-discretionary incentives available to firm k in state s, $\mathbb{E}\chi_s$, the

[49] This profit may be a function of state and firm characteristics, and a firm-state match value.

number of large firms in industry j, $\sum_i y_{ijs}$, and other state characteristics, x_s. A medium firm k has profit π_{ks} in state s:

$$\begin{aligned}\pi_{ks} &= \alpha \mathbb{E}\chi_s + \mu_j \sum_i y_{ijs} + \beta_m x_s + \zeta_s + \epsilon_{ks} \\ &= \delta_s + \epsilon_{ks}\end{aligned}$$

where δ_s is the mean expected profit for a medium establishment in state s. The ζ_s are unobserved state characteristics and ϵ_{ks} captures the firm-specific match value with the state. I assume that ϵ is distributed *iid* Extreme Value, and the outside option of not entering has a mean profitability of 0. Then, the share of medium firms entering state s is given by the logit formula:

$$\omega_s = M \times \frac{\exp(\delta_s)}{\sum_{m \in S} \exp(\delta_m) + 1} \tag{1.2}$$

where M is the total number of potential entrants. This follows the literature on discrete choice models, pioneered by McFadden (1974).

The spillover effect of large firm i in state s is given by:

$$\nu_{is} = \omega_s(y_{ijs} = 1) - \omega_s(y_{ijs} = 0)$$

Outcome

The outcome of the model is a set of equilibrium bids and large firm locations, $\{b^*_{is}, y^*_{is}\}$ s.t.

$$\begin{aligned}\text{losing bids:} \quad & b^*_{is} = v_{si}(x_s, z_i, \nu_{is}) \\ \text{winning bids:} \quad & b^*_{is} \leq v_{si}(x_s, z_i, \nu_{is}) \\ \text{locations:} \quad & y^*_{is} = 1[\pi_{is} + b^*_{is} > \pi_{ij} + b^*_{ij}] \ \forall \ j \in S.\end{aligned}$$

Example: Auction with 2 States

I will illustrate how the auction for firms works with a simple example (also shown in a diagram in Figure 4). Suppose there are two states, state 1 and state 2, competing for a firm, firm A. Firm A draws a profit for each state: $\{\pi_{A1}, \pi_{A2}\} = \{10, 7\}$. Each state draws a valuation for the firm. State 1 values firm A at \$3M, and state 2 values the firm at \$7M: $\{v_{1A}, v_{2A}\} = \{3, 7\}$.

If there were no subsidy competition, firm A would locate in the state that gives

the highest profit, state 1, receiving a payoff of \$10M. State 1 would receive their value for the firm, \$3M, for a total welfare ($\pi + v$) of \$13M.

If the states compete for the firm in an English Auction, state 2 can start the bidding with a bid of $3 + \epsilon$, making the payoff the firm would receive in state 2 ϵ higher than their payoff in state 1. However, state 1 can respond to that; and states will continue to increase their bids until one of the states reaches their stopping rule. In this example, it is state 1, which will not bid higher than their valuation for the firm, \$3M. Firm A receives a payoff of \$13M in State 1 when they bid their total value; State 2 responds with a payoff that is ϵ higher than \$13M, bidding $6 + \epsilon$. Therefore, state 2 offers the highest payoff for firm A, and firm A locates in state 2.

Note that the total welfare when firm A locates in state 2 is \$14M; welfare has increased due to subsidy competition. Therefore, in this simple example, subsidy competition is not a zero-sum game.[50] This is due to heterogeneity in the state values for the firm. Competition allows the state that would experience a larger benefit from the firm's entry to compensate the firm for that positive externality.

You may also note that in this example, subsidy competition reduces the total payoff of the states. Without competition, state 1 captured \$3M, their total valuation for firm A. With competition, state 2 has a payoff of $v_{2A} - b_2 = 1 - \epsilon$. Therefore, although total welfare increases with competition, this welfare gain is captured by the firm, and total state welfare decreases. If v_{2A} (state 2's valuation of firm A) were larger, both state and firm payoffs would increase under competition.

Discussion

The model does not capture every feature of the incentive competition landscape. The main simplification is with respect to the state economic development budgets. I treat the state non-discretionary incentive spending as exogenous and independent from spending on discretionary subsidies. I do not impose a budget constraint on discretionary subsidies. In reality the state may be setting the total economic devel-

[50] One could easily formulate an example where competition is a zero-sum game. Consider the same case as the example above, except that the valuation of state 2 is 5 instead of 7. Competition would still result in firm A locating in state 1, but rent would be transferred from the state to the firm.

opment budget, considering the trade-off between discretionary and non-discretionary spending. However, discussion with employees at various state economic development agencies made it clear that the "budget" is a very ill-defined concept, and large discretionary subsidy deals are often made under the assumption that the state will "find" or budget the money in the future.[51]

Another simplification is that I model this problem at the state level, although cities and counties often contribute incentives to the subsidy package and the firm is ultimately choosing a specific location within the state.[52] Lastly, I assume that whenever a firm announces its intention to locate, all the 48 states compete. This is a simplification that is primarily driven by the data I have because I only observe the location choice of the firm, after the fact. In other words, I do not know the "consideration set" of the firm. The best I could do was to determine the runner-up state. I will discuss this further in Section 1.4.2.

I chose the private value English Auction to model state competition for firms.[53] More specifically, it is a private value English *scoring* Auction, with an unobserved to the econometrician scoring rule. I use the English Auction because I have evidence from state documents on subsidy-giving that there are multiple rounds of bidding, and that states know each others bids.

The use of a scoring auction follows evidence that firms do not only care about the subsidy offer, but have preferences over state characteristics. Using a scoring auction instead of a beauty contest, generally means assuming that the "scoring rule" (in my case, the firm profit function) is known to bidders (states).[54] However, in this setting, the format in which the English Auction is run is that the firm will update states when their offer has been dominated by another state. Therefore, the states do not

[51]For a longer discussion of this assumption and the determination of economic development budgets see Appendix 5.A. Relatedly, I assume the state valuations for firms are independently distributed, and thus do not consider any interactions in the valuations of large firms. For example, the state does not necessarily value large firms less once they have just won an auction for one.

[52]Mast (Forthcoming) models the competition between cities and counties for firms within New York State. One reason I do not do this at the more local level is a data constraint. However, the state and city or county usually makes the offer jointly, and the total bid includes the amount contributed by the city or county, usually in the form of property tax abatements.

[53]Kim (2018) uses the private value sealed-bid first-price auction.

[54]From the buyer (firm) perspective, Asker and Cantillon (2008) show that scoring auctions weakly dominate beauty contests in the open ascending format.

need to know the scoring rule to compete.

One reasonable approach would to model this as a common value, as opposed to a private value, auction. In the pure common value auction, the bidders (states) have different information, but identical values for the good (firm). This means that the firm creates the same amount of value (in tax revenue, indirect job creation, etc.), regardless of the location it chooses. This assumption is not supported by most of the literature (e.g. Greenstone, Hornbeck and Moretti (2010), Bartik (1991)). Also, in this setting components of one state-specific value for the firm (e.g. the expected spillover effect in that location), should not affect the valuations of other states.

However, another way to think about common values in this context is that $H(v|\cdot)$ is not the distribution of true values, but the distribution of state beliefs about the value the firm will create, which is still location-specific, but has a common-value component. This comes back to the assumption that states know the value the firm will create in the state. Loosening this assumption is an area for further work.

1.4 Identification

The primitives from the model that I intend to identify are the large firm profits, π, large firm spillovers to medium-sized firms, ν, and the conditional distribution of state valuations for firms $H(v|x, z, \nu)$. I have data on large firm locations, winning subsidy bids, runner-up large firm locations, and medium-sized firm entry shares, along with state and firm characteristics. The identification of spillovers (ν) follows Berry (1994) closely — covariation in medium-sized firm entry shares and state characteristics identify the parameters of the medium firm profit function.[55] In this section I will focus on the large firm profit and the distribution of state valuations, which are not as straightforward to identify. Difficulties arise because (1) I only have data on winning bids, and (2) the winning bid does not represent the second highest valuation.

If firms only cared about the subsidy, and not other state characteristics, this would be a straightforward problem. The winning bid would represent the second order statistic from the distribution of state valuations, and identification would be

[55] I provide more details on spillovers when discussing estimation and results (Section 1.5.2).

achieved using the order statistic identity (Athey and Haile, 2002). However, because firms care about state characteristics, there are multiple steps. I must first recover firm profits. Here I use the model outcome, as well as techniques from the measurement error literature. Then I use the profits to calculate payoffs in the runner-up state, which allows me to apply the order statistic identity, and recover the full distribution of payoffs. Finally, firm payoffs are a function of state valuations, so I invert the distribution of payoffs to recover the distribution of state valuations for firms. I take the rest of the section to provide intuition and details.

1.4.1 Firm Profits

From the model we know that firm i goes to the state (bidder) that gives the highest payoff. We also know the optimal bidding strategy of each state is to bid up to their value, until no other state can raise their bid. This means that the winning state can stop bidding when the payoff they give the firm just exceeds the payoff in the runner-up state. Like the second price auction, the winning state will guarantee the firm the 2nd highest payoff. In other words, the payoffs in the runner-up and winning state are equivalent:

$$\underbrace{\pi_{\text{winner}} + b_{\text{winner}}}_{\text{payoff in winning state}} = \underbrace{\pi_{\text{runner-up}} + v_{\text{runner-up}}}_{\text{payoff in runner-up state}} \tag{1.3}$$

To formalize the argument, I assume:

Assumption 1 *States compete for firm i in a private-value English auction. In the auction, states observe all bids from competing states, b, and firm profits across all states, π.*

See Appendix Section 5.C for evidence that states do observe the bids of their competitors. The more demanding assumption, perhaps, is that states know what the firm's profit would be in each state. This is necessary for the equality in Equation 1.3 to hold. If there is asymmetric information in profits, the state may not know the payoff they have to offer the firm to ensure they win the competition, causing them to "overbid". However, given the state has a long history of competing for firms

and observing location choices, as well as access to financial information for publicly traded firms, this is not necessarily far from reality.

Assumption 2 *Large firm profits take the following functional form*

$$\pi_{is} = \beta_i x_s + \xi_s$$

where x_s are observed state characteristics, and ξ_s are unobserved (to the researcher) state characteristics.

Assumptions 1 and 2 give way to the following result:

Proposition 1 *The winning state, observing bids b, and profits π, will bid up to the firm's payoff in the runner-up state. Therefore, if firm i locates in state 1, the profit they get in state 1 is equal to the profit in the runner-up state, s, or:*

$$b^*_{i1} + \beta_i x_1 + \xi_1 = (b_{is} + \beta_i x_s + \xi_s)^{(2:n)} \tag{1.4}$$

where the notation $(2:n)$ refers to the ranking of the payoff of the state, $(2:n)$ is the 2nd highest payoff state of the n states.

This is given from the structure of the English Auction, winning state (state 1) will never bid higher than b^*_{i1}, as defined in Equation 1.4, because it will not change the probability of winning, but it will lower their payoff, $v_{1i} - b_{i1}$.

In the English Auction all losing states must have bid up to their value, which is their stopping rule. This means that $b_{is} = v_{is}$ and I can rewrite Equation 1.4 as:

$$b_{1i} = (v_{is} + \beta_i x_s + \xi_s)^{(2:n)} - \beta_i x_1 - \xi_1. \tag{1.5}$$

In order to identify β_i from Equation 1.5 I need to know the identity of the runner-up location, the state that gives the 2nd highest profit. Given that I know the identity of this 2nd highest payoff state (I will denote this state 2), and assuming independence of δx and $v + \delta\xi$, I can identify β_i from the following equation:[56]

$$b_{1i} = \theta_i + \beta_i(x_2 - x_1), \tag{1.6}$$

where $\theta_i = v_{i1} + (\xi_2 - \xi_1)$ is the residual of a linear regression of the observed winning bids (b_{1i}) on the difference in winning and runner-up state characteristics $(x_2 - x_1)$.

[56]The assumption of independence between δx and $v + \delta\xi$ is very strong, and I am working to introduce correlation between state valuations for the firm and state characteristics, and finding an instrument for x.

Given β_i I turn to the deconvolution of θ_i, with the aim of identifying the variance of the unobserved state heterogeneity, ξ.

Unobserved State Heterogeneity: σ_ξ^2

From the assumptions made in the previous section, I can write an equation for the winning bid (b_{i1}) where 1 denotes the winning state and 2 is the runner-up state:

$$b_{i1} = v_{i2} + \beta_i(x_2 - x_1) + (\xi_2 - \xi_1). \tag{1.7}$$

Given data on winning bids and observed state characteristics we can recover a residual, $\hat{\theta}_i$, from Equation 1.7, where:

$$\theta_i = v_{i1} + (\xi_2 - \xi_1) \tag{1.8}$$

However, we have no data on v or ξ. The identification challenge is to recover the variance of ξ from θ.

I provide details in Appendix Section 5.D, but in short I rely on tools created for the deconvolution of measurement error (see, for example, Carroll and Hall (1988)). Deconvolution was developed as a method to separate signal from noise. I observe a noisy signal, $\hat{\theta}$, of ξ. I can use the second moment of θ, to learn about the variance of ξ.

I assume that $\xi \perp v$, and $\xi \sim N(0, \sigma_\xi^2)$. I take the inverse Fourier transform of characteristic function of v_2, to get an expression for f_{v_2}, and then use the variance of θ to recover $\hat{\sigma_\xi^2}$:

$$var(\hat{\theta}) - \big[\frac{1}{S}\sum_{s=1}^{S}(v_{2,s} - \frac{1}{S}\sum_{s=1}^{S} v_{2,s} \times f_{v_2}(v_{2,s}; \sigma_\xi^2)))^2 + 2\sigma_\xi^2\big] = 0.$$

See Appendix Section 5.D for more details.

1.4.2 State Valuation: $H(v|x, z, \nu)$

Given the identification of β_i and σ_ξ^2, I proceed to the final object of interest, the state valuation of firms, $H(v|x, z, \nu)$.

In a traditional second price auction, where the good being auctioned goes to the bidder with the highest bid, we know that the distribution of observed winning bids is equivalent to the second order statistic of the distribution $H(v)$, because the winning

bidder will stop as soon as the 2nd highest bidder drops out. Then, the second order statistic of v can be used to identify $H(v)$. However, in this case the winning rule is that the good (firm) goes to the bidder (state) with the highest payoff. Therefore, I cannot identify H using only data on winning bids.

I will also note that the v_{i2} from Equation 1.7 is not necessarily the second highest v. The state that gives firm i the second highest payoff does not need to have the second highest valuation for i, just as the state that firm i locates in does not have to be the state with the winning bid. It very well could be that $v_{i2} > v_{i1} \geq b_{i1}$, if state 1 has more attractive characteristics. This means that even given v_{i2} I do not have the 2nd order statistic of $H(v)$.

Instead, I will consider what I know about firm payoffs. From Equation 1.1, payoff is defined as $w = b + \pi$. Suppose firm payoffs are distributed $F(w)$. Given $\hat{\beta}, \hat{\theta}, x$ and σ_ξ^2 I can estimate payoffs in the runner-up state:

$$\hat{w}_i^{(2:n)} = \underbrace{\hat{\theta}_i - \hat{\xi}_1}_{v_{2i}+\xi_2} + \underbrace{\hat{\beta}_i x_2}_{\pi_{i2}-\xi_2} . \tag{1.9}$$

The estimates of firm payoffs in the second highest state give way to an empirical CDF of the second order statistic of payoffs $\hat{F}(w)^{(2:n)}$. Identification of $F(w)$ comes from the second order statistic identity. The i-th order statistic from an i.i.d. sample of size n from an arbitrary distribution F has distribution (see Arnold, Balakrishnan and Nagaraja (1992), Athey and Haile (2002)):

$$F^{(i:n)}(w|\cdot) = \frac{n!}{(n-i)!(i-1)!} \int_0^{F(w|\cdot)} t^{i-1}(1-t)^{n-i} dt \tag{1.10}$$

where n is the number of bidders. Therefore the distribution of firm payoffs in all states, $F(s|x, \xi)$, is identified from data on the 2nd order statistic of payoffs, $w_i^{(2:n)}$.

As I mentioned in the model section, I assume that whenever a firm announces its intention to locate, all the 48 states compete, so $n = 48$. This is a simplification that is primarily driven by the data I have because I only observe the location choice of the firm, after the fact, I do not know the "consideration set" of the firm. If the real competition for a firm A is between VA, NC and GA, I am assuming that all other states are also in play. So, I estimate the model, I treat the observed bids as second highest among 48 states where as it should be second highest among 3 states. This usually does not affect the bids, because in an English auction it is weakly dominant

strategy is to bid your own value irrespective of the competition. However, the firm location choice is a function of both bids and state characteristics, and the choice of n affects the distribution of firm payoffs. This will lead me to underestimate the distribution of valuations.

Recall, the goal is to identify the state valuation for firms, $H(v|\cdot)$. This is crucial to start to understand how states make subsidy-setting decisions. Whether or not states offer subsidies based on jobs and spillover, or re-election concerns, will have implications for how we evaluate this policy (Glaeser, 2001). At this point, I know the distribution of payoffs, F, and from the model I know the relationship between payoffs (w) , profits (π) and state valuations for the firm (v):

$$w = v + \underbrace{\beta x + \xi}_{\pi} \sim F(w|\cdot)$$

Suppose firm profits are distributed with some known distribution G, with pdf $g(\pi)$. Then I can exploit the relationship between valuation and profit to recover $H(v|\cdot)$:

$$\begin{aligned} H(t|\cdot) = \Pr(v < t|\cdot) &= \Pr(w - \pi < t|\cdot) \\ &= \Pr(w < t + \pi|\cdot) \\ &= \int F(t + \pi|\cdot)\frac{1}{\beta}g(\pi)d\pi. \end{aligned} \tag{1.11}$$

I invert Equation 1.11 to recover the conditional distribution of state valuations for firms, $H(v|\cdot)$, as desired.

1.5 Estimation and Results

The estimation argument closely follows the identification argument. As in the identification section I will detail the estimation separately for each part of the problem: firm preferences, spillovers, and state valuation. The discussion of estimation of the variance of unobserved state characteristics is left to the appendix.

1.5.1 Large Firm Preferences: β

From Section 1.4.1, the relationship of interest is

$$b_{1i} = \beta_j(x_2 - x_1) + \underbrace{\alpha_t + \epsilon_{it}}_{v_{i2}+(\xi_2-\xi_1)} \tag{1.12}$$

where b and x are data, and 1 denotes the state that firm i located in, while 2 denotes the runner-up location. The regression equation also includes year fixed effects, α_t, which, in terms of the model, can be thought of the mean valuation of the runner-up states in that year. The year fixed effects will be included with the residual, ϵ, and used to recover the payoffs in the runner-up state. Equation 1.12 follows directly from the identification argument (Equation 1.5).

However, the model also implies that profit in the winning state (state 1) is the *highest*; it is greater than or equal to profit in *all* other states. This gives a set of inequalities that constrain the equation in Equation 1.12:

$$b_{1i} = \beta_j(x_2 - x_1) + \underbrace{\alpha_t + \epsilon_{it}}_{v_{i2}+(\xi_2-\xi_1)} \tag{1.13}$$

$$s.t.\ b_{1i} \geq v_{is} + \beta_j x_s + \xi_s - \beta_j x_1 - \xi_1\ \forall s.$$

So, the estimation of β_j is a constrained optimization problem. I present results for both the constrained and unconstrained estimation in Table 5, but before going over the estimates I introduce the state characteristics (x) and industry groups (j) that I will use in estimation.

Allowing for Heterogeneity by Industry

In the data section (Section 1.2) I present descriptive statistics by 13 industry groups, highlighting the heterogeneity in subsidy-giving and size by industry. In the estimation I will use broader classifications, allowing for 4 industry groups of approximately equal size, as shown in Table 4. I will estimate firm preferences at this industry group level, so that low-skill manufacturing firms may prefer right-to-work states, for example, more than high-skill services firms. This is driven by sample size considerations. I want to allow for as much heterogeneity in the profit function by industry, to get

realistic estimates of firm profits, but I only have 485 subsidies in my sample.[57]

Co-variates

The state characteristics considered are the state corporate income tax rate, the state individual income tax rate, the state sales tax rate, the proportion of citizens with a college degree, whether the state is a right-to-work state, the housing cost differential in the state, and state-industry level establishments and wages.

Tax rate data come from the Tax Foundation. I use the highest bracket tax rate for the corporate and individual income taxes. The proportion of citizens with a college degree in the state is calculated using Census data, and the right-to-work status of the state is collected from the National Conference of State Legislatures. The housing cost data is from Zillow, and the differential is calculated à la Albouy (2016), and is normalized to have mean zero and standard deviation 1. The state-industry establishments and wages are the number of establishments and the wages at the four-digit industry level in the state, normalized to have mean zero and standard deviation 1.

Figures 5 and 6 show the densities of each of these co-variates in the sample of state-years that give subsidies and the full sample of all states and years (2002-2016). Figure 5 shows the tax variables: corporate, income, and sales. Figure 6 includes the other characteristics: population with a BA (%), housing cost differential, and industry-level establishments and wages. The states that win subsidy competitions have similar tax rates to the full sample, but have higher industry wages, and more existing industry concentration.

Results

Table 5 displays the estimates for both the unconstrained (Equation 1.12) and the constrained (Equation 1.13) estimation procedures. I will go through the results for the constrained case, which is the estimation procedure suggested by the model.

A one percentage point increase in the corporate tax rate decreases the profitability

[57]Note, I also do not allow for any firm-state level unobserved match value.

of a location by 2.4 million dollars, and a standard deviation (2.8 percentage point) increase in the corporate tax rate corresponds to a $6.6 million (6.2%) decrease in profits. However a one percentage point increase in either income tax or sales tax increases profitability of a location, this may reflect some amenity value of the state, and is also, of course, not necessarily paid by the firm, but more relevant for the firm's employees and managers. A one percentage point increase in the college educated population increases profits by $4.1 million, and a standard deviation (3.9 percentage point) increase leads to a 16 million dollar (15%) increase in profits.

I allow for industry-group coefficients on the right-to-work variable, housing costs, establishments, and wages. This is important to more realistically model the counterfactual location choice of firms.[58] These coefficients highlight differences across groups. For example, high-skill manufacturing firms are $21M (19%) more profitable in right-to-work states, while high-skill services firms are $9.6M less profitable.[59] Both high-skill groups (in manufacturing and services) are more adverse to high housing costs, and high-skill services firms benefit the most from proximity to other establishments in their industry, highlighting the importance of thick labor markets in skilled-industries.

Figure 7 presents profits across states in three industries (Auto Manufacturing, Consulting, and Oil and Coal). Some states are always profitable (e.g. TX, NC), but industry level patterns emerge - Automobile manufacturers are most profitable in Michigan, South Carolina, and Georgia, while Oil and Coal are also profitable in Louisiana and Oklahoma, and consulting firms are profitable in New York and California.

Given the estimates of β I can calculate the profit of a firm in their observed and runner-up location. I will use this estimate of profit to recover an estimate of $H(v)$, the distribution of state valuations for firms. First, I use the model of medium firm location choice to estimate the potential spillovers from subsidized firms.

[58] Ideally I would have richer firm-level characteristics and I would be able to estimate a random coefficients model. I am constrained by the number of observations, which is why I do not estimate industry specific profit functions separately, or industry-specific coefficients for each variable.

[59] These results are consistent with Holmes (1998), who uses a border discontinuity approach and finds that establishments are more likely to locate in right-to-work states.

1.5.2 Estimation of Spillovers

The model for medium firm location choice gives an expression for market share (Equation 1.2). My data has observed shares, which I denote $\hat{\omega}_s$. The goal is to recover the mean profitability of a location, δ_s. I apply the standard Berry (1994) inversion to solve for δ as a function of observed market shares:

$$\delta_s = \log \hat{\omega}_s - \log \hat{\omega}_0$$

which gives an estimable equation:

$$\log \hat{\omega}_s - \log \hat{\omega}_0 = \alpha \mathbb{E}\chi_s + \mu_j \sum_i y_{ijs} + \beta_m x_s + \zeta_s. \tag{1.14}$$

The coefficients of interest are α, the effect of increasing spending on expected incentives available to medium sized firms on their profit, and μ_j, the effect of winning the auction for an additional large firm in industry j on the profit of the medium sized firms. I allow for 11 industry groups in the medium firm profit function, allowing for heterogeneity in spillover across industries.

The results are presented in Tables 6 and 7. Note that the expected non-discretionary incentive has a positive effect on medium firm profits, an 10 thousand dollar increase in the expected non-discretionary incentive available is associated with about a 0.06 (3.1%) increase in medium firm profit in a location.[60] Attracting an additional large firm to the location via subsidy has a smaller effect on medium firm profit at 0.04 (2.1%), however, this effect is heterogenous by industry of the large firm. Firms in automobile, chemicals, and other high-tech manufacturing have a stronger positive effect on medium firm profit, increasing profit by as much as 0.13 (6.7%).

I use the estimates in Table 7 to calculate the expected spillover effect, ν, borne by an additional firm i in industry j, locating in state s. From the model:

$$\hat{\nu}_{js} = \hat{\omega}_s(y_{ijs} = 1) - \hat{\omega}_s(y_{ijs} = 0) \tag{1.15}$$

In estimation this amounts to adding the value of the coefficient μ_j to state s's profitability, δ, and recalculating the market share, ω. I can translate this to number of firms with 100-249, 249-500 employees respectively, or number of new jobs created

[60] I calculate "expected" incentive by dividing the total available non-discretionary incentives with the number of medium firms that entered the state in the previous year. I instrument incentive spending with the state balance in the previous year.

via entry of medium-sized firms. A histogram of predicted spillover, in terms of indirect jobs created via the entry (or exit) of medium-sized firms can be found in Figure 8 (a). This is the indirect job creation for the average large firm, and the heterogeneity in number of indirect jobs arises from the shape of the relation of logit probability to mean profits.[61] At the median, the spillover is 120 indirect jobs (224 at the mean). The median number of *direct* jobs promised by a firm is 775 (1658 at the mean), which translates to a multiplier effect of 0.15. For every 10 new direct jobs created by a large firm a state should expect 1.5 indirect jobs, at the median.

Note that there is significant heterogeneity within industry (predicted spillover is industry-state-year specific), shown in Panel (b) with box plots for each industry. Firms in the automobile manufacturing have the largest positive spillover effects, and other manufacturing and high-tech services firms drive the positive average effect. The multiplier effect for automobile manufacturers is 0.69, so for every 10 direct jobs created at an auto plant, a state should expect about 7 indirect jobs to be created from the entry of new establishments.[62] Miscellaneous services and manufacturing, e.g. wholesale trade and retail, have a negative effect, crowding out smaller establishments. In general, these estimates are a lower bound on the indirect jobs created via spillover. As shown in Greenstone, Hornbeck and Moretti (2010), indirect jobs are borne from new establishment entry *and* increased productivity of incumbents. These estimates only capture the first effect.

I will use this expected state-specific spillover of the firm as a conditioning variable when I estimate the distribution of state valuations, to say how much states value potential spillovers.

[61] The relationship between the logit probability and average profits (δ) is sigmoid (S-shaped), which means that an additional large firm will have different effects, depending on how profitable the state is to start. The S-shape means that the probability is flat at low and high profitability states, so an additional large firm will have little effect on the probability those states are chosen (other alternatives are either sufficiently better or worse). In the middle, a small change in profitability can swing the choices of the medium firms, and has a significant effect on entry shares.

[62] The median indirect job creation for auto plants is 1,308 (2,197 at the mean), while the median direct job creation is 1,895 (2,970 at the mean).

1.5.3 State Valuations for Firms

I estimate the distribution of state valuations for firms via indirect inference. This follows from the identification (Section 1.4.2) very closely. I calculate payoffs in the runner-up state (Equation 1.9), and use the empirical CDF as the second order statistic of payoffs (Equation 1.17) to recover the distribution of payoffs. Then I simulate state characteristics and ξ and estimate H using the sample average (this corresponds to Equation 1.11 in Section 1.4.2).

The only component of the procedure not explained by the identification is the estimation of the conditional distribution of state valuations.

In the following subsection I will detail the estimation of the distribution of state valuations for firms, conditional on the number of jobs promised by the firms. The other variables I condition on (spillover, unemployment, politics) are mostly state specific, and I follow the estimation procedure below on that subset of the data. For example, I can split the sample into estimated payoffs ($\hat{w}_2$) and jobs when the runner-up state has a high potential spillover and when the runner-up state has a lower potential spillover, and compare the two estimated distributions.

The Conditional Distribution: $H(v|jobs)$

My goal is to estimate the distribution of state valuation for firms, conditional on jobs. Job creation, as mentioned in the data section, is the number one stated objective of states when they give discretionary subsidies to firms. Hence, in estimation, it will be important to allow the state valuation for firms to vary depending on the level of jobs the firm promises to create. In order to recover this conditional distribution I need to estimate the joint distribution of the 2nd order statistic of firm payoffs (from which I will derive the valuation), and jobs.

I estimate 2nd highest payoffs (w_2), firm i's payoffs the runner-up state:

$$\hat{w}_i^{(2:n)} = \underbrace{\hat{\theta}_i - \hat{\xi}_1}_{=v_{2i}+\xi_2} + \underbrace{\hat{\beta}_i x_2}_{=\pi_{i2}-\xi_2}, \tag{1.16}$$

and I know the number of direct jobs firm i promises to create. I am interested in the relationship between how each state values firm i, v_{si}, and the number of jobs i promises. I have no estimates of valuations at this point, but I do know that firm

payoffs are a function of the state valuation, $w_{i2} = v_{2i} + \pi_{i2}$. Therefore, I exploit the relationship between the estimated payoffs, $\hat{w}_2$ and the number of jobs promised to recover the relationship between the valuations v and the number of jobs promised.

Specifically, I have an empirical distribution of payoffs in the runner-up states, $\hat{F}^{(2:n)}(w)$, (Figure 9). I need the conditional distribution $\hat{F}^{(2:n)}(w|jobs = j)$, which I can plug into the order statistic identity to solve for $\hat{F}(w|jobs = j)$:

$$\hat{F}^{(2:n)}(w|jobs = j) = \frac{n!}{(n-i)!(i-1)!} \int_0^{\hat{F}(w|jobs=j)} t^{i-1}(1-t)^{n-i} dt \tag{1.17}$$

This estimate of the conditional distribution of payoffs, $\hat{F}(w|jobs = j)$, will subsequently be used in the estimation of $\hat{H}(v|jobs = j)$.

I can use a copula to estimate the joint distribution of F_{w_2} and F_{jobs}. From Sklar's Theorem I know that there is a unique copula C:[0,1]$^2 \rightarrow$ [0,1] such that:

$$F(w_2, jobs) = C(w_2, jobs) = C(F_{w_2}, F_{jobs}),$$

so, estimating $F(\cdot, \cdot)$ is the same as estimating $C(\cdot, \cdot)$ (Nelson, 1999). I consider a parametric copula, $C(\cdot, \cdot, \kappa)$ so that the copula is known up to the dependence parameter, κ. I employ the Frank Copula, from the Archimedian Family:

$$C_\kappa(w_2, jobs) = -\frac{1}{\theta} \log\left[1 + \frac{(\exp(-\kappa w_2) - 1)(\exp(-\theta jobs) - 1)}{\exp(-\theta) - 1}\right].$$

In order to exploit the copula to recover the joint distribution of payoffs and jobs I need to parameterize the marginal distributions. I use the gamma distribution to fit observed jobs and the gumbel distribution for "observed" (estimated) payoffs. See the histograms in Figure 10 for a comparison of the raw data and the fitted distributions.

Using these parameters and the estimated dependence between jobs and payoffs. I can generate the multivariate distribution of payoffs and jobs, shown in Figure 11.

Given the multivariate distribution and the marginal distribution of jobs, I can calculate the conditional distribution of runner-up payoffs at any level of jobs, $\hat{F}^{(2:n)}(w|jobs)$. I then follow Equation 1.17, as outlined in the beginning of the section, using the order statistic identity to recover the full distribution of payoffs, $\hat{F}(w|jobs)$.

Once I have an estimate for the conditional distribution of payoffs across all states, I exploit the relationship between payoffs and valuations to recover the distribution of state valuations for firms.

Estimation of $H(v|jobs)$

The last step in the estimation process is to draw $S = 1000$ state characteristics (x) from the underlying empirical distributions, and draw $S = 1000$ many ξ_s from $N(0, \hat{\sigma}_\xi^2)$, where $\hat{\sigma}_\xi^2) = 2.2$. See Figures 5 and 6 for the empirical distributions of state characteristics, in all states over the sample and only in the states giving subsidies. I sample from the underlying distribution, but there are noticeable differences in the two groups, especially when one considers the industry level variables, establishments and wages.

I estimate H using the sample average (this corresponds to Equation 1.11 in Section 1.4.2):

$$H_S(t|jobs) = 1/S \sum_{s=1}^{S} \hat{F}(t + \hat{\beta} x_s + \hat{\xi}_s|jobs)$$

as S approaches ∞, $H_S(t|\cdot)$ approaches the true $H(t|\cdot)$ for all t. See Appendix Section 5.E to see a simulation exercise confirming this.

Results

Figure 12 presents the results in graphical form. Each figure displays the estimated conditional distribution from which states draw their valuation for a firm, $\hat{H}(v|\cdot)$.[63] The distribution is conditioned on number of jobs promised by the firm, and, depending on the figure, other state and firm characteristics. The first thing to note, in Figure 12A, is that the valuation does not seem to be very dependent on the number of jobs created.[64] In the full sample, a firm promising 2,000 jobs is worth on average \$4.9M (7.8%) more than one with 100 jobs. Increasing firm size from 2,000 jobs, a firm promising 20,000 jobs is only worth \$3.0M (4.6%) more on average than one

[63] As I mentioned in the previous subsection, in order to estimate the conditional distribution when the conditioning variable varies at the state level, I split the sample by the conditioning variable before I estimate the joint distribution of payoffs and jobs, and then proceed with the estimation process as detailed above. This is why I will use binary variables (e.g. high vs. low spillover, high vs. low unemployment, new vs. term-limited governor). As a result, I can evaluate $H(v|jobs, \nu = \text{high})$, for example. In future iterations I will use a single index model, which will allow me to condition on multiple continuous variables simultaneously.

[64] A distinction between the 3 different levels of jobs (0, 2,000 and 20,000) is more visible when I limit the sample to only manufacturing firms, but it is still relatively small.

with 2,000 jobs. These results suggest that states are not solely maximizing direct job creation when they decide their valuation for a firm, and that states have decreasing valuations for the marginal job. Therefore, the weak relationship between direct job creation and subsidy size that is evident in the raw data holds, even when accounting for differences in firm profits across states.

The valuation for increased direct jobs is slightly larger for the subset of manufacturing firms (9.7%) but smaller for non-manufacturing firms (3.6%). In general, manufacturing firms are worth more to a state, in that they reveal a higher valuation for manufacturing firms than non-manufacturing firms. This is shown in Figure 12B, which plots the distribution of state valuations at 2,000 direct jobs for all firms, manufacturing firms, and non-manufacturing firms.

Indirect job creation (spillover) explains some of the small differences in valuations by job creation. First of all, when I account for the spillover levels a firm creating 2,000 direct jobs is worth on average 12% more than a firm promising 100 direct jobs, instead of 7% when I don't account for spillovers. Figure 12C presents the valuations conditional on predicted spillover, $\hat{\nu}$. I calculate the distribution of state valuations separately for low-spillover firms(the bottom third of firm-state pairs) and high-spillover firms (the top third of firm-state pairs), for a firm that promises to create 2,000 direct jobs. A high spillover firm promising to create 2,000 jobs is valued \$16.8M (27%) higher than a low spillover firm promising the same number of direct jobs. Figure 12D presents the distribution conditional on wages: Firms in high-wage industries are valued much more than low, a firm promising to create 100 jobs in a high wage industry is worth \$9.0M more than a low wage counterpart, and this difference grows with the number of jobs promised.

In the bottom row of Figure 12 I explore potential state level determinants of valuations for firms. Panel E shows the distribution of valuations conditional on unemployment, which is a measure of the economic conditions in the state. High unemployment states value a firm promising 2,000 jobs \$3.1M more than a low unemployment state, and this effect grows with firm size.[65] A firm promising 10,000

[65]I define "high" unemployment as an unemployment rate larger than 7%, and low, as under 5.5%. The median rate in the sample is 5.5% and the mean is 6%.

jobs is valued on average $7.3M higher than a low unemployment state values a firm of the same size. Heterogeneous labor market conditions across states lead higher unemployment states to benefit more, that is, have a larger valuation for, job creation.

Figure 12F explores the state potential to capture revenue from the firm, specifically via property taxes. States that rely heavily on property taxes for revenue value a firm $14.3B more than state with less property tax collection, suggesting the importance of potential spillovers to property values, and property tax abatements as a component of subsidy size.[66]

Lastly, political motivations for winning a firm are potentially creating inefficiencies. Figure 12G shows that governors who face re-election value firms creating 2,000 jobs $3.8M more than their term-limited counterparts. The effect decreases with number of jobs, in fact the difference is largest for the smallest number of jobs promised, at $6.6M. This suggests that there are political considerations, such as the effect of publicity of attracting a firm and creating jobs for the state on the chances of re-election, that affect the state subsidy-setting decision, and these considerations dominate when there is more uncertainty about the economic impact of the firm (low direct job creation).[67] This finding could also be the result of inexperience; new governors are learning on the job and overestimate the positive benefit of attracting a firm.[68]

[66]I define the state as "low" reliance if less than 25% of state and local revenues come from property taxes, and "high" reliance if it is greater than 35%. This corresponds to the 25th and 75th percentiles in the data (the median is 30%). Future work should explicitly model the spillover effects through property values.

[67]One concern is that new governors may enjoy more political support in the legislature than term-limited governors, and therefore, be more likely to get the funds they desire for subsidy deals. I do not find that to be the case in the data, at least in terms of party majorities. Term-limited governors are in the same party as the majority in the legislature in 52% of state-years, and "new" governors for 54%.

[68]Note that it may be the case that *all* states over-estimate (or, perhaps less likely, under-estimate) the effect of attracting a new firm. This results are driven by the *revealed* valuations of the states. I am not able to check whether the revealed valuations of the states align with the actual benefits that the firms create, as there is limited evaluation of subsidies post-disbursement. In fact, only 32 states have published evaluations of tax incentive programs (not individual deals) since the National Conference of State Legislatures started tracking them in 2007. Only 27 of 82 evaluations were published before 2014, so the majority are published in a recent push for transparency. Also, many evaluations concern film tax credits. When I drop the film tax credit evaluations I am left with 29 states and 65 evaluations over 2007-2017.

Taken all together, the results suggest that competition allows states to compensate firms for heterogeneous spillovers, economic concerns, and revenue considerations across states, increasing the efficiency of firm locations. The indirect job creation and property tax reliance go the furthest in explaining state valuations. If I did not consider these unobserved spillover effects I would miss an important component in the state subsidy-setting decision, and it would be harder to rationalize observed subsidy-setting behavior.

Model Fit

Before getting to the counterfactual, Figure 13 compares the observed subsidies in the data, to subsidies generated by the model. In the simulation, I draw state valuations for each firm from the estimated distribution. I then allow the states to play the auction for each firm, given their valuation draw, $\hat{v}$. The simulated subsidies are those that allocate the firms to the highest payoff state, where the winning state pays the difference in their profits and the runner-up payoffs.

As you can see from the table, the simulated subsidies fits the data well until we get into the right tail, where it cannot justify the largest subsidies we see in the data. In the next section I will use the model to evaluate the effects of a counterfactual subsidy regime, which eliminates subsidy spending.

1.6 Counterfactual Subsidy Regime

1.6.1 Eliminating Incentives

What if we were to ban states and cities from offering discretionary tax breaks to firms? This is the policy in place in the European Union, which restricts member countries from offering "state aid" to companies (Commission, 2008). In the U.S., legal scholars have posited that discretionary subsidies are in violation of the commerce clause of the Constitution (Enrich, 1996).[69] Also in the U.S., governors have

[69]In fact, a 2004 case brought against DaimlerChrysler and the state of Ohio, for an investment tax credit given to the car manufacturer, used this argument. The U.S. Court of Appeals in Cincinnati found the credit unconstitutional, but the ruling was struck down by the Supreme Court for a

proposed a truce on subsidy competition (Story, 2012).

In this exercise I eliminate incentive spending and determine where firms would locate in the absence of subsidies. Eliminating incentive spending means that the large firms would have to pay the state's posted corporate tax rate, and receive no tax credits or non-discretionary incentives. This is the most severe potential policy change, which will illustrate the upper bound on the effect of limiting incentive spending.[70]

In order to determine the counterfactual location I calculate firm profit in each state, using $\hat{\beta}$ from Table 5. The counterfactual location is simply the state that gives the firm the highest profit, given that subsidies are set to 0.

Figure 14(a) shows the locations chosen by firms in the data, so, under subsidy competition. Panel B is the case without any cost increases, i.e., all of the firms could move to one state without changing the characteristics of that state. In this case, the majority of firms (85%) choose alternative states when I remove the subsidies. Many of the firms are moving to lower cost states (KS (9%), TX (16%)) or highly educated, thicker labor market states (CA (23%), NC (11%), VA (20%)). The locations are much more concentrated than in the subsidy competition case. The result that the majority of firms choose an alternative state in the counterfactual, is due in part to a lack of general equilibrium effects. That is, when I calculate counterfactual profits and I have 9% of all large firms move to Kansas, the costs of housing and wages in Kansas do not change. In reality, the entry of a large firm increases competition for inputs, increasing land values and the cost of wages.

Incorporating Cost Increases

In Table 8 I try to account for the increase in competition for labor and land following the entry of a large firm by inflating housing costs and wages following counterfactual moves. To be specific, I run the counterfactual exercise in each year separately, and make cost adjustments after the firms choose their locations. I start with the first

procedural flaw (Holder, 2018).

[70]This is a partial equilibrium analysis. States who lose firms when they are not able to compete discretionarily would likely adjust by changing their corporate tax rate.

year of the data, 2002. In 2002, I calculate the profits in all states, without subsidies, and identify the highest-profit states for the firms that entered in 2002. If a state was chosen in the counterfactual, I increased housing costs and industry wages by x% of a standard deviation. I then allow the 2003 entrants to pick locations, and repeat the adjustment. Table 8 shows how the number of firms that stay in their original locations increases with costs. The first line is the baseline, there is no cost increase, and only 15% of firms stay in the same states. If costs increase by 5% of a standard deviation (recall costs and wages are normalized to be mean 0 and standard deviation 1, see Figure 6) after entry, 26% of firms chose to stay in their original locations, and if costs increase by 10% of a standard deviation, 41% of firms are stayers.

The last row is the "preferred" counterfactual prediction, using estimated changes in housing costs and wages. I use the data to calculate changes in housing costs and industry-level wages, after a large firm in the sample locates in a state. I allow these effects to differ by size of the state, as one might imagine, a firm has a different effect on state-level wages and prices in Rhode Island than they do in California. I estimate that a large firm increases industry level wages by 68% of a standard deviation in small states (states with populations under 4 million), and by 18% of a standard deviation in larger states.[71] The housing price effect is 7% of a standard deviation in small states and 1.2% in larger states. When I use these estimated cost increases 68% of firms choose alternative states, and the remaining 32% choose the same locations they are observed choosing under competition. The counterfactual locations with this preferred specification are shown in Panel C of Figure 14.

Changes in Spillover

This counterfactual can also illustrate the role of subsidy competition in increasing welfare through indirect job creation (spillover). In the remainder of the section I will use the counterfactual locations chosen under my estimated cost increases (where 68% move), and compare potential spillovers in the counterfactual with the potential spillovers predicted by the observed location choices.

[71]The states with populations under 4 million in the sample period are: AL, AR, CT, DE, IA, ID, KS, ME, MT, NE, NV, NH, NM, ND, OK, OR, RI, SD, UT, VT, WV, WY.

In the no-incentives case, firms locate in states where they induce a total of 57,480 indirect jobs via spillover. In the subsidy competition case (i.e. the factual case) they go to states where they create 84,693 jobs, an increase of over 27,000 jobs (47%). As suggested by the conditional distributions, states use subsidies to compensate firms for locating where they have larger positive externalities, increasing total welfare.

Figure 15 illustrates the loses and gains in state-level job creation when I eliminate subsidy spending. Panel (a) shows the changes in indirect job creation through spillover. This is the indirect job creation predicted by the counterfactual firm locations, less indirect job creation predicted with firm locations in the data. States in the Southeast and Southwest lose most of the indirect jobs created — North Carolina alone loses about 9,500 (88%) of the indirect jobs created through spillovers. Note that some states (e.g. Oklahoma, Kansas, Missouri) exhibit small gains in indirect job creation because they lose a firm that had negative spillover effects. This is highlighted with Figure 15B, which maps the change in indirect and direct job creation in each state.

Suppose there was a social planner, whose goal was to maximize total job creation. The social planner does not care about firms' profits, or states' individual valuations for firms, they just want to allocate the firms to the locations where they will create the largest spillovers. If firms locate in the states with the largest predicted spillover, total indirect job creation would be 568,022, which means that subsidy competition only achieves about 15% of total possible indirect job creation. This highlights the role of state profits in the firm location decision, as well as the fact that states have heterogeneous valuation for indirect job creation, and value other benefits besides job creation.

Total Welfare

Lastly, I perform a back of the envelope calculation of the change in total welfare between the subsidy competition and no-subsidy cases. Total welfare is the sum of the states' valuations for firms plus the firms' profit. During competition, states can transfer some of their welfare (valuation for the firm) to the firm, in the form of a subsidy. I simulate state valuations for each firm from the estimated conditional

distributions, given the number of direct jobs promised by the firm and the number of indirect jobs anticipated by the state.

Table 9 shows the results. I find that total welfare increases by 22% under competition, due to firms locating where they are valued more. However, this welfare increase is captured entirely by the firms. Total welfare increases by about $18B, and firms' payoffs (firm profits plus subsidies) increase by $27B. This means the total welfare captured by the states actually decreases due to competition, by $9B, or 21%.

A social planner might discount the increases in welfare created by firm profits, especially if the firms are foreign and profits are enjoyed outside of the United States. These welfare calculations should also be considered when states think about the trade-off on spending in incentives for a few large firms, and broader based economic development programs. I discuss this further in the conclusion.

1.7 Conclusion

States offer generous tax credits and subsidy deals to attract individual firms to their jurisdiction. The extent to which these incentives are effective in attracting firms and creating jobs depends on the characteristics of the state as well as the states' valuation of the firm and its potential spillover effects. In short, subsidy competition can increase welfare if subsidies allow firms to internalize part of the positive externality they will have in a state.

This paper answers two questions along this line of inquiry: How do states determine discretionary subsidies, and what is the effect of these incentives on firms' location choice? To answer these questions, I introduce a new dataset on state-level incentive spending and firm-level subsidies, which I create by reading state budget documents and tax expenditure reports, as well as press releases and news articles on each subsidy deal.

In this paper, I use an open outcry ascending auction to model the bidding process. To capture the fact that, all else equal, a less "attractive" state must offer a larger subsidy to attract a firm, I embed the location choice problem of the firm within the auction framework. I allow a state's valuation for a firm depends on firm and

state characteristics, such as the number of direct jobs promised by the firm and the potential indirect job creation (spillover) the firm would have in the state. To measure these spillovers, I estimate an entry decision of smaller, non-subsidized, firms as a function of entry choice of larger, subsidized, firms.

I find evidence that high unemployment states, states who will benefit most from property value increases, and states that will experience large spillovers in the form of indirect job creation, have the highest valuations for firms. This suggests that subsidy competition can allow states to compensate firms for heterogeneous externalities across space, increasing the efficiency of firm locations. In fact, I find that competition increases total welfare, by allocating firms to states that have higher valuations for the firm. However, this increase in welfare is experienced entirely by the firm; firm payoffs increase by 75% between the no-subsidy and subsidy-competition cases.

One caveat of the way I model competition among states is that I assume that whenever a firm announces its intention to locate, all the 48 states compete. This is a simplification that is primarily driven by the data I have because I only observe the location choice of the firm, after the fact. In other words, I do not know the "consideration set" of the firm. If, in fact, the competition is not between all states, I am underestimating the true valuation. In this paper, the best I can do is determine the runner-up state, but going forward it may be possible to gather more information about the firms' consideration set.

Another caveat is that I treat the subsidy choices of a state to be independent of the choices of its neighboring states. But we know from the work of Case, Rosen and Hines (1993) that there can be interdependence across states. To allow for dependence across states in their subsidy choices require more data on state and a different approach that is based on social networks and is beyond the scope of this paper. It is an important extension of my approach that requires substantially more data and I leave that for future research.

Lastly, I assume the states' can accurately predict the benefit a firm will have in their jurisdiction, and I estimate the state valuations using data on realized subsidy deals. I use a revealed preference approach; the subsidy deals offered by the state reveal the states' underlying valuation for the firm. However, it is possible that states

overestimate (or underestimate) the effect a firm will have once it locates in the state. Whether states can accurately predict the revenue and job creation effects of a potential entrant is an open question, because the analysis of the economic effects of firms post-subsidy disbursement is limited. However, a recent push for transparency might soon provide the data to verify this assumption.[72]

Although the results in this paper point to subsidy competition being welfare increasing, there is still much to learn about state incentive spending. Future work should consider the trade-offs between spending on discretionary subsidies for a few large firms and more broad-based incentive programs. There are opportunity costs to states spending on incentives for a few large firms; they could instead lower taxes for citizens, invest in public goods, or create incentive programs for small businesses. Also, giving discretionary tax breaks to a few large firms may have anti-competitive effects on the product market, as these firms now have lower costs then their competitors.[73] The medium size establishment location results suggest that increasing the expected non-discretionary subsidy available to an establishment by $10,000 has a similar effect on the profit of a medium sized establishment as having an additional large establishment in the state. Therefore, in some cases it may even be more affordable to increase incentives for smaller firms.

In short, this paper provides the first evidence of how states value firms, contributing to one part of a larger discussion of state economic development policy. The data introduced in this paper can be used to push research in this arena further.

[72] As of 2015, the Government Accounting Standards Board requires that state and local governments disclose all tax abatements to firms (Board, 2015). Relatedly, the National Conference of State Legislatures has noted an increase in state-level incentive programs evaluations published post-2014.

[73] **?** find that although national product market concentration is increasing, when the top firm in an industry opens a plant, local concentration declines. The effect of discretionary subsidies on product-market competition, both at the local and national level, as yet to be studied.

Chapter 2

Campaign Spending and Corporate Subsidies: Evidence from *Citizens United v. FEC*

States spend at least $15 billion a year on tax breaks and subsidies to attract and retain corporations in their local areas.[1] Despite the prevalence of subsidy-giving and the magnitude of total incentive spending, not enough is known about how states decide which firms and industries to target, and how much money to give. Politicians cite job creation as the motivating factor for incentive spending, but anecdotal evidence suggests that there are other forces at play. Corporate campaign spending is one potential factor in how states allocate incentive spending, but it remains unclear whether firms are able to leverage political spending to influence the size and incidence of government subsidies.

Recent research finds that firms are more likely to contribute to election campaigns of Congress members who are stockholders (Tahoun, 2014) and that firms with connections to politicians use their power to influence elections (Bertrand, Kra-

[1]The $15B is from data I have collected from state budgets and tax expenditure reports. This does not include more local (city, county) spending or incentive programs for activities and not business location, such as motion picture production incentives. In that regard, this is likely a lower bound on total spending. Bartik (2017) estimates that state and local governments spent $45B in 2015, Story (2012) has estimates as high as $90B.

marz, Schoar and Thesmar, 2004), suggesting that political connections may influence corporate spending in elections. Other researchers find that firms that give larger contributions to politicians reap future benefits (Claessens, Feyen and Laeven, 2008; Cooper, Gulen and Ovtchinnikov, 2010) and that procurement contracts increase after the election among companies with boards of directors connected to the winning party (Goldman, Rocholl and So, 2009), suggesting that corporate spending may influence state subsidy-giving. Recent events, such as Disney spending $1.2 million in a city council election, D.C. tax breaks being awarded to building developers who contributed to city council campaigns, and a scandal in New Jersey involving political contributions in exchange for economic development awards, all suggest that corporate campaign spending may be rewarded with discretionary subsidies.[2]

In this paper, I construct a new data set and exploit exogenous variation in corporations' abilities to spend in elections created by the 2010 *Citizens United v. Federal Election Commission* Supreme Court ruling to identify the effect of corporate campaign spending in state elections on state subsidy-giving for firms. The *Citizens United* ruling overturned 20 years of legal precedent by blocking the federal government from restricting corporations' independent political expenditures. Twenty-four states that had previously prohibited corporations from spending in state elections were now required to comply with the federal ruling, meaning that corporations were free to spend in elections where they had previously been constrained. I use a difference-in-differences approach, comparing state incentive spending from 2007-2014 in the 24 treatment states to two control groups using a new data set on state incentive spending that I created.

I find that the ability of corporations to spend in elections increases state dis-

[2]The Los Angeles Times published a 3 part series on Disneyland's local political involvement in 2017, providing evidence that Disney was heavily spending on city council elections to elect "supportive politicians" - council members who had voted for Disney tax breaks in the past. Disney has received an estimated $1 billion in tax breaks from the city of Anaheim in the last 20 years, and spent $1.2 million in the 2016 city council election alone. In D.C., NPR reporters linked campaign contributions by building developers to an increased probability in winning tax breaks or discounted public land. Over $640 million (one-third of the total subsidies) went to ten developers who had donated the most money on city council campaigns. In New Jersey, Chris Christie was accused of "gross politicization " of the state economic development agency, as he fired the veteran director and appointed an aide who proceeded to give over $1.25 billion to firms who had contributed to the Christie-led Republican Governors Association and/or to Christie's campaign.

cretionary subsidy-giving. While total and per capita incentive spending weakly increases, treated states are more likely to increase their budget for discretionary funds for firms. Moreover, the probability of giving any subsidy increased by 12 percentage points (15%), and the probability of giving a follow-on subsidy increased by 23 percentage points (32%) in treatment states relative to others. I do not find evidence that corporate campaign spending affects the size of subsidies, conditional on subsidy-giving, suggesting that corporate campaign spending affects the extensive margin, but not the intensive margin. All of my findings suggest that corporate campaign spending is, in fact, one determinant in states' subsidy-giving decisions. I also provide evidence to rule out possible concurrent policy or economic changes that may conflate my results.

The remainder of the paper proceeds as follows. Section 2.1 provides an overview of campaign finance regulation in the United States, with a focus on *Citizens United v. Federal Election Commission*. Section 2.2 is an analysis of the 2010 *Citizens United* ruling on election spending at the state level. Section 2.3 introduces a new data set on state incentive spending and presents descriptive evidence on the relationship between campaign spending and subsidies. Section 2.4 contains the empirical strategy, results, and robustness checks. Section 2.5 concludes.

2.1 Campaign Finance and *Citizens United*

Campaign finance refers to all funds used or raised to support a candidate, party, or issue. These funds come in two main forms: direct contributions ("hard money") and independent expenditures ("soft money"). A direct contribution is a monetary or in-kind contribution to a candidate's campaign. States require that candidates disclose all contributions to their campaign, and regulate the amount an individual, corporation, political action committee (PAC), and political party can contribute to a candidate with contribution limits. These contribution limits vary by type of contributor, office of candidate, and state.

Independent spending is less straightforward than direct contributions to candidates. Independent expenditures are any spending on communication, i.e. adver-

tising, in support or against a candidate. The important distinction from direct contributions is that the candidate themselves did not coordinate or approve the advertisement. An important difference is that independent expenditures are not subject to the contribution limits. They are typically regulated with disclosure requirements, which vary by state and by size of the independent expenditure.

Therefore, a corporation seeking to support a candidate in their election may either contribute directly to their campaign, given the limit in that state, or fund advertising for that candidate, which is usually coordinated by a PAC. Whether or not the state is able to prohibit the corporation from spending in either form, or create more barriers to entry for corporations, has often been the decision of the U.S. Supreme Court.

2.1.1 Campaign Finance and Corporations

The first legislation to prohibit corporations from making campaign contributions directly to political candidates was the Tillman Act, which was passed by Congress in 1907. This was part of a movement to limit corporate interests over state legislatures and prevent corruption by large corporate contributors. The Taft-Hartley Act followed in 1947, further limiting corporate involvement by prohibiting independent expenditures in federal elections by both corporations and unions.

The decades following the Tillman Act saw a series of ad-hoc campaign finance laws, introducing disclosure requirements and prohibiting union and public utility contributions. Many regulations were relatively ineffective, as there was no system in place to enforce the limits, and Congress didn't start to collect campaign finance disclosures until 1967.

The Federal Election Campaign Act was passed in 1971, and remains the primary U.S. federal law regulating campaign spending and fundraising. With this act and the subsequent creation of the Federal Election Commission (FEC), regulations began to be put into place to limit the role of money in politics. The act was amended in 1974 to place legal limits on campaign contributions and expenditures, and between 1970 and 1980, nine states enacted bans that prohibited corporations and/or unions from making independent expenditures to state campaigns. Two Supreme Court cases

followed to create further barriers for corporations and PACs. *Austin v. Michigan Chamber of Commerce* (1990) made it more difficult for corporations to be politically involved, ruling that corporations must keep a separate account from which they can make political contributions. *Nixon v. Shrink Missouri Government PAC* (2000) upheld the federal law on campaign contributions, ruling that states can also limit the amount of money that any one individual or group can contribute to a state campaign. As of 2018 twenty-two states still prohibit corporations from directly contributing to candidates.

2.1.2 *Citizens United v. Federal Election Commission*

In January 2010, decades of legal precedent were overturned when the Supreme Court, in *Citizens United v. FEC* decided that the government cannot restrict independent political expenditures by corporations, labor unions, and other associations. The Supreme Court ruled, in a 5-4 decision, that banning corporate and union independent expenditures violated the First Amendment, meaning that corporations would still be subject to a state's legislation on direct-to-candidate contributions, but would be able to spend on PACs and other associations to buy media advertising in support of their favored candidate. The Court had upheld bans on contributions in the past, arguing that contributions may encourage "quid pro quo arrangements," and regulating such contributions would prevent corruption. However, they interpret independent expenditures as being, by definition, *independent* from the candidate, and thus not a source of quid pro quo corruption.

The ruling came as a surprise to Democrats and Republicans alike, as they had worked together 8 years earlier to pass the 2002 Bipartisan Campaign Reform Act. While most of the media attention was focused on the potential adverse effects of *Citizens* at the federal level, the decision was relevant to elections at all levels of government.

At the time of this ruling, 24 states also prohibited corporations from campaign spending in state elections. The *Citizens United vs. FEC* ruling effectively invalidated these laws, forcing states to allow corporations to make independent expenditures in state elections.

Immediately after the ruling, the D.C. Court of Appeals invalidated various limits on contributions to independent expenditure groups, citing *Citizens United*. As mentioned earlier, most states immediately overturned previous legislation to comply with the federal law.[3]

2.2 Direct Effects of *Citizens United*

The *Citizens United* ruling made it illegal to restrict corporate independent spending in elections. This affected 24 states that had previously restricted corporate spending in their elections. The goal of this paper is to use this exogenous shock to measure the effect of corporate spending in elections on incentive spending by state governments. However, the first step is to verify that lifting the independent expenditures ban in fact increased corporate spending in state elections. I estimate the direct effect of Citizens United on corporate independent expenditures in elections.

2.2.1 Data

I use data on state campaign finance from the National Conference of State Legislatures (of State Legislatures, 2017). They publish a document every 2 years with the legislated state limits on individual, political party, PACs, corporations and union contributions to political candidates. They also create a list of state laws affected by *Citizens United*, as well as post-ruling legislation related to *Citizens United*.

Treatment and Control States

The treatment and control states are listed in Table 10. The treatment states include all 24 states which prohibited corporations from campaign spending at the time of the *Citizens United* decision. After the decision 14 states repealed existing legislation or enacted new legislation to conform to the federal ruling. Ten states still have laws

[3]Montana, mindful of a history of corruption in their state politics, continued to restrict corporate campaign spending after *Citizens United*. In June 2012, the Supreme Court reversed a decision of the Montana Supreme Court in *Western Tradition Partnership, Inv. v. Montana* (2011), which had upheld the law limiting political spending by corporations.

prohibiting corporate independent spending which are potentially unenforceable. The states of course can continue to restrict direct contributions from corporations; 22 states still prohibit corporate direct to candidate contributions. I include the states that still have laws restricting independent expenditures on the book as treatment states, as they likely are not enforcing the law in wake of the Supreme Court case in Montana, but have not yet repealed it. If these states are still enforcing the bans then we can think of this as an "intent to treat," as all 24 states received the treatment of their laws being invalidated, but only 14 complied, or "accepted" the treatment.

In the analysis of the effect of *Citizens United* on subsidy spending I consider two control groups: the set of 26 states which did not prohibit corporate spending at the time of the ruling, and a more restrictive definition of states that allowed for unlimited corporate spending at the time of the ruling. Using the restricted sample allows for a cleaner analysis; states that always allowed unlimited corporate campaign spending (both independent expenditures and campaign contributions) are compared with states that previously banned all corporate campaign spending, but now must allow it in one form (independent expenditures), before and after the ban is lifted. This includes 8 states: IL, MO, MS, NE, NM, OR, UT and VA. I present results using both control groups. The baseline results will use the less restrictive sample, including all states that allowed corporate independent expenditures, but possibly restricted contributions, at the time of the ruling as a control (26 states).

Campaign Spending

I use data on corporate spending in state elections from the National Institute on Money in State Politics, colloquially known as "Follow the Money" (Follow the Money, 2000-2016). The Institute has a database of corporate, association, PAC, and individual-level contributions to all state-level elections. This covers all 50 states from 2000 to the present. Follow the Money also has data on independent spending made in state elections for 31 states, 17 of which are present in the data from 2006 to the present. The data are limited to states that have adequate disclosure requirements.

Follow the Money only has data on independent expenditures for a subset of states,

and I need to further restrict the sample to states that I observe in the data before 2010. This leaves a sample of 17 states, 12 in the treatment group (AK, AZ, CO, IA, MA, MI, MN, NC, OH, OK, TN and TX) and 5 in the control group (CA, ID, ME, MO and WA).[4] Figure 16 shows the independent expenditures of treatment and control states from 2006 to 2016. This is spending that is not contributed directly to the candidate or party, but is used for advertisements for the candidate. Here we see a large jump in spending in treatment states in 2014. More states have gubernatorial elections in 2006, 2010 and 2014, so we should compare 2010 and 2014 to pre-*Citizens* 2006, and 2012 and 2016 to pre-*Citizens* 2008. Figure 17 is the graphical representation of the difference-in-differences strategy.

2.2.2 Empirical Strategy

I exploit the 2010 *Citizens United* ruling to identify the effect of the ruling on corporate independent expenditures. It must be that independent spending increases post-*Citizens United* for there to be an effect of the ruling on subsidy decisions.

I use a difference-in-differences approach, comparing states that were affected by the ruling ($\text{Treat}_s = 1$), with states that already allowed corporate spending, before and after the Supreme Court ruling. The post-ruling variable, Post_t, equals 1 if the year is greater than 2009, as the ruling occurred in January of 2010. The left hand side variable is a measure of campaign spending in state s at time t. I estimate the equation for the years 2007 to 2014:

$$y_{st} = \theta_0 + \theta_1 \text{Treat}_s \times \text{Post}_t + \theta_2 \text{Treat}_s + \theta_3 X_{st} + \eta_t + \epsilon_{st} \tag{2.1}$$

Table 11 presents results of the effect of *Citizens United* on campaign spending. The sample includes only 3 election years: 2006, 2010, and 2014.[5] Treatment states experience a 116% increase in independent spending post-*Citizens*, and a 119% increase in the number of records, which would be a single PAC or interest group buying a specific ad. There is no such effect on direct to candidate contributions, which con-

[4]The treatment states are disproportionately represented because they are states that had banned corporate independent expenditures, a strict campaign finance law that is correlated with other strict laws, such as requiring more disclosure.

[5]The majority of states in the independent expenditure sample have gubernatorial elections in 2006, 2010 and 2014.

firms that the ruling had no effect on state's laws restricting corporate contributions directly to candidates. This confirms the results of Spencer and Wood (2012), who find a 128% increase in independent expenditures in treatment states post-*Citizens* using only 2006 and 2010 data points. This also confirms that corporations were "constrained" by the corporate spending bans in treatment states pre-ruling, as these states experience a large increase in political spending when the bans are repealed. Next, I will estimate the reduced form effect of Citizens United on state subsidies for corporations. In order to do that I need to collect data on state incentive spending and subsidies.

2.3 State Incentives for Firms

States spend billions of dollars per year on incentives for firms. These incentives are justified by the economic benefit that the firm will bring to the state, in the form of both direct and indirect jobs, and increased demand for goods and services. However, there is very little cost-benefit analysis post-subsidy disbursement, and even less transparency when it comes to the state decision of how much a job at a certain firm is worth, and which firms and industries should receive discretionary funds. Whether or not the political involvement of a firm can affect the incentives it receives is the empirical question at the heart of this paper.

This lack of transparency means that high-quality data on state incentive spending is rare. In this section I introduce a new data set I collected on state-level spending on tax credits and subsidy programs. I supplement this state-level data with establishment-level incentive data from the organization *Good Jobs First*.

2.3.1 State Incentive Spending and Subsidies for Firms

States vary widely in the structure of their corporate and individual income taxes and payroll, and the absence of comprehensive data on state taxes, incentives, and subsidies has been a difficulty for empirical research in this field. In response, I have created my own data set of state spending on tax credits and economic development incentives from 2007-2014 by reading state level legislation, budget documents, and

annual revenue reports. I discuss this data set in both Chapters 1 and 3, see sections 1.2 and 3.2 respectively.

I use the state-level incentive spending data as the outcome variable in the difference-in-differences analysis, to estimate the effect of corporate campaign involvement on state incentive spending.

2.3.2 Establishment Level Data

I supplement my state spending data with data on subsidies for individual establishments from *Good Jobs First* (Mattera and Tarczynska, 2019), a policy organization that tracks state and local government subsidies. These data include the amount of subsidies received in a given year from a given locality. These are not limited to discretionary subsidies, but include tax credits and job training grants that apply to all firms within a certain criteria. Tax credits may be affected by corporate influence in two ways: (1) Governments can use tax credits in a discretionary way, writing legislation that fits the interest of a single firm (2) Corporations may use their campaign spending to support politicians who will be more likely to pass tax credits in their interest.

I use these data to create two main outcome variables: whether the state gave any large subsidy in a given year, and whether the state gave any large "follow-on" subsidy in a given year. I define a "follow-on" subsidy as any subsidy for a firm that is already in the state and has already received a subsidy of a certain size.[6] I also calculate variables on the median, mean, and maximum subsidy a state gave in each year.

The *Good Jobs First* database goes back to the early 1990s, but coverage greatly improves in the mid 2000s. I use data from 2007-2014 for my main analysis, but use data starting in 2002 to identify follow-on subsidies. I aggregate this data up

[6]This is not uncommon. For example, Boeing received $8.7 billion in tax breaks from the state of Washington in 2013, after having received over $3 billion in 2003. In fact, over the sample period, 63% of state-year observations had a "follow-on" subsidy valued at $50,000 or more, and 44% had follow-on subsidies of at least $1 million. This means that almost half of the state-year observations in the sample gave a subsidy of $1 million to a firm that was *already* located in the state, and had *already* received a subsidy valued at least $1 million.

to the state level, and only consider subsidies that are over $500,000, because the database has better coverage for the largest subsidies. When states do not disclose their spending the Good Jobs First team uses Freedom of Information Act requests and tracks press releases in order to get accurate subsidies for the large deals. In this sense I am using the Good Jobs First to measure the effect of corporate political spending on the size and incidence of the largest subsidies, but because we know that this data set is not comprehensive, it is a complement rather than a substitute for the data I have collected on total incentive spending.

2.3.3 Descriptive Statistics

I use the state incentive spending and establishment-level subsidy data as outcomes in the analysis in order to determine whether allowing corporations to spend more in state elections leads to more incentive spending by states, and more frequent or generous subsidies for individual firms. I include three co-variates that would affect the demand for state incentive spending: the state unemployment rate in $t-1$, the state corporate tax rate, and the number of large establishments in the state. State unemployment rates are from the Bureau of Labor Statistics (Local Area Unemployment Statistics, 2000-2016), state establishment levels are from Census County Business Patterns (County Business Patterns, 1997-2017), and state corporate tax rates are from the Council of State Governments (CSG Book of the State, 1950-2018).

Table 13 compares the spending variables and co-variates across the treatment and two definitions of the control group. The co-variates do not vary much over the treatment and control, treatment states spend slightly less on incentives at the median. See Table 22 for statistics on incentive spending, subsidy giving, and characteristics at the state level.

Lastly, I test for descriptive evidence of a relationship between campaign finance regulations and subsidies. I run the following regression:

$$y_{st} = \beta_0 + \beta_1 \text{Unlimited}_{st} + \beta_2 X_{st} + \mu_t + \xi_{st} \tag{2.2}$$

where Unlimited_{st} is a dummy variable that equals one if state s allows unlimited corporate spending in time t and y_{st} is a measure of subsidy spending in state s and

time t. State co-variates, X_{st} and year fixed effects, μ_t are included. Table 12 shows the results, which should just be interpreted as correlations. States with no limit on corporate spending spend about $20 per capita less on incentives but are 11 percentage points more likely to give a subsidy over $500,000 in a given year. They also have significantly larger subsidies, conditional on subsidy-giving. States that allow unlimited corporate spending give discretionary subsidies that are, at the median, $30 million larger than in states that restrict corporate campaign spending. This is suggestive evidence that there is a link between a firm's ability to influence elections and a politician's propensity to subsidize corporations with discretionary deals. However, it is possible that a state government's propensity to enact a stricter campaign finance legislation is correlated with that government's preference for providing discretionary subsidies.

2.4 Empirical Strategy and Results

To identify the causal relationship between corporate spending and government subsidies for firms, I exploit the exogenous shock bourne by the Supreme Court ruling in *Citizens United v. Federal Election Commission (FEC)*. This identification strategy allows me to causally identify the effect of *Citizens* on subsidy-giving. I assume that the only channel through which the *Citizens* ruling effects subsidy spending at the state level is through increased campaign spending.

I use a difference-in-differences approach, comparing states that were affected by the ruling ($\text{Treat}_s = 1$), with states that already allowed corporate spending in elections, before and after the Supreme Court ruling. The post-ruling variable, Post_t, equals 1 if the year is greater than 2010. As the ruling occurred in January of 2010, the year 2010 is omitted from the analysis. The left hand side variable is a measure of subsidies in state s at time t. I estimate the equation using data from 2007 to 2014:

$$y_{st} = \theta_0 + \theta_1 \text{Treat}_s \times \text{Post}_t + \theta_2 \text{Treat}_s + \theta_3 X_{st} + \eta_t + \epsilon_{st} \tag{2.3}$$

The identifying assumption is that independent spending and subsidy giving in treatment and control states would have evolved parallel to each other in the absence of the Supreme Court ruling. That is, any difference that is detected is due to the ability

of corporations to now spend in elections in the treated state case. Identification of θ_1 comes from comparisons of incentive spending and subsidy giving in treatment states, which had prohibited corporate independent spending, with that of the control states, which have always allowed corporate spending, before and after the Supreme Court ruling, conditional on other observable co-variates, X_{st}. I control for year specific shocks to subsidy spending with a year fixed effect, η_t.

Table 14 presents the results of the effect of *Citizens United* on incentive spending. Each regression is run with two definitions for the control group. The first is the unrestricted sample, which includes all states that had not banned corporate spending at the time of the *Citizens United* ruling. The second is the restricted sample, which only includes states that allowed unlimited spending of corporations at the time of the *Citizens United* ruling. There is a clear relationship between the increased corporate involvement allowed by the *Citizens* decision and state incentive spending. Total incentive spending decreases, but is not statistically significant, when I use the full sample. When I only use the states that had always allowed unlimited corporate spending as the control, total spending increases in the treated states by almost $40 million (14%), however, this is also not precisely estimated. Strikingly, the amount treatment states allocate for discretionary spending increases by 58 million dollars (160%).

Given that states are allocating more money to discretionary spending, I look at states' discretionary subsidy-giving. The first two columns of Table 6 use as outcomes "Any subsidy," which equals 1 if the state gave a subsidy that is at least $50,000 in a given year, and "Follow-on subsidy," which equals 1 if the state gave a subsidy that is at least $50,000 to a firm that had previously received $50,000 in the same state. The ability of corporations to spend on state elections increases the probability a state gives any subsidy by 12 percentage points (15%), and any follow-on subsidy by 23 percentage points (32%). The effect on follow-on subsidies are larger, meaning that firms that already have a presence in the state are likely to benefit from being able to spend in elections. This fits with anecdotal evidence that suggests that the firms have all the bargaining power when they decide where to locate or expand, soliciting bids from states. Once a firm is already established in a state they may need to become

more politically involved to ensure they continue to receive support from the state.

The next three columns are conditional on subsidy giving. The dependent variable measures the log of the size of individual subsidies observed in that state: mean, median, and maximum. There is no obvious effect of increased corporate spending on subsidy size, conditional on subsidy giving. Therefore, my findings show that states increased total incentive spending, and were more likely to give individual establishments subsidies post-*Citizens*, especially establishments who were already located in the state. These subsidies are often questioned because they do not reward new jobs or investment, but preserve the status-quo.

2.4.1 Event Study

I test for differential pre-trends between treatment and control states with an event study approach. This approach takes Equation 2.3 and expands the $\text{Treat}_s \times \text{Post}_t$ variable to include an indicator for each year in the sample, omitting 2010 as the base year. There should be no effect of being a treatment state in the years before the ruling. Figure 18 presents the event study coefficient estimates and confidence intervals, the outcomes being: (a) total incentive spending, (b) per-capita incentive spending, (c) size of the state discretionary fund for incentives, and (d) whether the state gave any individual subsidy worth over $500K. The confidence intervals are large, due to the small sample size, but the figures do not point to a violation of the parallel trends assumption.

2.4.2 Robustness Checks

Taking the difference-in-differences and event study results together, the evidence suggests a relationship between corporate political involvement and state incentives for firms. However, one might worry about a concurrent policy change in the treatment or control states that may be driving these results. In the next section I provide evidence to rule out the 2010 elections or an influx of new firms as possible concurrent confounding changes.

2010 Elections

If the states that were affected by *Citizens United* ruling in 2010 also experienced some related policy or regime change then I would not be able to identify the effect of Citizens United on state subsidy-giving. For example, if the treatment states all elected new governors in 2010, and those governors were all pro-business and increased incentive spending, I would not be able to identify whether the increase in subsidy-giving was due to increased political involvement of corporations or the new governors. There was a substantial amount of political turmoil in 2010, as a result of "backlash" to Obama's first term and the Great Recession. Thirty-seven states held gubernatorial elections in 2010, 19 in the treatment group and 18 control states. Were there more upsets and regime changes in the treatment states? If there were more upsets and regime changes in the treatment states then the results may be picking up something about the change in the legislating party, not the change in campaign finance law.

I construct characteristics of state governors and legislatures from election data from the National Institute on Money in State Politics (Follow the Money, 2000-2016). In the treatment states twelve elections were open, due to the incumbent being term limited (8) or retiring (4). The control states saw ten open elections, with seven term-limited governors. Although the two groups are fairly evenly split in terms of number and type of elections the control group experienced more changes in governing party; 8 treatment states elected Republicans to replace Democrats, as compared to 3 control states.[7]

I use this data on new governors, party, and incumbency (or election upsets) to create three new "treatment concepts." In order to test if changes in administration are driving the results I run the baseline difference-in-differences regression, but with the new treatment variables. If the election treatment increases state incentive spending the baseline results are more difficult to interpret.

As a reminder the diff-in-diff specification is as follows:

$$y_{st} = \theta_0 + \theta_1 \text{Treat}_s \times \text{Post}_t + \theta_2 \text{Treat}_s + \theta_3 X_{st} + \eta_t + \epsilon_{st} \tag{2.4}$$

[7]Three control states and two treatment states elected Democrats to replace Republicans.

where $\text{Treat}_s = 1$ if state s elected a new governor in 2010, if the governor's party switched in 2010, or if the incumbent was elected out in 2010. $\text{Post}_t = 1$ if the year is after 2009. Table 16 shows the results. There seems to be no positive effect of the election treatments on the state incentive spending outcomes. The states that switch from Democrat to Republican governors (8 in the *Citizens* treatment and 3 control) are no more likely to increase spending or subsidy-giving. Table 16 provides counter-evidence to the hypothesis that 2010 elections, instead of the increased ability of corporations to spend in elections after 2010, are driving the results.

Increased Business Activity

I also confirm that there is not a differential increase in the number of establishments in treatment states post-*Citizens*. If, for some unobserved reason, the number of large establishments in treatment states is increasing post-2010, that might drive increases in incentive spending. More establishments in a state would correlate with more spending on tax credits that were in place before the campaign finance law change. Therefore, I would see an increase in incentive spending in treatment states not because the state was changing incentive spending policy, but because there were more establishments qualifying for existing incentive programs.

To test that there was no differential increase in business activity in the treatment states I apply the same difference-in-differences analysis as the main results, but with the outcome variable being the number of establishments of a given size. There are three size categories, 250+ employees, 500+ employees, and 1000+ employees. I use these categories because smaller establishments are less likely to qualify for state tax credits and incentive programs, which usually have a minimum job creation requirement. Table 17 shows the results; there is no concurrent influx of establishments in treatment states post-*Citizens*.

2.5 Conclusion

In this paper I study how states make subsidy-setting decisions. How does a governor and legislature determine how much money to allocate for incentives to attract firms

each year, and moreover, how do they decide which firms to target and how much to give an individual establishment?

While there are likely many factors that go into the state's subsidy decision, I focus on one potential determinant: corporate campaign spending. I test for a relationship between government subsidies for firms and corporate campaign spending on state elections. I leverage the exogenous shock of the Supreme Court *Citizens United* case on a corporation's ability to spend in state elections to identify the effect of corporate spending on subsidy-giving. I also introduce a novel data set on state incentive spending.

I find that state spending on discretionary subsidies increases when we allow corporations to spend in state elections.The probability a treatment state gives any subsidy increases by about 12 percentage points (15%) post *Citizens*, and a treatment state is 23 percentage points (32%) more likely to give a second subsidy to a firm that is already located in the state. These results suggest that corporate campaign spending is, in fact, a factor in the state subsidy-setting decision.

The mechanism through which subsidy-giving and election spending are related is an area for future work. It may be that subsidies precede campaign spending and firms and CEOs are more likely to contribute to specific politicians who have subsidized in the past, or use campaign spending as a part of a lobbying effort for future tax breaks. Firms could also spend to elect politicians they perceive as pro-business, without any past relationship with the candidate. A difficulty going forward will be tracking corporation-specific independent expenditures. States vary in their disclosure rules for independent expenditures, and even when the spending is disclosed it is only the PAC that bought the advertisement that is listed, not all of the corporations and individuals who donated to the PAC.[8] This underscores the need for increased transparency in both subsidy disclosure and campaign spending.

[8]Campaign contributions are a more straightforward way to track corporate spending, but are now only a small part of how corporations can spend in elections. Aobida et al. (2018) explore the relationship between campaign contributions and subsidies, and find a positive relationship between political connections (contributions) and subsidies, which in turn leads to more inefficient (in terms of job growth) subsidies.

Chapter 3

Evaluating State and Local Business Incentives

joint work with Owen Zidar

State and local governments spend billions of dollars each year on tax incentives and subsidies to attract and retain firms (Slattery, 2019*a*; Bartik, 2017). These policies are highly controversial. Some argue that supporting and attracting industrial activity is key for local economic growth and prosperity, while others question the effectiveness of incentive spending and whether the mounting costs are justified. This essay attempts to advance this debate by describing and evaluating state and local business tax incentives in the United States.

Due to difficulty in tracking and measuring incentives for firms, empirical evidence in this area is limited. We leverage new data sets at the firm and state level from Slattery (2019*a*), as well as some case-based evidence, to describe the size and structure of incentive programs, as well as which firms get incentives, which places give them, and why. The two data sets both contain information on incentive spending of the states. The firm-level data set includes discretionary subsidies, which are incentive packages that state and local governments tailor to an individual firm. The state-level data set tracks total incentive spending at the state level, and contains both state tax expenditures on tax credits for businesses, and state economic development programs

for businesses. The latter can include grants, job training, loans, and discretionary subsidies, among other types of incentives. Total spending on economic development projects is added to total tax expenditures for firms, to create a state-level incentive measure.

All 50 states offer some type of incentives for businesses, whether it be a general tax credit for job creation, or a discretionary grant program to attract individual firms. In 2014, states spent anywhere between $5 and $216 per-capita on incentives for firms. Large establishments in manufacturing and tech sectors are most likely to receive financial support. In our sample of almost 500 firm-specific subsidy deals, the average deal is $157 million for 1,660 jobs, 87% of deals are for establishments in manufacturing or high-skilled services industries, and the firms that own these establishments have an average market value of $47 billion. Still, there is a lot of variation across deals—states spend anywhere between $1,000 and $17 million per job.

Part of the goal of this essay is to understand the differences between states and firms that explain this variance in incentive spending. We find that poorer places are more likely to give a discretionary subsidy to attract a given firm, and, conditional on subsidy-giving, poor places spend more per job. Using detailed data on individual subsidies in North Carolina, we find that it is the firms' promises of job creation and investment at the establishment, as well as the state expectations about indirect job creation, GDP, and net tax revenue, that predict the size of the subsidy offered. North Carolina is optimistic about the projected impact (on average 1 dollar is projected to increase GDP by 68 dollars), which aligns with other anecdotal evidence (e.g., projections from Amazon and Foxconn) and is vastly larger than typical point estimates in the government spending multiplier literature (Ramey, 2011; Chodorow-Reich, 2017). We also find some suggestive evidence that political cycles play a role in the size of individual subsidies and the generosity of state-level tax credit programs.

Given the new data on state incentive programs and individual deals we can move to evaluation—do these policies affect the location and level of economic activity? Evaluation is a hard problem, as changes in state incentive policies, or willingness-to-pay for a given firm, are not exogenous. However, we leverage the two new data sets

to provide suggestive evidence, and encourage others to look more into these issues. First, we look at the effect of a new subsidized establishment, in the county where it locates, by comparing outcomes in that "winning" county with the "runner-up" location as in Greenstone, Hornbeck and Moretti (2010). We find that on average employment within the 3-digit industry increases by over 700 jobs, but at the median, the winning county does not seem much better off, in fact, employment decreases by 5 jobs. However, differential trends between winning and runner up locations make inference difficult. Second, we study the determinants of new establishment entry and find that non-tax determinants like market potential are key. Firms make location and investment decisions to maximize after-tax profits, which depend strongly on non-tax factors such as wages, market access, productivity, and amenities. Although larger establishment shares are associated with higher per-capita incentive spending, increases in incentive spending do not lead to increases in establishment entry.

In short, we do not find strong evidence in support of local tax incentives increasing economic growth. This finding should give pause to many policy makers hoping to use business incentives to grow their local economies. However, we note there is a lot of heterogeneity in the effectiveness of incentive spending, and of course, much more work to be done. We hope that this analysis and data collection effort will inspire further research in this area, including both more effort in identifying causal effects of incentive spending, and in pinpointing the factors that lead some subsidies to be more successful. This line of research will provide policy makers with novel estimates of local impacts which they can use to calibrate terms of deals and assess what might actually happen after giving deals.

3.1 Firm-Specific Subsidies

Throughout the paper, we leverage two data sets from Slattery (2019*a*). The first, which we will focus on in this section, includes discretionary subsidies for firms from 2002-2016. Each observation is a subsidy deal for the location of one establishment (e.g., a plant, headquarters, R&D center) of a given firm. Most of the firms receiving subsidies have multiple establishments, and the data is at the "deal" level. We start

with the set of all entries over $5M in the Good Jobs First Subsidy Tracker (Mattera and Tarczynska, 2019), and limit the sample to entries that involve a discretionary program or mention expansion or relocation. We arrive at a sample of 484 establishments receiving discretionary subsidies over the period 2002-2016. The dataset includes the name of each firm, the location, industry, and promised number of jobs at the establishment, the runner-up location of each establishment, and the terms of the subsidy deal.[1] In this section, we use the firm-level subsidy data to explain what discretionary subsidies are, who gets them, which states give them and why, and then turn to their effects. We start by describing one subsidy deal in the data set to provide some texture and then characterize subsidies more generally.

3.1.1 What are firm-specific subsidies and which firms receive them?

A Discretionary Subsidy for Volkswagen

In 2008, Volkswagen and the state of Tennessee came to an agreement. Volkswagen (VW) would locate their new assembly plant in Chatanooga, hire 2,000 employees and spend almost $1 billion. In return, VW would receive a discretionary subsidy from TN worth over $500 million. According to the director of industry-government relations at VW, this location decision was the result of "truly a very close competition," with Chatanooga narrowly beating out a site in Huntsville, Alabama, where the subsidy offer was at least $386 million (Bruns, September 2008; Bennett, July 2008).

At the time of the deal, the state reported that the incentive package for Volkswagen would amount to an estimated $558 million, given the level of job creation and investment VW projected. This amount is a function of state-level tax credits and grants that Tennessee would offer to any company of a certain size, as well as discretionary tax abatements and in-kind contributions from the state and local government. Specifically, the deal consisted of property given to VW ($81M), worker training ($30M), highway and road construction ($43M), rail line upgrades ($3.5M), "enhanced" state job and investment tax credits over 20 years ($200M), and local

[1] See Slattery (2019*a*) for more details about sample selection and data collection.

property tax abatements over 30 years ($200M). Moreover, the state promised specialized tax credits for any suppliers that locate immediately around the VW plant (Times, July 2008).

Senator Lamar Alexander, Governor Phil Bredesen, and local government officials all championed the deal, not only for the 2,000 promised jobs and $1B investment, but also for the expected indirect job creation and revenue effects. "The Volkswagen investment in this community is going to have a tremendous economic gain for the entire region. I'm confident we're going to have a very reasonable incentive package when you look at the initial costs of what is being offered compared with a much bigger long-term return, " stated Matt Kisber, the TN commissioner for Economic and Community Development (ECD), adding "I think Gov. Bredesen and the mayors here are right to treat an assembly plant as worth a large taxpayer investment. There's nothing quite like the automobile industry to bring in money, raise family incomes and bring in jobs." In fact, Mr Kisber and the ECD projected that in a few years VW would have an annual payroll of more than $100M, help create 14,000 total jobs, and have a total economic benefit of over $600M per year Times (July 2008).

Discretionary Subsidies for Firms

At the time, the VW location deal was the largest subsidy offer made by Tennessee — $558M for a 2,000 job automobile plant, with a cost of about $279,000 per job promised.[2] However, in terms of discretionary subsidies offered to large firms, it is not necessarily an outlier.

Over 30% of the subsidy deals in the sample mention contributions to the subsidy package from local governments, e.g., the county and city.[3] Like in the VW case, local governments usually add to the subsidy deal by offering property tax abatements, which can be very large in localities with high property taxes. Larger cities may have economic development offices and economic development teams of their own, who will

[2]Interpreting these cost per job numbers requites care as the subsidy flows over a period of ten years and so cost per job year is likely lower than these estimates. Complications with discount rates and job churn complicate estimates cost per effective annual full time employees.

[3]This estimate is likely a lower bound on deals that involve local government spending. We do not have a comprehensive data set on spending at the more local level. We suspect that the local contribution is reported in news articles and press releases when it is a significant portion of the total deal.

work with the state to develop a subsidy offer for a given firm.

Table 18 presents descriptive statistics for subsidy size and cost per job for the top 10 industries receiving subsidies. Over the entire sample, firms receive $157M on average, and promise 1,660 new jobs at the establishment, for a mean cost per job of $464K. The subsidy size is normalized to 2017 dollars and a 10 year contract. The modal subsidy deal is paid out over 10 years, but some have longer horizons, such as the 20 years of state tax credits for VW.

The top 10 industries receiving subsidies make up almost 50% of the sample; subsidy-reciept is concentrated in manufacturing and high-skilled services. Automobile manufacturing firms are the most "popular" industry, with 48 subsidies, or 10% of the total sample. The average automobile manufacturer promises to create almost 3,000 jobs, and receives $263M, at $122K per job. Variance in the subsidy cost per job across (and within) industry is large. For example, in basic chemical manufacturing the mean subsidy size is $348M, but the number of jobs promised is so low that the subsidy amounts to over $3M per job (and almost $2M per job at the median). Meanwhile, in the financial services industry, the cost per job is much smaller, at about $90K on average, and $35K at the median.

Firms are more likely to receive a discretionary subsidy when they build a new establishment with over 1,000 employees. We compare the size of establishments in the subsidy data with the size distribution of establishments entering the U.S., from the Census Business Dynamics Statistics. Panel A of Table 19 shows how the percentage of establishments receiving discretionary subsidies increases with employment. Over 30% of all establishments that enter with over 1,000 employees receive discretionary subsidies, while the percentage is less than 0.2% for establishments with under 250 employees.

The firms that receive discretionary subsidies not only have larger establishments, they have above average total employment, profits, revenue, and capital stock. Table 20 presents descriptive statistics for all firms in the Compustat database from 2001-2014, for the firms in the sample that we could match to Compustat over the same period, and for the matched (subsidized) firms in the year of the subsidy deal. Firms that receive discretionary subsidies from states have 8 times more employees than the

average firm in Compustat (60 times more at the median. Moreover, in the year that the firm receives the discretionary subsidy, they employ 102,900 workers, or about 11 times the average firm employment (and 107 times at the median). The same patterns hold for capital stock, revenue, and profits. The differences are striking. The gross profit of the average firm in Compustat from 2001-2014 is just over $1B. The average gross profit for the subsample of firms that ever received a discretionary subsidy in that period is $14B ($21B in the year of the subsidy deal).

3.1.2 Who provides firm-specific subsidies?

Who gives discretionary subsidies to firms? In the subsidy "deal level" dataset, 38 states are represented. North Carolina, Louisiana, and Michigan all give at least 40 subsidies over 2002-2016, making up 31% of the sample. Meanwhile, Idaho, New Mexico, and Rhode Island are only observed once. The median state gives 9 discretionary subsidies, and the mean is 13. States with an "average" subsidy-giving count include Alabama, California, and Tennessee, among others.

The firm-level subsidy dataset not only includes the state, but the specific county where the establishment will locate. Moreover, for a subset of subsidy deals, we know the identity of the runner-up county, or the county the firm would have located, if the subsidy offer was not sufficiently high.[4] In Table 21, we compare the characteristics of counties that successfully attract a firm with a discretionary subsidy (the "winner") with counties that were runner-ups in the subsidy competition, as well as with the U.S. average. These comparisons are done in the year of the subsidy deal. In general, winning counties are smaller that the runner-ups, with a mean population of 766,000, compared to 984,000. They are also slightly poorer, with a personal income per capita of $52,000, compared to $56,000. Similarly, average wages in winning counties are just over $1,000 lower than runner-ups, at the mean (but slightly higher at the median). However, both winning and runner-up counties are much larger and richer than the U.S. average.

Within the sample of winning counties, poorer counties are more likely to give

[4]The identity of the runner-up states and counties was collected by reading news articles and press releases about each subsidy deal. See Slattery (2019*a*) for more information.

larger subsidies. Figure 19 illustrates this phenomenon with a binned scatterplot, with subsidy size plotted against average wages in the county. Similarly, poorer counties spend more per job when they give a subsidy. Counties with an average wage of less than $40,000 pay over $400,000 per job in the mean subsidy deal. Meanwhile, counties with average wages over over $100,000 pay less than $100,000 per job in a given subsidy.

Why do poor counties spend more on subsidies than their wealthier counterparts? This phenomenon could be because they are less profitable for firms, and thus have to spend more to convince them to locate there, rather than a more productive place. It also could be because, due to their labor market conditions or industrial composition, they would benefit more from attracting a new large establishment. We will briefly explore these hypotheses, and others, in the following subsection.

3.1.3 Why do they give firm-specific subsidies?

Glaeser (2001) provides five reasons why cities offer tax incentives to firms. First, incentives might be bids that represent location-specific values of attracting a given firm in terms of labor market and product market surplus. Places that will experience larger shifts in labor demand, for example, will bid more. A second and related view is that firms generate spillovers and agglomeration benefits for local producers, consumers, and suppliers. A firm that attracts skilled workers (Glaeser, Scheinkman and Shleifer, 1995; Moretti and Wilson, 2014) or that broadens the industrial mix of an area may be especially valuable (Glaeser, Kallal, Scheinkman and Shleifer, 1992). Third, places offer incentives to attract firms, which become future taxpayers. Fourth, firms may price discriminate to lower taxes for more mobile firms. Fifth, incentives may reflect corruption and capture.

How does our descriptive evidence lines up with these theories? Tables 19 and 20 show that that very large and profitable firms are more likely to receive subsidies, which could be consistent with the first and second Glaeser hypotheses. It would be interesting for others to investigate how subsidy receipt depends on the product and labor market characteristics of firms as well as the number and type of workers it attracts. In terms of firm mobility for hypotheses three and four, Figure 25C shows that

manufacturing establishments and information and professional and technical services (especially establishments with more than 1000 employees) are among the most likely industries to move. We see similar patterns in Figure 25D for new establishments. These patterns are more consistent with the fourth hypothesis, as relatively mobile industries are more rather than less likely to receive subsidies. Finally, Chirinko and Wilson (2010) and Slattery (2019*a*) provide some evidence on the political economy front as well.

North Carolina Example

North Carolina provides excellent deal-specific data that helps shed light on what firms promise locations in terms of jobs and spillovers, and what a typical state might expect in terms of indirect impacts on economic activity. Across the 96 deals from 2011-2015, the average firm-specific subsidy in North Carolina amounts to roughly $6M, providing 335 direct jobs and 540 indirect jobs. Figure 20A presents pairwise correlates of firm characteristics that are associated with larger firm-specific subsidies. It shows that the number of direct jobs is the strongest correlate of subsidies. North Carolina subsidies increase by $29K for every direct job, which is substantially more than the increase for every indirect job. Subsidies also tend to be higher for high-wage firms. Subsidies increase by 100 dollars for every dollar of average wages, so going from the mean wage of $64K to the 95th percentile of $125K implies roughly twice as large of a subsidy.

For a median subsidy deal, North Carolina predicts that for every direct job created at the new establishment, 1.4 indirect jobs will be created in the local area (1.7 indirect jobs at the mean). This estimate is very close to local multiplier effects calculated in the labor literature. Moretti (2010) finds that for every additional job in manufacturing in a city, 1.6 jobs are created in the nontradable sector in that same city. If that additional job is a skilled tradable job, and therefore a higher paid job, the multiplier increases to 2.5 (Moretti, 2010). This industry heterogeneity is also reflected in North Carolina's indirect job estimates—two pharmaceutical manufacturers garner the largest indirect job predictions, with estimates of over 5 indirect jobs per direct job created.[5]

[5]Note that the Moretti (2010) estimates are for indirect jobs in *nontradable* industries. North

North Carolina also provides projections for the expected impact on tax revenue and GDP that are quite striking. On average, the expected tax revenue and GDP impacts are $13.7M and $709M, respectively. To put these numbers in comparison, the 335 promised direct jobs at $64K per job in average wages amounts to a direct wage bill increase of $23 M. Another way to analyze these projections is to compare them to the government multiplier literature (Ramey, 2011; Chodorow-Reich, 2017). Panel B and C of Figure 20 show the relationship between the projected impacts and size of firm-specific subsidies. North Carolina projects that it will recover 76 cents for every dollar of subsidy in terms of tax revenue, and 68 dollars of GDP for every dollar of subsidy. Typical estimates of government spending multipliers range from zero to two, so this estimate seems optimistic. More work on the multiplier effects of firm subsidies is needed. Greenstone, Hornbeck and Moretti (2010) estimate the effects on local TFP, and others could use their approach to evaluate overall multiplier effects.

3.1.4 What are the Effects on Employment, Economic Activity, and Local Budgets?

This section investigates the effects of firm-specific tax incentives by comparing outcomes in "winning" locations to runner-up locations as in Greenstone, Hornbeck and Moretti (2010). We examine effects on employment within the targeted industry (i.e., at the NAICS 3 digit level), overall employment in the county, average earnings and per capita income, as well as impacts on government expenditures and revenues at the local level.

Volkswagen Example

> You can see how much more Volkswagen has meant to Tennessee than we talked about in 2008, when this was first a dream —Dr. William Fox (2013)

Earlier in this section, we described the terms of the 2008 subsidy deal for Volkswagen, and the high hopes the state and local government officials had for the economic

Carolina makes no such distinction. For example, if NC believes a firm will attract many suppliers (also in manufacturing) this would be included in their estimate.

effects in the region. We can evaluate this particular subsidy by comparing how outcomes in Chatanooga, the winning city in Tennessee, compared to outcomes in Huntsville, the runner-up in Alabama.

Figure 21A plots how employment in Transportation Equipment Manufacturing (NAICS 336) evolved from 2000 to 2017 in Hamilton County, TN and Madison County, AL.[6] The "winning" city Chattanooga is in Hamilton County, and the runner up city of Huntsville is in Madison County. It shows that Madison initially had roughly 8000 employees in transportation equipment manufacturing before the VW deal in 2008, which was substantially more than the roughly 750 employees in Hamilton county. After the VW deal in 2008, Hamilton saw a sharp increase in employment to nearly 3,500 employees while the runner up Madison experienced a short-term decline of approximately 2,000 workers and eventual recovery back to its initial level of 8,000. The reversal of fortunes might suggest business stealing effects of employees leaving Madison to go to Hamilton county.

Figure 21A also plots this employment difference between Hamilton and Madison County each year. It shows that the gap between the two went from approximately -7,500 employees before the VW deal to -3,500 employees. Thus, the difference in differences amounted to approximately 4,000 workers in transportation manufacturing following the VW deal. If we are concerned that some of this estimate reflects double counting (due to business stealing affecting both the treatment and comparison group), we can use the raw difference of post versus pre of approximately 2750 additional jobs in Hamilton.

Recall that the TN commissioner of local economic development projected that VW's promised 2,000 job plant and $1B investment would increase local payroll by

[6]NAICS 336 includes motor vehicle manufacturing (NAICS 3361).

$100M, create 14,000 jobs, and have a total economic benefit of $600M per year. While it is plausible that VW's plant increased auto employment by a few thousand jobs, it is hard to detect effects on total employment.[7] In terms of payroll, the direct estimates were quite reasonable since 2000 direct jobs at an average annual salary in 2008 of $50K amounts to $100M of payroll. The indirect and spillover benefits are harder to detect, especially since this subsidy is just one case study. We now turn to what happens in general following firm-specific subsidies to try to shed light on these issues.

Effects of Firm-Specific Subsidies in General

Figure 21B shows the average levels and pairwise differences between "winning" counties and runner up counties in the 3 digit industry of the deal and how they evolve overtime. In the full sample of all deals for which we know the runner-up county, the average difference in the years before the deal is approximately -16,500 jobs, which indicates that "winning" counties tend to be smaller than runner up counties. This finding is consistent with the findings in (Patrick, 2016). The figure also shows that this difference is shrinking in the pre-period, indicating that industry employment in "winning" counties tends to be increasing more than in runner-up places on average. This pattern causes a positive trend in the pre-period and illustrates that the runner up counties may not have parallel trends. This pattern illustrates the problem in evaluating the effects of discretionary subsidies for firms. Namely, the places that are willing to pay more for a given firm may also be places that are making effort to support industry in other ways, and the subsidy is just one part of a growing economic

[7]For example, a simple difference-in-differences specification run on 3 digit employment just in these two counties has a treatment effect of 1985 jobs (with a standard error of 626), but the estimate for total employment is -16,356 (with a standard error of 4136).

development regime. This phenomenon also would be the case when a place is trying to recover from a negative employment shock or other recent change in economic conditions. In the post period, the average difference is approximately -15,000 jobs, but falls below an extrapolated trend from the pre-period.[8] Taking the trends at face value implies a negative effect on employment within the 3 digit industry of the deal. Ignoring trends would show positive DID estimate, but the differential trends between the treatment and comparison group suggests caution when making inferences.

To obtain a better understanding of these effects, we explore pairwise difference-in-difference estimates for each deal. For each deal, we calculate the average difference in employment between "winning" and runner up places in the post years in t+4, t+5, t+6 where $t = 2008$, and the average difference in the pre-years of t-1, t-2, t-3. For example, for the VW deal, this statistic is 4,226 workers (see Figure 21A). Figure 22 plots how these deal-specific estimates relate to the number of jobs promised and the size of the subsidy in Panels A and B, respectively.

Panel A shows that there is substantial heterogeneity in deal-specific estimates of employment effects in levels and percents. The Volkswagen point estimate is fairly large relative to other deals, especially in percentage terms. The mean estimate across deals is an increase of 722 jobs and a 22.7 percent increase. The typical (i.e., median) deal, however, results in -5 jobs and 0.5% decrease within 3-digit industry employment. Thus, while some deals do seem to positively impact employment at the 3-digit industry level, the typical deal does not, and many deals do not seem to increase employment at all. There is an insignificant (and slightly negative) relationship between these deal-specific estimates and the number of direct jobs promised. Similarly, Panel

[8] In the appendix, we plot a similar series that absorbs year by two-digit industry fixed effects to account for possible calendar year and industry-specific shocks. This adjustment results in similar pre-trends, and less growth in employment in the post period.

B shows a wide-range of outcomes for a given size of subsidy. Overall, we do not find strong evidence that local tax incentives increase employment and economic growth.

3.2 State and Local Business Incentives

A common proposal is to ban discretionary subsidies for firms. However, even if states were prohibited from competing for individual firms with specialized subsidy packages, there are many non-discretionary programs that states use to attract and retain firms. These non-discretionary programs, such as job creation tax credits and job training grants, often make up a significant portion of discretionary subsidy deals. To understand how much states spend on incentives for firms, discretionary and non-discretionary, we use hand-collected data from state tax expenditure reports and budget documents from 2007-2014 from Slattery (2019*a*).[9] The tax expenditure reports the amount spent (revenue forgone) on each tax credit, while the annual state budget outlines the funding for economic development programs (e.g., job training grants, infrastructure projects, and discretionary funds). In this section, we use this data set to describe and evaluate state incentive spending.

3.2.1 What types of incentives do states provide for firms?

Volkswagen Example

We can return to the Volkswagen plant in Tennessee to understand how state tax incentives and grants for firms work. As a reminder, VW received an approximately $558M subsidy deal, which consisted of city and county tax abatements ($200M) and

[9]This process involves reading each document to identify tax credits and budget items targeted at businesses, and collect the data by hand. See Slattery (2019*a*) for more detail on data collection.

property and infrastructure from the state ($128M), as well as state funds for worker training ($30M) and "enhanced" state job and investment tax credits over 20 years ($200M).

Tennessee had two tax credits available to firms in 2008, the "Jobs Credit" and the "Industrial Machinery Credit." VW qualified for both. The standard Jobs Credit applies to any type of company in the following list: Headquarters, Manufacturing, Data Centers, Warehousing and Distribution and Call Centers. A company creating at least 10 jobs, and investing $1M would receive $4,500 per job for 1 year. This $4,500 per job would then be used against the corporate tax burden of the firm, lowering their tax bill. The number of years and tax credit per job increase with the size of the firm. Because of the size of the investment, VW qualified for the "enhanced" Jobs Credit, at $5,000 per job over 20 years. Suppliers of VW qualify for $5,000 per job over 6 years, regardless of job creation and investment (which is the rate for non-suppliers creating at least 250 jobs and investing $250M).

The industrial machinery credit is a tax credit of 1% - 10% for the purchase, third-party installation, and repair of qualified industrial machinery. The credit rate is determined by the level of investment, an investment of $100M receives 1%, $500M receives 7%, and $1B receives 10%. Therefore, the roughly $1B investment of VW would be eligible for a tax reduction of up to $100M.

The VW subsidy package also included state funds for worker training. More specifically, the state promised at least $12,000 per employee to train each of the 2,000 workers, and to pay for the construction of a technical training center. Some of this money came from Tennessee's "Fast Track" program, which has both an arm to grant money to communities for infrastructure projects (e.g., building a technical training center) and to provide grants directly to companies for job training. According to

the state budget documents, Tennessee spent over $53M on the Fast Track program in 2008, and allocated $71M for the program in 2009, likely increasing the available funds because of the arrival of VW. Like the tax credits, the size of the Fast Track grant is determined by the company investment, number of new jobs, and wages of new jobs, as well as the types of skills needed, and the location of the project. Since 2011, there have been 874 projects in the "Fast Track" program, and firms received about $4,000 per new job.

To summarize, any manufacturing firm entering Tennessee in 2008 would receive tax relief from the Jobs Credit and Industrial Machinery Credit, as well as grants for job training from the Fast Track program. The generosity of these incentives would be determined by the size of their investment and the number of jobs at the plant. These tax credits are already part of the tax code, and the Fast Track program is already funded in the state budget. Therefore, without any additional action by the state or local government, a manufacturing firm locating in TN would receive money from at least three incentive programs.

Of course, the average manufacturing firm is less likely to receive discretionary incentives such as property, infrastructure, and property tax abatements. These discretionary components of a subsidy deal are usually funded through the state budget. For example, in Tennessee, there is an infrastructure program via Fast Track that gives grants to local communities for infrastructure projects benefiting a company that will create new jobs or make new investments. There is also an "Economic Development Fund" that provides additional grant support to companies expanding or locating in TN. This support is "only used in exception cases where the impact of the company on a given community is significant." Lastly, there are capital grants

available to "significant projects."[10] According to the state budget, in 2008 the Department of Economic and Community Development in Tennessee spent $109M on business attraction and recruitment.

State-level Incentive Spending

Like Tennessee, most states use not only tax credits, but economic development programs financed through the state budget to reduce costs for certain types of firms and encourage certain activities, such as job creation and investment.

Table 22 displays state-level statistics in 2014. The two right panels include data on state-level incentives and state characteristics. This table includes per-capita economic development spending and tax expenditures, as well as per-capita corporate tax revenue, government spending, and GDP. We will use per-capita incentive spending (the sum of economic development and tax expenditures) throughout the paper as a measure of the generosity of a state's incentives.[11]

On average states spend $54 per-capita on incentives for firms, with $34 coming from economic development programs in the state budget, and $20 coming from tax expenditures. There is a lot of variation, both in levels and in the financing structure of state incentive spending. Consider two states with similar GDP per-capita and corporate tax rates: Oregon and North Carolina. North Carolina spends almost twice on incentives per-capita than Oregon, with $40 instead of $17. And although OR has a higher corporate tax rate (7.6%, compared to NC's 6.9%), the fraction of incentive spending in OR coming from tax credits is just 13%, compared to 53% in NC. Of the five top per-capita spenders, which all spend over $100 per capita (MI,

[10]Since 2011 this only included 9 companies, including VW, Amazon, GM, and Nissan.

[11]Of course, we don't know how incentive spending is distributed across firms within the state – for the most part states do not report incentives at the firm or establishment level. However, for the remainder of this section we will describe what we do know about the distribution of spending across programs and firms within the state.

WV, NY, VT, and NH), WV finances all of their spending through the state budget, while 90% of incentive spending in NH comes from tax credits.[12]

These incentive spending of these top per-capita spenders (MI, WV, NY, VT, NH) is high relative to other state spending items. For example, per-capita incentive spending over the sample is 56% of public safety expenditures, 40% of spending on health and hospitals, 30% of transportation, and 12% of education. Meanwhile, for the full sample of states it is 23% of public safety, 13% of health and hospitals, 11% of transportation, and less than 5% of education.

Another way to think about the generosity of state-level incentives is to compare incentive spending with corporate tax revenues. At the mean, 2014 incentive spending is about 40% of corporate tax revenues. However, in 3 states (MI, SD, WV) per-capita incentive spending is more than 100% of corporate tax revenue, while 5 other states report 0 corporate income tax revenue, but spend about $44 per capita on incentives for firms.

A layer of heterogeneity is added when one considers the type of tax credits and grants available to firms, and the type of firms that are likely to qualify for non-discretionary incentives from the state. We categorize each tax credit in the data by the targeted activity or industry, e.g. what does the firm have to do in order to receive a tax credit.[13] For example, the two Tennessee tax credits discussed earlier, the "Jobs Credit" and "Industrial Machinery Credit," target job creation and investment,

[12]There is also within state variation over time in how they finance incentives. For example, in 2013 MI decreased their per-capita tax expenditures from $117 to $13. However, they increased their per-capita economic development budget by about $90, leaving total per-capita incentive spending almost unchanged. If one were to study just one type of incentive they could easily miss the big picture.)

[13]As most states have a statutory tax rate on corporate income, tax credits are a relatively straightforward way to reduce the tax burden of certain types of firms. Over the period 2005-2014 states had approximately 305 unique tax credits for business attraction and retention in their tax code. They are also relatively easy to codify, using the title and/or description of the tax credit.

respectively.[14]

Figure 35A shows the breakdown of per-capita tax expenditures by type of tax credit, over time. There is not a lot of variation in terms of the focus of tax credits or the level, with the states spending a combined $1,000 per-capita over the sample period. The most popular tax credits (in terms of both number of credits available, and total spending) target job creation, investment, and research activity. Those three types of credits make up 75% of total per-capita tax expenditures. A smaller portion of tax expenditures are dedicated to small business, technology firms, or designated for establishments that create jobs and invest in certain regions within a state (enterprise zones).

From Figure 35A we know that research-intensive firms, and those with high job creation and capital investment, will most likely be eligible for the most incentives from the state. Moreover, states can use tax credits to target specific industries. For example, Washington has tax credits for "Airplane manufacturing facilities" and "Aerospace product development," while Massachusetts has a "Life Sciences Tax Incentive program." Lastly, some states write tax credits so specifically that only one firm would qualify, making it more of a discretionary subsidy. For example, California enacted a tax credit entitled the "New Advanced Strategic Aircraft Program", which specifically gives a credit of 17% of wages to "qualified taxpayers that hire employees to manufacture certain property for the United States Air Force." This credit was in exchange for Lockheed locating the production of new bombers for the Air Force in California.

It is more difficult to do a similar breakdown of incentive "type" for economic

[14]Of course, this characterization is a simplification, as the credit was limited to certain types of companies (manufacturing, headquarters, call centers, warehouses, and data centers).

development programs, as some states only report the total budget for economic development spending, and not the breakdown across individual programs. However, for the states that do provide a more detailed budget, 19% of total funds are still classified as "general economic development," 36% are allocated to job training grants and 22% are for discretionary funds, or "strategic attraction." About 14% of funds are for tech-focused programs, and 8% are for low-cost loan programs for firm. Less than 2% is small business focused.[15]

Only a small fraction of tax credits and and economic development programs explicitly target small businesses, but that does not necessarily mean that they do not receive incentives. However, states generally do not report the amount of tax credits disbursed at the establishment level. A notable exception is Indiana. The Indiana Economic Development Corporation "Economic Incentives and Compliance Report," lists the name, location, and employment of each establishment receiving a tax credit, loan, or grant from the state. The program through which they receive the funds, as well as the amount of the award is also included. Therefore, we can compare the size distribution of establishments in Indiana receiving state incentives with the size distribution of all establishments in Indiana. Panel B of Table 19 reports the results for 2006. Note that, similar to the discretionary subsidy case, the probability any establishment receives a state incentive in 2006 increases with their size. Therefore, even when the incentives are not discretionary, larger establishments are more likely to be the recipients.

[15]These statistics are from a sample of 17 states that specified a specific purpose for at least 50% of their economic development funds, in each year of the sample

3.2.2 Who provides them?

As shown in Table 22, all 48 states in the continental U.S. offer some form of financial incentives for at least a subset of establishments in their states, but the level of incentive varies widely. Michigan is the highest spender in 2014, offering $216 per-capita, while Nevada is the lowest, at $5.4 per-capita. However, there is not a clear pattern in state per-capita incentive spending in terms of other state observables, such as GDP, tax revenue, corporate tax rate, or geography.

Figure 23 shows that state incentive spending per-capita is uncorrelated with GDP per-capita, Gross Operating Surplus (GOS) per-capita, Employment/Population, Average Wages, Campaign Contributions of Business, Corporate Tax Rates, or Political Party. There is a small positive correlation between per-capita incentive spending and the union membership in the state, as well as per-capita revenues and expenditures.

Figure 35B shows that states have higher tax expenditures per-capita when they have a higher state corporate tax rate. But the tax rate doesn't explain total incentive spending well because of the ability of states to offer grants and other incentives through the budget. In short, high tax places are not necessarily giving the largest incentives.

3.2.3 Why do they give them?

The stated goal of most state tax credit programs is to attract and retain firms of a given type, or in a given industry, by reducing their costs of operating in the state. For example, unlike the federal R&D tax credit, the state level R&D tax credit is not necessarily used to increase innovation, but to attract research intensive firms. For example, in California a report to the Council on Science and Technology reads:

> California is perceived as a high-tax business environment by firms contemplating setting up business or expanding...An R&D-related tax measure targets the particular types of firms that California desires to attract in spite of its relatively high position in the "tax" league tables.

Similarly, legislation on tax credits and economic development programs often mention job creation and economic activity. For example, the legislation enacting North Carolina's Job Development Investment Grant (JDIG) program states:

> The purpose is to stimulate economic activity and to create new jobs for the citizens of the State by encouraging and promoting the expansion of existing business and industry within the State and by recruiting and attracting new business and industry to the State.

We also see patterns based on the existing industrial composition of the state. For example, California is the home of two large industry clusters - Hollywood and Silicon Valley. In order to support these industries specifically, and keep jobs and prevent firms from relocating, they have both a "Film and Television Tax Credit" and a "Research and Development Tax Credit."[16]Similarly, the specialized programs we already mentioned - the aerospace industry tax credits in Washington and life sciences credit in Massachusetts - target industries with a strong presence in the respective states.

To understand why states give tax incentives to businesses, we study changes in state incentive spending over time, and test whether such changes are driven by

[16]Spending on film and television tax credits is not included in the data set. Many states have incentives for the film production, but most firms that receive these credits do not have any tax liability in the awarded state (the exception being CA, NY), and do not have permanent establishments in the locations where they film.

the economic or political characteristics of the state. Table 23 reports the results from a linear probability model, where the dependent variable equals 1 if the state increased per-capita incentive spending by 20% (columns 1-5). The regressions are at the state level, for the years 2007-2014, and each specification includes state and year fixed effects. We find some evidence for both political and economic motivations for increasing per-capita incentive spending. In particular, spending is more likely to increase in election years, when GDP is higher, and following a decrease in the employment rate. When a state loses jobs the fiscal externality of creating a new job is higher, which aligns with the revenue-capture hypothesis of Glaeser (2001), and findings on states' willingness to pay for individual firms (Slattery, 2019*a*).

3.2.4 Effects of State Incentives on Economic Activity and State Budgets?

This section investigates the effects of state incentives by relating changes in state incentive spending per capita from 2007 to 2014 to changes in outcomes. We focus on this period since it is when both state tax expenditure and economic development budget data are available for the 48 contiguous states. We examine effects on effects on per capita tax revenue, per capita GDP, and per capita government spending.

Measuring the effect of state incentive spending on economic outcomes such as tax revenue, GDP, and government spending is a difficult task, because changes in state incentive spending are likely a response to changes in local economic conditions, or made by forward looking states in anticipation of changing economic conditions. Therefore we take all this evidence as suggestive of the relationship between state incentive spending and economic outcomes.

Figure 24 plots the change in per capita outcomes of each state from 2007 to 2014 versus the change in per capita incentive spending over this period. Panel A shows that increases in per capita incentive spending are associated with increased GDP per capita. The slope implies than every additional dollar of incentive spending is associated with 39 dollars of GDP per capita, but the relationship is statistically insignificant. Quantitatively, this increase in GDP per capita is half of the North Carolina projected multiplier, but is much larger than the typical government spending multiplier literature. These effects are worth much more investigation in future work. The effects on total tax revenue are more modest and also statistically indistinguishable from zero. Panel B shows how two measures of state government spending change. States with bigger increases in per capita incentives tend to have lower direct government spending per capita and total expenditures per capita. The slope implies that every dollar of incentive spending per capita is associated with 2.2 and 5 fewer dollars of per capita spending for these two respective measures. However, both of these estimates are statistically insignificant.

3.3 Effect of Taxes and Incentives on Firm Location

A primary motivation for providing both firm-specific and general business incentives is to attract firms and affect firm location decisions. The section briefly describes patterns in firm location, the determinants of firm location, and evidence on how do these incentives affect firm location.

3.3.1 Where do Firms Locate?

The share of firms that locate in a given place provides a revealed preference measure of how attractive it is to locate there. Figure 25 shows each state's share of total establishments and new establishments in Panel A and B, respectively. In 2014, California was home to one in nine establishments in the US and one in eight new firms. This fact illustrates the importance of non-tax factors since taxation in California is higher than in neighboring Nevada (Suárez Serrato and Zidar, 2016).

3.3.2 Determinants of Firm Location

Firm location decisions are multidimensional—they depend on more factors than just tax incentives. Firms make location and investment decisions to maximize a stream of after-tax profits, so the responsiveness of the supply of corporate capital and thus overall economic growth depend on other determinants of profits and how they relate to tax incentives. Specifically, firms care about local wages and prices, how productive they will be in a given location, market size and proximity to customers, local amenities and how easy it is to attract a skilled workforce, and many other factors. Different firms put different weight on these considerations, but these non-tax factors play a key role in shaping firm location and investment decisions.

Figure 26 shows that importance of non-tax factors by plotting the share of establishments in each state versus measures of market potential (population and GDP) as well as wages and house prices. Panel A shows that the state share of establishments is convex in log population and that this relationship swamps variation in corporate tax rates. Panel B plots the relationship between state establishment shares and average wages. On one hand, high wages are unattractive for firms because that

means higher costs, but on the other hand, high wages signal high productivity, so interpreting the relationship between wages and establishment shares requires care. The largest establishment share states (i.e., California, Florida, Texas, New York, and Pennsylvania) exhibit substantial variation in nominal mean wages. Interestingly, the figure also shows that states with above median corporate tax rates tend to have higher wages, which indicates that accounting for non-tax factors like factor prices and productivity is essential when thinking about the relationship between tax incentives and firm location. Panel C and D show that the patterns with log GDP and average housing costs are quite similar to log population and wages, respectively.

Table 24 shows the relationship between state establishment shares and a number of determinants of firm location decisions. The first six columns show the bivariate relationships and the next two columns regress establishment shares on all of the covariates simultaneously. Higher log GDP, log wages, and log state incentives are associated with higher establishment shares. Column 7, which includes all the covariates, shows that log GDP is positively associated with firm location and that conditional on log GDP, wages have a negative association with firm location. These patterns seem consistent with the idea that firms are attracted by places with large market access and productivity, but all else equal prefer lower factor prices. The effects of both state corporate tax rates and state incentive spending are less important than these non-tax forces.[17]

[17]Recent papers include Heider and Ljungqvist (2015), Giroud and Rauh (Forthcoming), Suárez Serrato and Zidar (2016), Fajgelbaum, Morales, Serrato and Zidar (2019), and Ljungqvist and Smolyansky (2014). See also (Bartik, 1991, 1985; Hines, 1996; Helms, 1985; Wilson, Hubbard and Slemrod, 1993; Bartik, 1989; Duranton, Gobillon and Overman, 2011; Dupont and Martin, 2006; Wasylenko, 1997; Devereux and Griffith, 1998; Rathelot and Sillard, 2008; Gabe and Bell, 2004; Newman, 1983; Papke, 1987; Carlton, 1983).

3.3.3 Effect of Taxes and Incentive Spending on Firm Location

Figures 27 shows how changes in firm location relate to changes in state incentive spending and state corporate taxes. We measure changes firm location using the change in each state's share of establishments.

Panel A of Figure 28 shows that in the 2014 cross section, places with more incentive spending per capita tend to have slightly larger shares of establishments. In changes, however, places that increased incentives per capita tend to see declines in establishment shares. The figure shows that Michigan is one of the places that increases incentives per capita most between 2007 and 2014, suggesting that incentive provision at the state level may be correlated with weak economic conditions, and once again highlighting the difficulty in evaluating these incentives. Since market potential is a key determinant of firm location, this correlation between incentives and firm location may be reflecting market conditions and other factors. The Appendix shows similar patterns for the location of new establishments and for manufacturing plants.

Panel B of Figure 29 shows that high corporate tax rate places tend to have slightly lower establishment shares but the relationship in the 2014 cross section of states is insignificant. In changes, increases in corporate tax rates tend to be associated with declines in establishment shares. In the period of 2007-2014, many states did not change their state corporate tax rate, but places like Illinois which raised their corporate tax rate saw some of the biggest declines in establishment shares across states over this period. The Appendix also shows that the patterns for new establishments and for manufacturing plants are similar.

3.4 Conclusion

State and local governments are devoting substantial resources towards attracting firms and corporate capital. This paper describes some of these efforts and how they affect on local economic activity and state budgets. Given the scale and scope of these policies, much more work needs to be done to analyze how these programs effect the welfare of local areas and the nation.

Similar initiatives also occur at higher levels of government. Governments around the world are aggressively courting firms and capital as well. For example, the corporate tax rate cut from 35% to 21% in the 2017 U.S. tax reform cost over $1.3 trillion dollars (Barro and Furman, 2018). Efforts to attract investment and profits of multinationals is an area that is greatly in need of much more research. We hope that this article encourages others to work more on these topics. We know little about the scale and scope of these initiatives at the international level and how they affect government budgets, the scale and location of economic activity, and the distribution of resources. The stakes are very high and evidence is much too limited.

Chapter 4

Figures and Tables

Figure 1: Subsidy Source Data

A. Toyo Tire

Subsidy Tracker Individual Entry

Company: Toyo Tire

Parent Company: Toyo Tire & Rubber

Subsidy Source: multiple

Location: Georgia

City: Cartersville

County: Bartow

Project Description:
Tire plant

Year: 2004

Major Industry of Parent: automotive parts

Specific Industry of Parent: automotive parts-tires

Subsidy Value: $71,000,000

Program Name: multiple

Awarding Agency: multiple

Type of Subsidy: MEGADEAL

Number of Jobs or Training Slots: 900

Wage Data: $15

Wage Data Type: estimated average hourly wage

Capital Investment: $392,000,000

Source of Data:
The outlines of the project and subsidy details were taken from: "Bartow County makes formal proposal for $392 million tire plant," The Associated Press State & Local Wire, June 4, 2004. The total subsidy amount and wage data were taken from: Christopher Quinn, "The cost of new jobs; Incentives for tire plant spark debate in Bartow," The Atlanta Journal-Constitution, August 23, 2004.

Notes:
The state of Georgia and Bartow County approved a subsidy deal for Toyo Tire to locate a tire plant in the county. Toyo Tire received $8 million in infrastructure and land, $1,750 in state tax credits for each job created (potentially 900 jobs total), tax abatements for five years (undisclosed amount), exemption from state and local sales taxes for equipment purchases, and possibly other incentives. The deal also had three phases of investment from the company: (1) $146 million and 350 workers, (2) $127 million and 300 workers, and (3) $119 million and 250 jobs. Overlap with main Subsidy Tracker data: none.

Source Notes: If an online information source is not working, check the Tracker inventory page for an updated link.

B. Microchip

Subsidy Tracker Individual Entry

Company: Microchip

Parent Company:

Subsidy Source: state

Location: Oregon

City: Gresham

Project Description:
Semiconductor fabrication

Year: 2002

Subsidy Value: $13,100,000

Program Name: Strategic Investment Program

Awarding Agency: Business Oregon

Type of Subsidy: property tax abatement

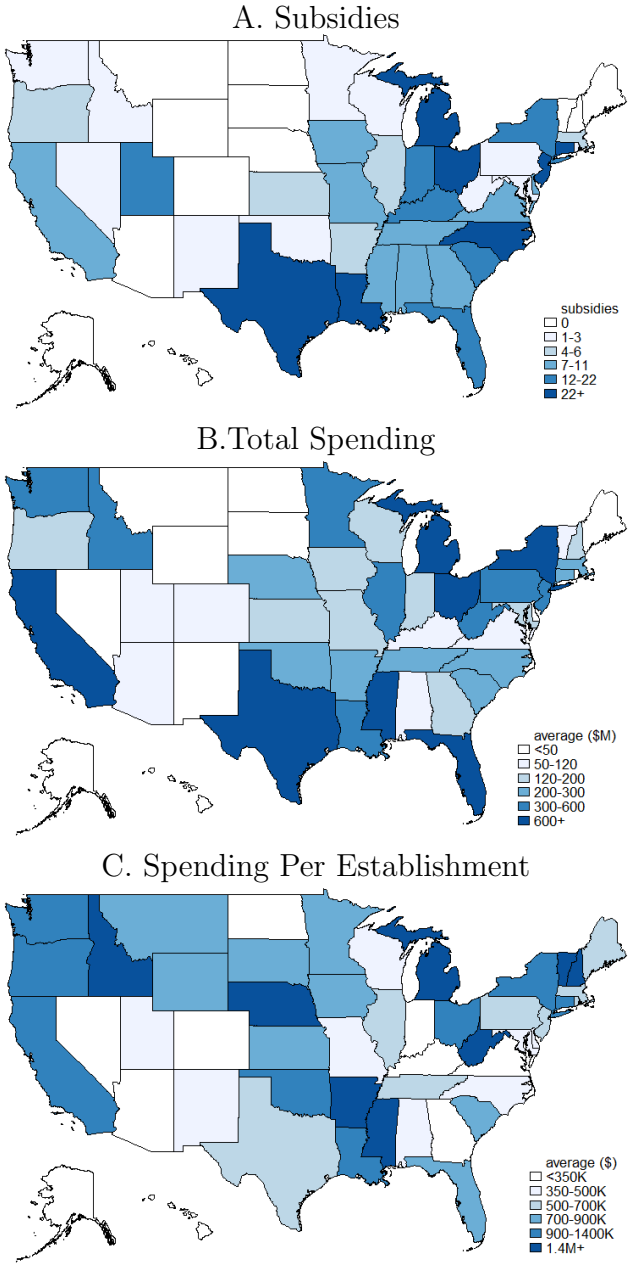
Source of Data:
Direct from Business Oregon; not on web

Notes:
Year is year of approval; subsidy value is cumulative amount of abatement through 2010

Source Notes: If an online information source is not working, check the Tracker inventory page for an updated link.

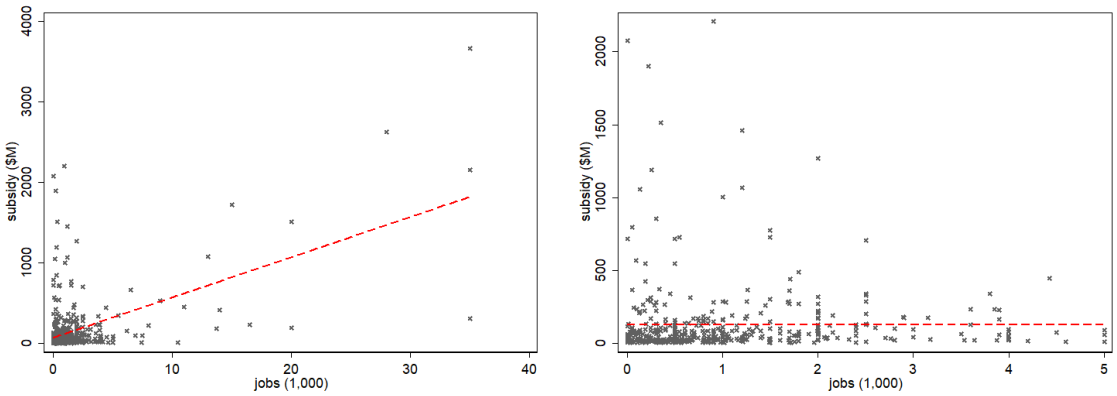
Notes: These are two examples of the information available in the *Good Jobs First* Subsidy Tracker. Each entry is a subsidy deal. Both entries include the company name, location, project description, year, size of the subsidy, and source of the subsidy funds.

Figure 2: Geographic Distribution of Subsidy-Giving and Incentive Spending



Notes: The three figures above show the geographic distribution of subsidy-giving and spending. Figure (a) is the number of subsidies given by each state over the sample period (2002-2016). Figure (b) is the yearly average of each states' total economic development spending (not only discretionary). Figure (c) is the average per-establishment incentive spending. This is calculated as the states' total economic development spending in year t, divided by the number of establishments with 100+ employees that entered the state in year t.

Figure 3: Direct Jobs Promised vs. Subsidy Size



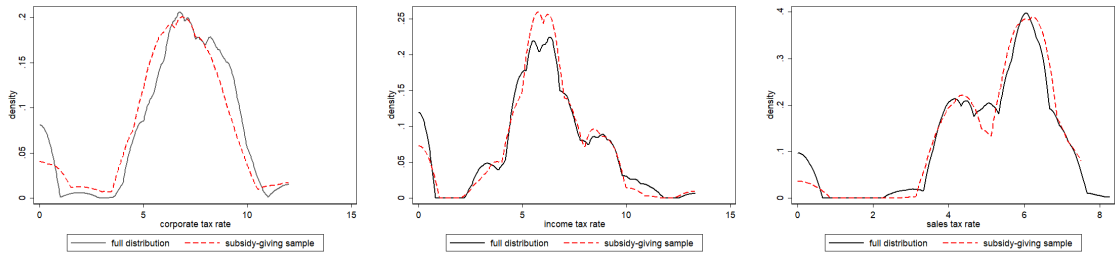
Notes: This figure plots the number of direct jobs promised in a subsidy deal, with the size of the subsidy the firm receives. Jobs, in 1,000, is on the x-axis, and subsidy size, in $M, is on the y-axis. The red dashed line is the trend line, the predicted subsidy size using a linear regression of subsidy size on direct jobs promised. The figure on the left uses the full sample, while the figure on the right uses only deals with direct job creation of 5,000 jobs or less, which is 96% of the sample.

Figure 4: Subsidy Competition Example with 2 States

State 1	**State 2**
$v_{1A} = 3,\ \pi_{A1} = 10, W = 13$	$v_{2A} = 7,\ \pi_{A2} = 7, W = 14$
$\vdots$	$b_2 = 3 + \epsilon$
$b_1 = v_{1A} = 3$	$\pi_{A2} + b_2 = 10 + \epsilon$
$\pi_{A1} + v_{1A} = 13$	$\vdots$
-------stop-------	$b_2 = 6 + \epsilon$
	$\pi_{A2} + b_2 = 13 + \epsilon$

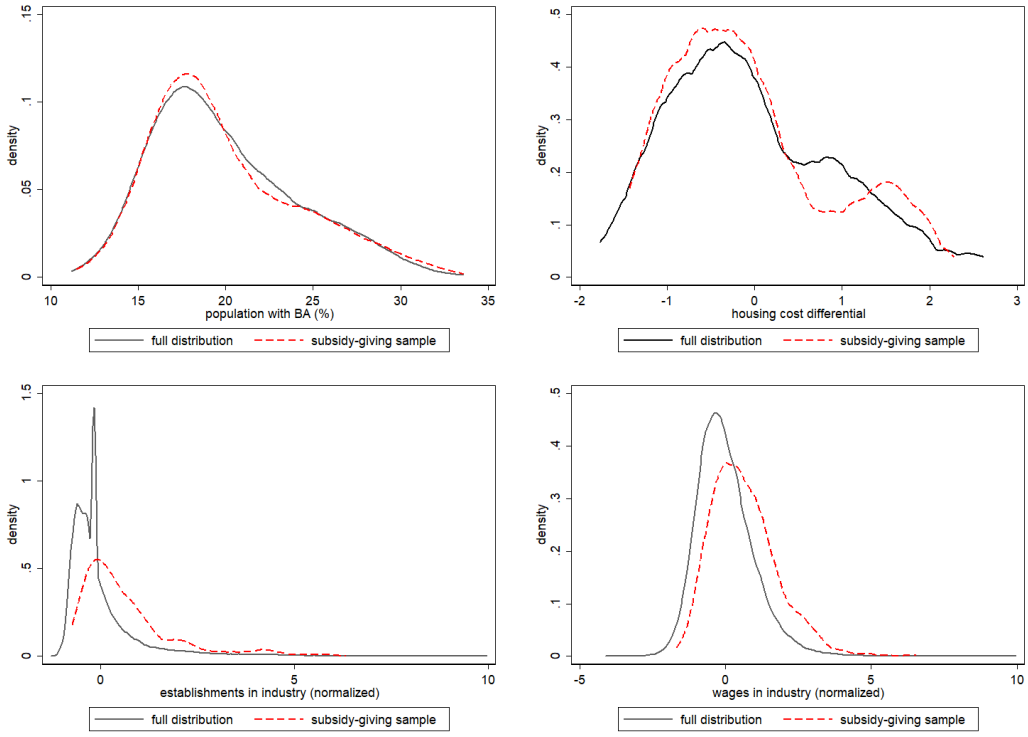
Notes: This figure diagrams an example of subsidy competition between two states. This example shows that subsidy competition can lead to a higher welfare outcome. This is due to heterogeneity in the benefit the firm will have in each state.

Figure 5: Co-variates: State Tax Rates



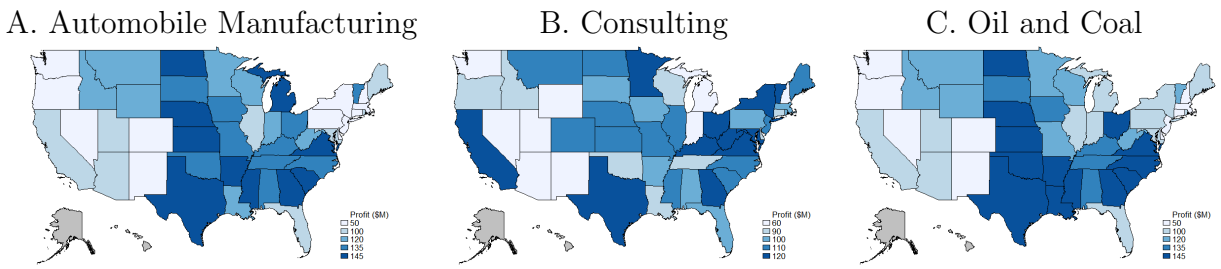
Notes: These figures display the densities of tax rates in the subsidy observations, and in the full sample (48 continental states, 2002-2016).

Figure 6: Co-variates: State Characteristics



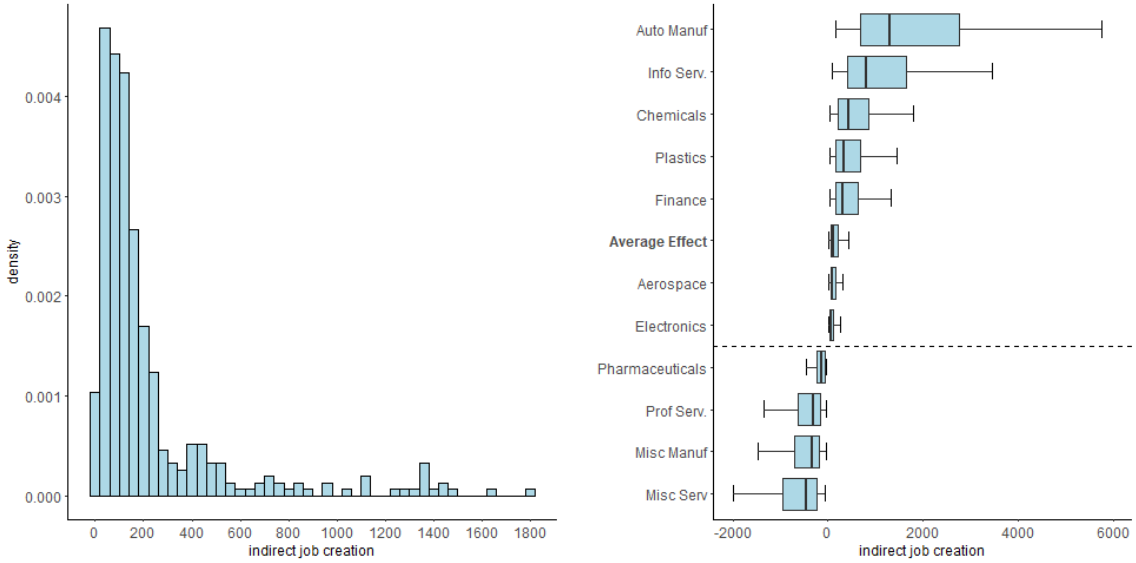
Notes: These figures display the densities of state characteristics in the subsidy observations, and in the full sample (48 continental states, 2002-2016). The housing costs, establishments, and wages are normalized to have standard deviation of one and mean of zero. The establishment and wage variables are measured at the industry level, and the normalization is done at the industry level.

Figure 7: Estimated Profits by Industry (2016)



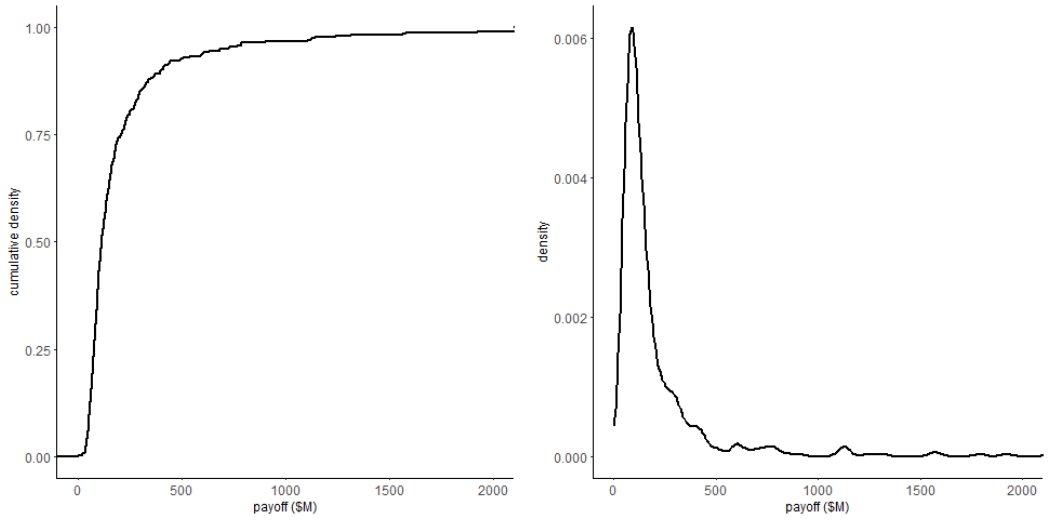
Notes: These figures display the estimated profit across states in the year 2016, for three different industries. Profits are calculated using the estimated $\hat{\beta}$ from Equation 1.13, multiplied by the co-variates of the state.

Figure 8: Predicted Spillover from Medium Firm Entry



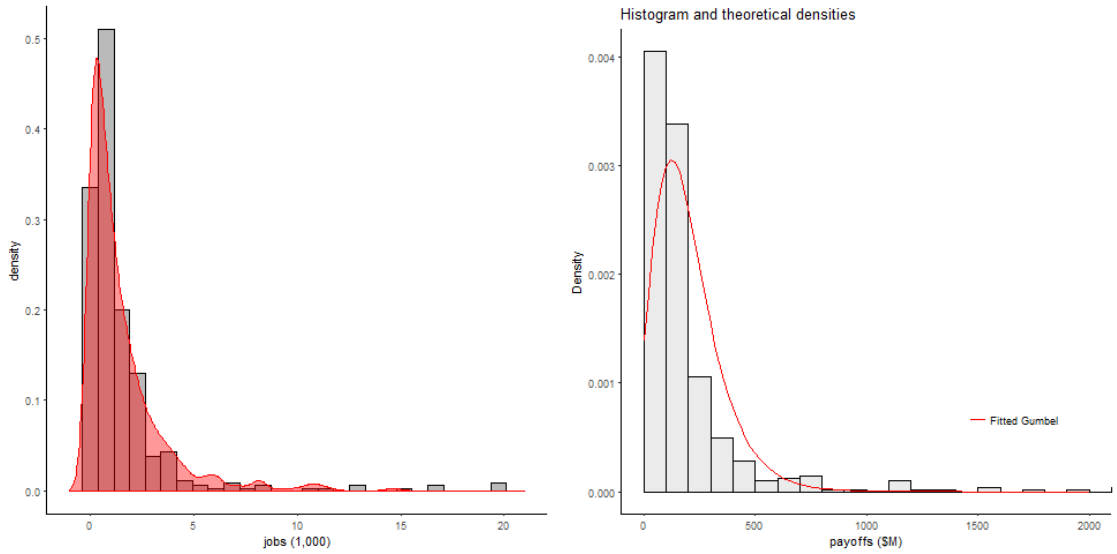
Notes: These figures provide descriptive statistics for the predicted spillovers. The predicted spillover for a firm in industry group j is calculated in each state s, year t, according to Equation 1.15. The density of indirect job creation for the average firm is shown on the left, while a box plot for each industry group is shown on the right, with the average effect in bold, and the industries with negative indirect job creation below the dotted line.

Figure 9: Payoffs in the Runner-Up State ($\hat{w}_2$)



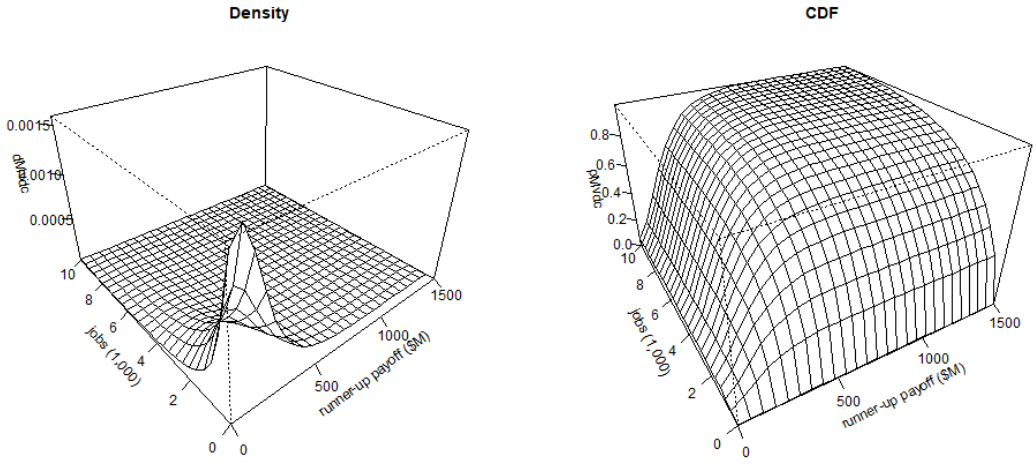
Notes: This is the empirical cumulative distribution and density of firm payoffs in the runner up state. This is calculated using the estimated residual ($\hat{\theta}$), simulated unobserved state characteristics ($\hat{\xi}$), estimated firm preferences ($\hat{\beta}$), and runner-up state characteristics (x). See Equation 1.16 for the calculation.

Figure 10: Simulated and Observed Jobs and Payoffs



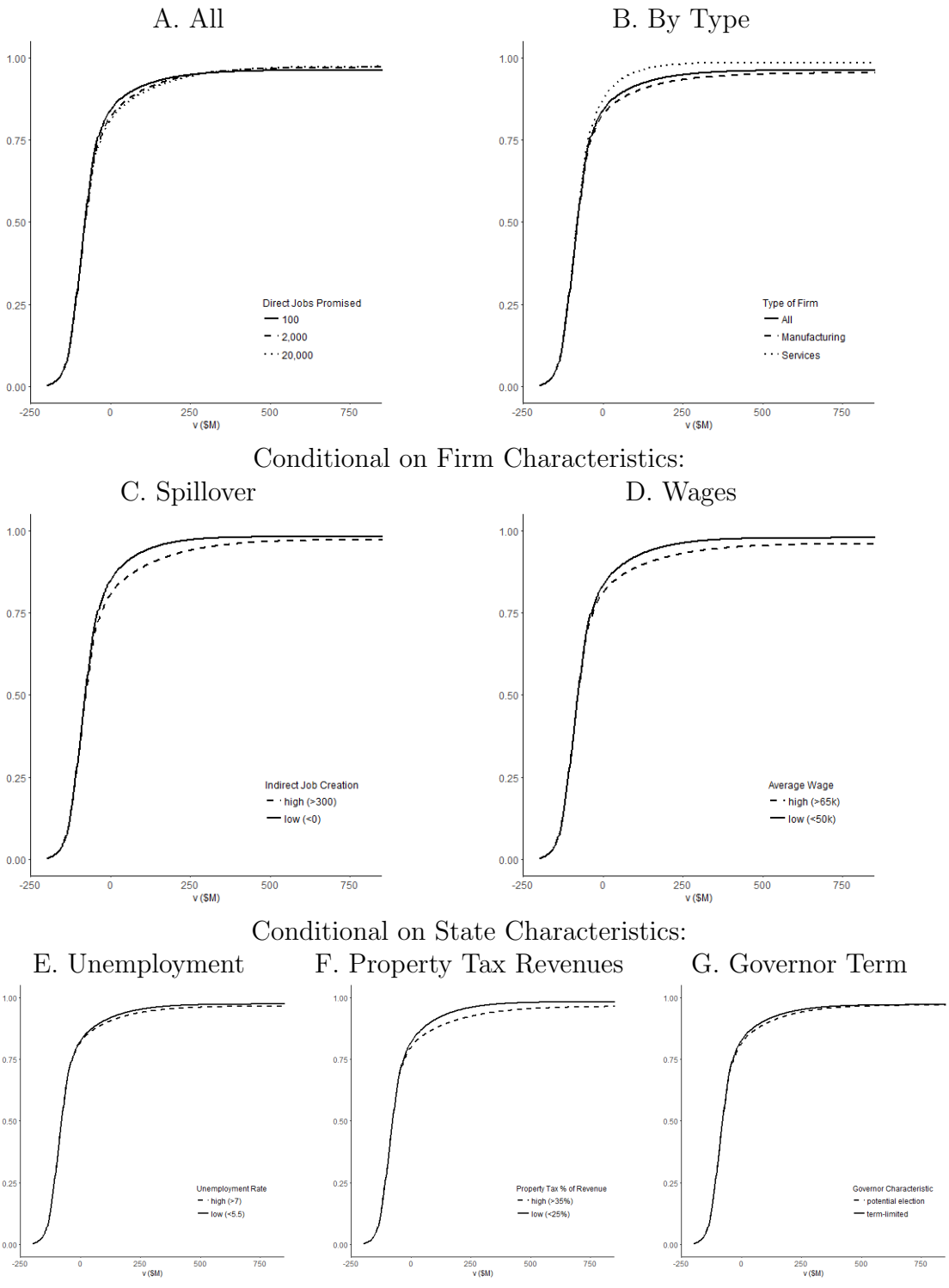
Notes: These figures display the histograms of the data on direct jobs promised (left) and payoffs in the runner-up state (right) against the fitted density functions (in red). I use a gamma distribution to fit direct jobs promised, and a gumbel distribution to fit estimated runner-up payoffs.

Figure 11: Joint Distribution of Jobs and Payoffs



Notes: These figures display the joint density (left) and joint cumulative distribution (right) of direct jobs promised and payoffs in the runner-up state. The joint distribution of payoffs and jobs was recovered using the marginal distributions of jobs and payoffs and employing the Frank Copula.

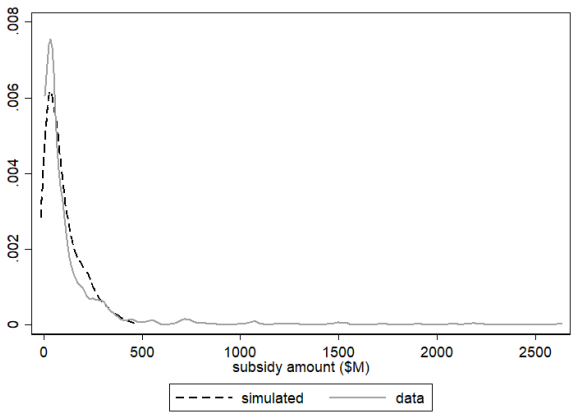
Figure 12: State Valuation for Firms



Notes: This figure displays the conditional distribution of states' valuation for firms. Each sub-figure shows the valuation distribution, conditional on a different variable. The y-axis is the cumulative distribution, and the x-axis is the valuation, in $M. The conditioning variables are in the titles.

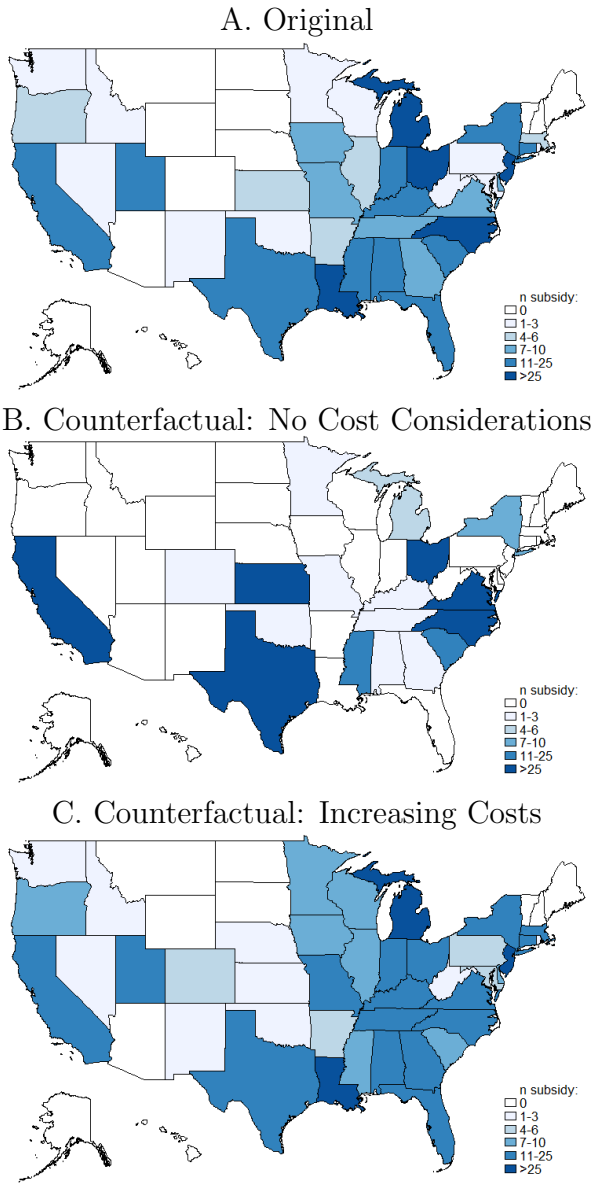
Figure 13: Model Fit

	Data	Simulated
10^{th} percentile	11.8	5.6
25^{th} percentile	22.0	30.5
50^{th} percentile	57.0	68.5
75^{th} percentile	136.3	143.7
90^{th} percentile	307.8	229.4
Mean	156.3	97.4
Standard Deviation	342.1	91.8



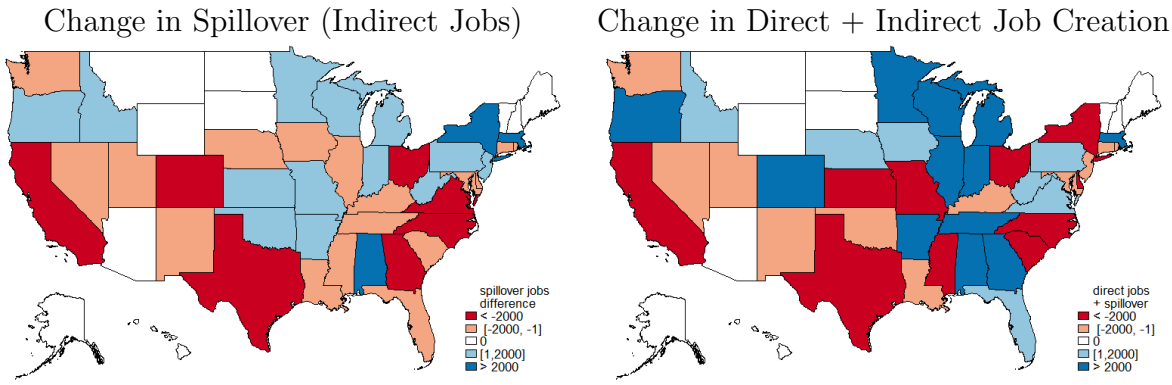
Notes: This figure compares the subsidies predicted by the model with subsidies observed in the data. The table on the left gives descriptive statistics for the data and simulated subsidies, while the figure on the right is the probability density function for each.

Figure 14: Counterfactual: Eliminating Incentives



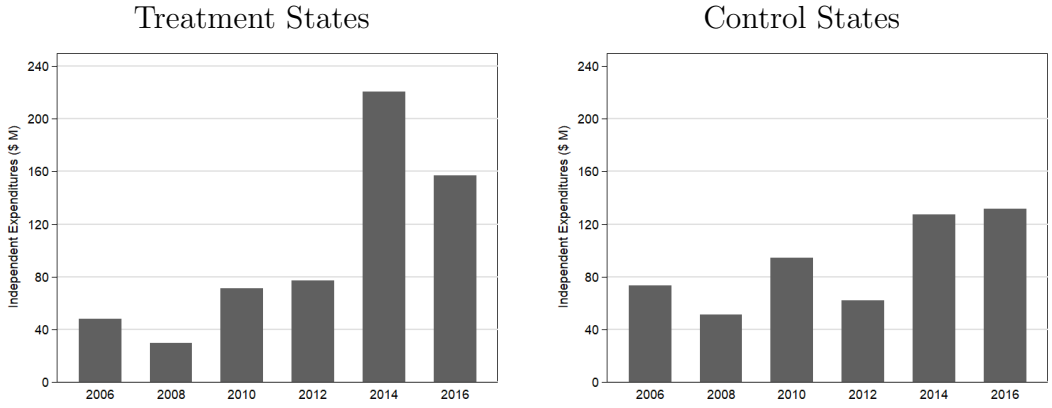
Notes: This figure displays the location choices of firms in the data (Panel (a)), and in two counterfactuals in which subsidy spending is set to zero (Panels (b) and (c)). In Panel (b) wages and housing costs in a state do not change following the entry of a large firm — in Panel (c) they do.

Figure 15: Counterfactual Spillovers: Eliminating Incentives



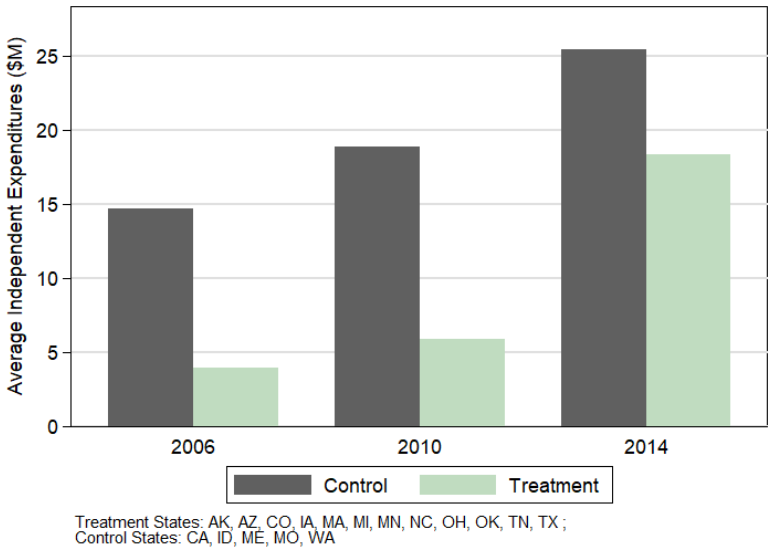
Notes: In this figure the difference in predicted job creation given locations chosen in the data, and predicted job creation given locations chosen in the counterfactual, is shown for each state. The red represents negative changes (job losses), while the blue represents positive changes (job gains). The figure on the left only considers *indirect* job creation, that is, jobs created via spillovers. The figure on the right uses both the direct jobs promised and the indirect jobs in the calculation.

Figure 16: Independent Expenditures in State Elections: 2006-2016



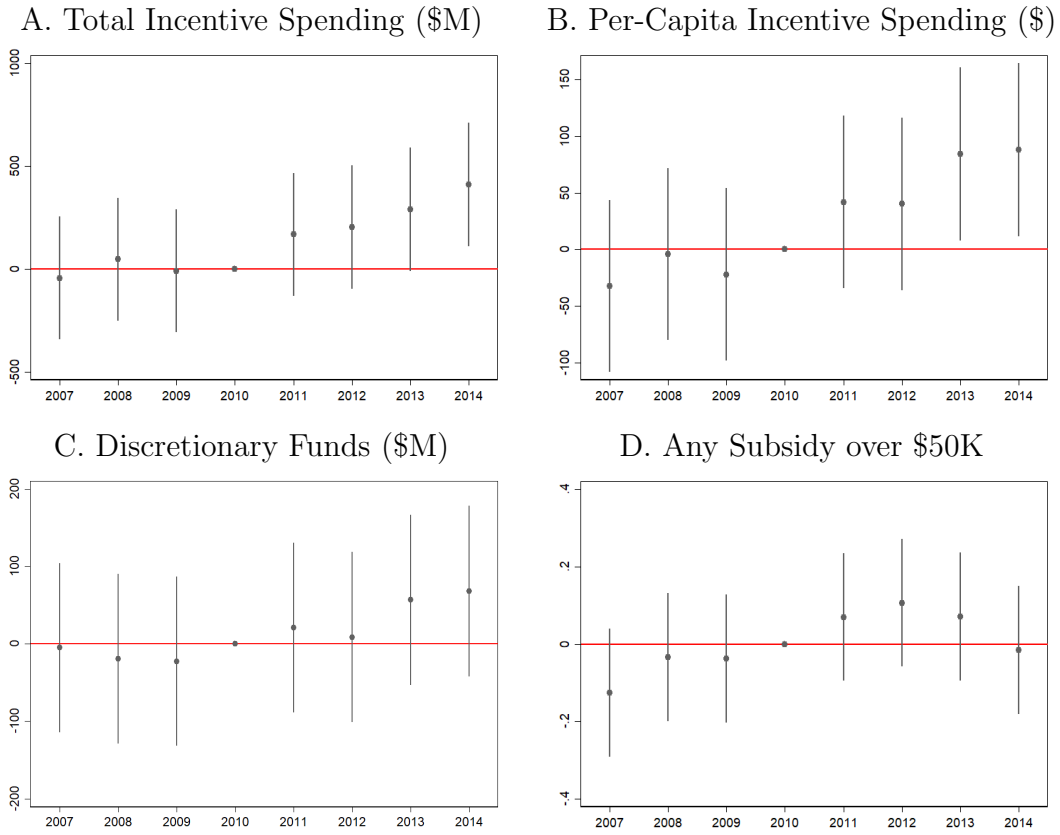
Notes: These figures display the independent expenditures of treatment and control states from 2006 to 2016. The source is Follow the Money (2000-2016). Follow the Money only has data on independent expenditures for a subset of states, and I need to further restrict the sample to states that I observe in the data before 2010. This leaves a sample of 17 states, 12 in the treatment group (AK, AZ, CO, IA, MA, MI, MN, NC, OH, OK, TN and TX) and 5 in the control group (CA, ID, ME, MO and WA).

Figure 17: Mean Independent Expenditures: 2006, 2010, 2014



Notes: This figure display the mean independent expenditures of treatment and control states from 2006 to 2016. The source is Follow the Money (2000-2016). Follow the Money only has data on independent expenditures for a subset of states, and I need to further restrict the sample to states that I observe in the data before 2010. Moreover, I restrict to the states with gubernatorial elections in 2006, 2010, and 2014.

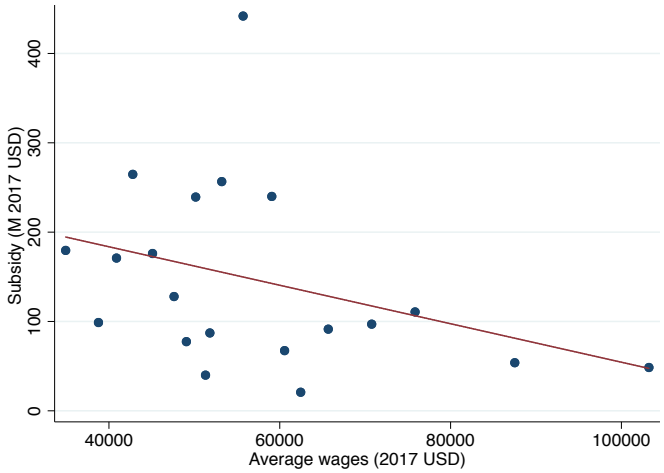
Figure 18: Event Study Estimates



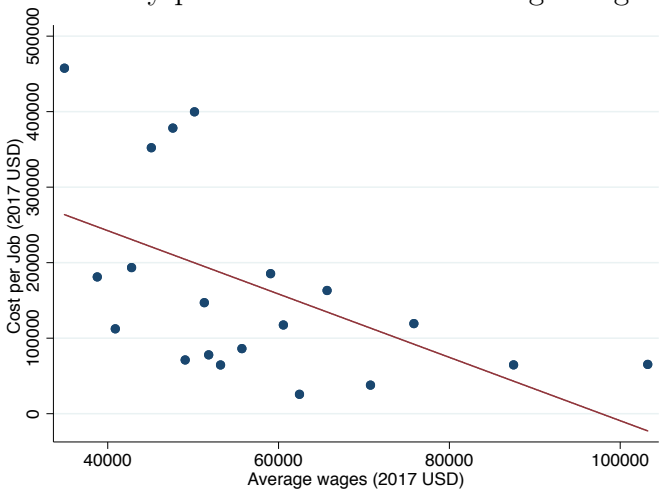
Notes: The event study approach takes Equation 2.3 and expands the $\text{Treat}_s \times \text{Post}_t$ variable to include an indicator for each year in the sample, omitting 2010 as the base year. This figure presents the event study coefficient estimates and confidence intervals, the outcomes being: (a) total incentive spending, (b) per-capita incentive spending, (c) size of the state discretionary fund for incentives, and (d) whether the state gave any individual subsidy worth over $500K.

Figure 19: Firm-Specific Subsidies Larger, More Generous in Lower Wage Locations

A. Subsidies Relative to Average Wages



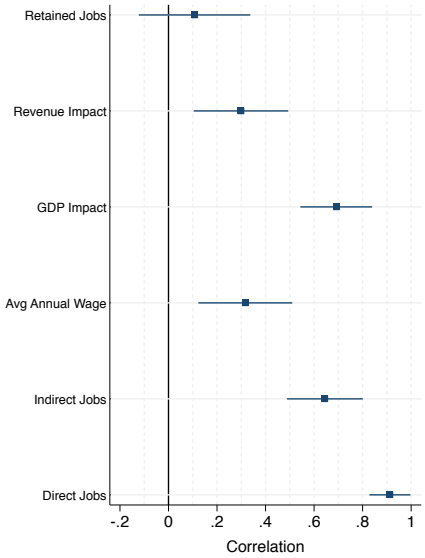
B. Subsidy per Job Relative to Average Wages



Notes: This figure shows the relationship between firm-specific incentives and local average earnings. The firm-specific subsidy data is from the sample of 484 discretionary subsidy deals collected by the author. Average wages are sourced from the QCEW. For each firm-specific incentive we use wages in the county where the firm locates, aka the "winning county." Panel A plots total subsidies for each deal relative to average wages in the winning county. Panel B replicates Panel A for subsidy per job promised. Subsidies, cost per job, and wages are measured in 2017 dollars.

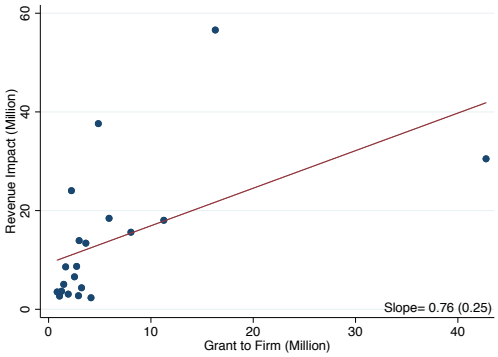
Figure 20: Determinants of Firm-Level Subsidies: Evidence from North Carolina

A. Correlates of Firm-Level Subsidies in North Carolina

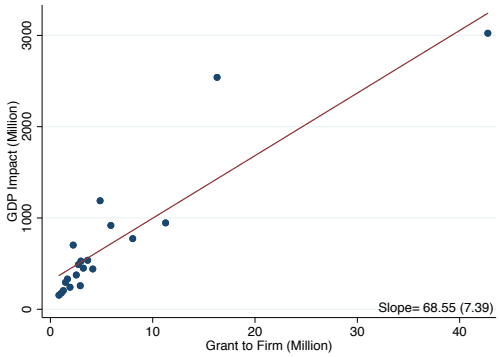


North Carolina's Projected Effects of Firm Subsidies on Tax Revenue and GDP

B. Revenue Impact ($M)

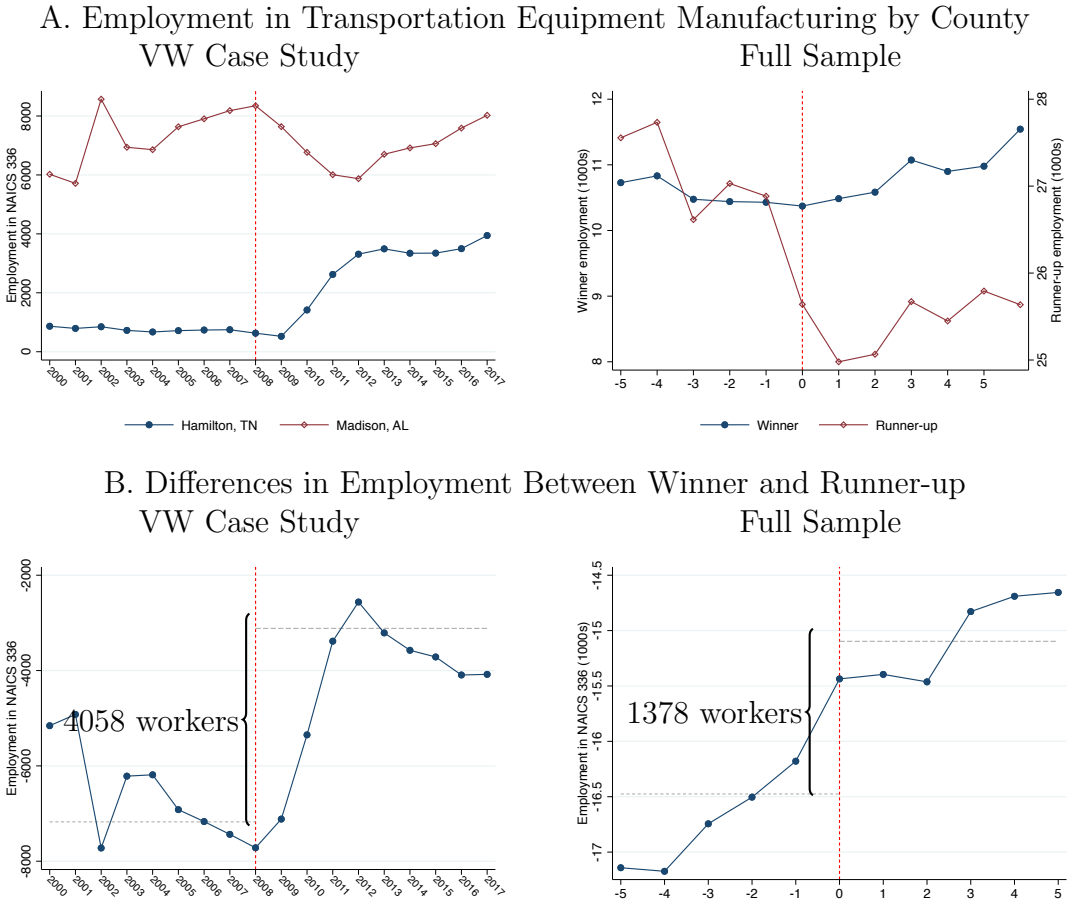


C. GDP Impact ($M)



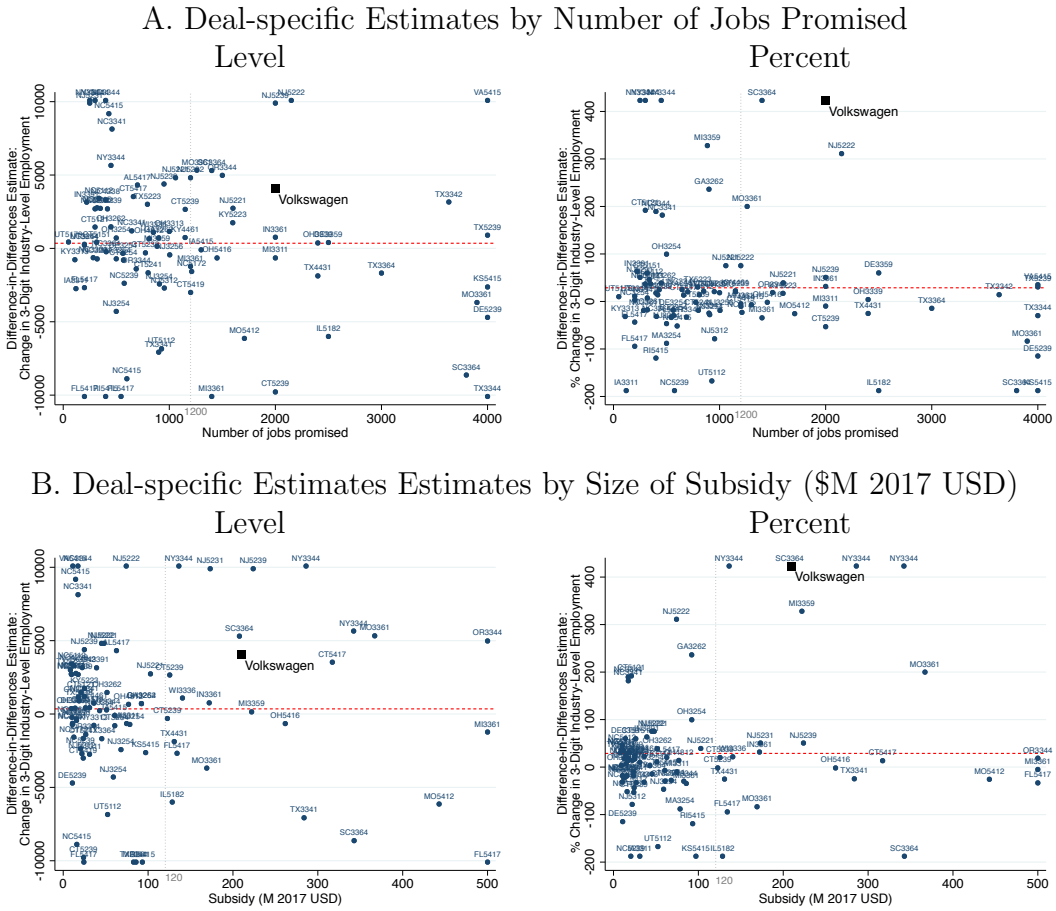
Notes: North Carolina provides detailed information on discretionary subsidies awarded through the "Job Development Investment Grant" Program. This includes the terms of each grant, the promises of the firm receiving the grant (number of jobs they will create, level of investment, wages), and the state expectations for the effect of the firm (indirect job creation, GDP, revenue). Panel A of this figure reports the correlation between firm-level subsidies in North Carolina on number of direct and indirect jobs, average annual wages, GDP impact, revenue impact and retained jobs. 95% confidence intervals are included. Panels B and C of this figure report the relationship between subsidies and projected tax revenues and projected GDP, respectively. GDP impact, revenue impact and subsidy are measured in millions of dollars.

Figure 21: Impact of Subsidy on Employment in the 2008 VW Deal, Analysis Sample



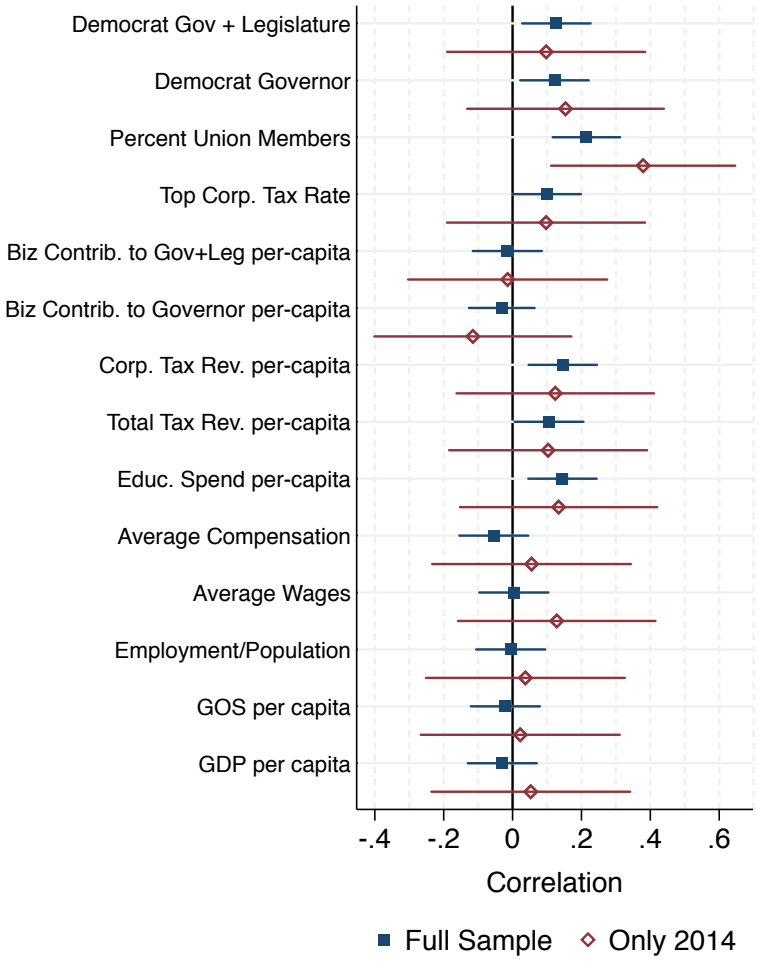
Notes: This figure summarizes the impact of winning a firm-specific subsidy on employment in the industry of the deal. Left-hand-side panels plot employment for the winning and runner-up counties in the competition for the Volkswagen assembly plant in 2008. As noted in the text, VW located in Hamilton County, Tennessee, and received a subsidy worth about $558M from the state and local governments in Tennessee. According to reporting on the deal, this subsidy package just beat out the offer from Madison County, Alabama. In this figure we compare outcomes in those two counties. Panel A plots total employment in Hamilton, TN ("winner" county) and Madison, AL ("runner-up") in Transportation Equipment Manufacturing (NAICS 336), which is Volkswagen's industry. Panel B plots the level difference in employment between the winner and runner-up by year. The red dashed line indicates the year of the deal. The dotted grey lines indicate average employment over the three years before the deal, and the average employment level four, five and six years after the deal. The right-hand-size panels replicate the VW case figures for all deals in our analysis sample. Event year is 0 in the year of deal.

Figure 22: Pairwise Difference-in-Differences Estimates of Firm-Specific Subsidies



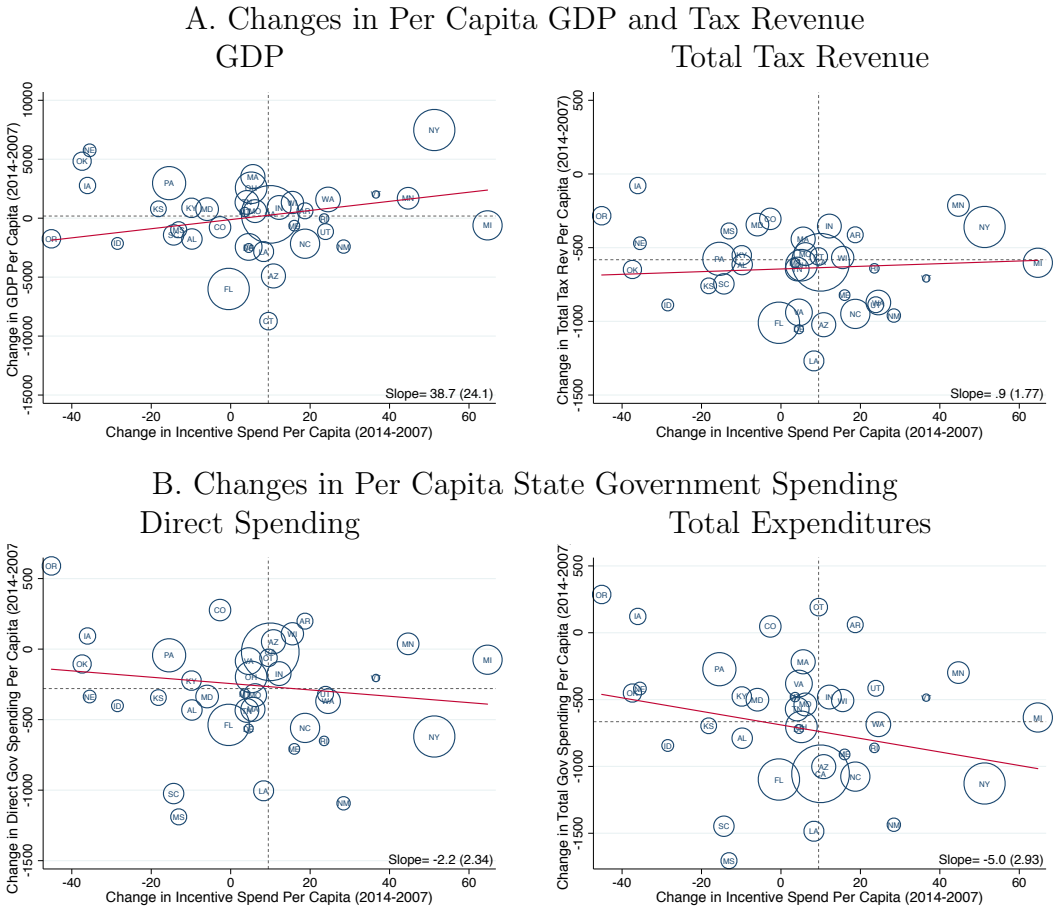
Notes: This figure plots pairwise difference-in-difference estimates for the 122 deals in our sample whose "winner" and "runner-up" counties have positive pre-deal employment. Pre-deal employment is the average for the three years prior to the deal. Post-deal employment is the three-year average of employment 4, 5 and 6 years after the deal. Panel A compares the level and percent change in employment to the number of jobs promised. Panel B replicates Panel A, but plots the estimates relative to the size of the subsidy package. Estimates are winzorized at the 5% level. The dotted light gray line denotes the average number jobs promised and the size of the average subsidy package. The dashed red line denotes the mean difference-in-differences estimate. We censor number of jobs promised at 4,000 and subsidy amount to $500M for visualization's sake. Four deals promise over 4,000 jobs, and 5 are given over $500M in subsidies.

Figure 23: State Characteristics and Per-Capita Incentive Spending



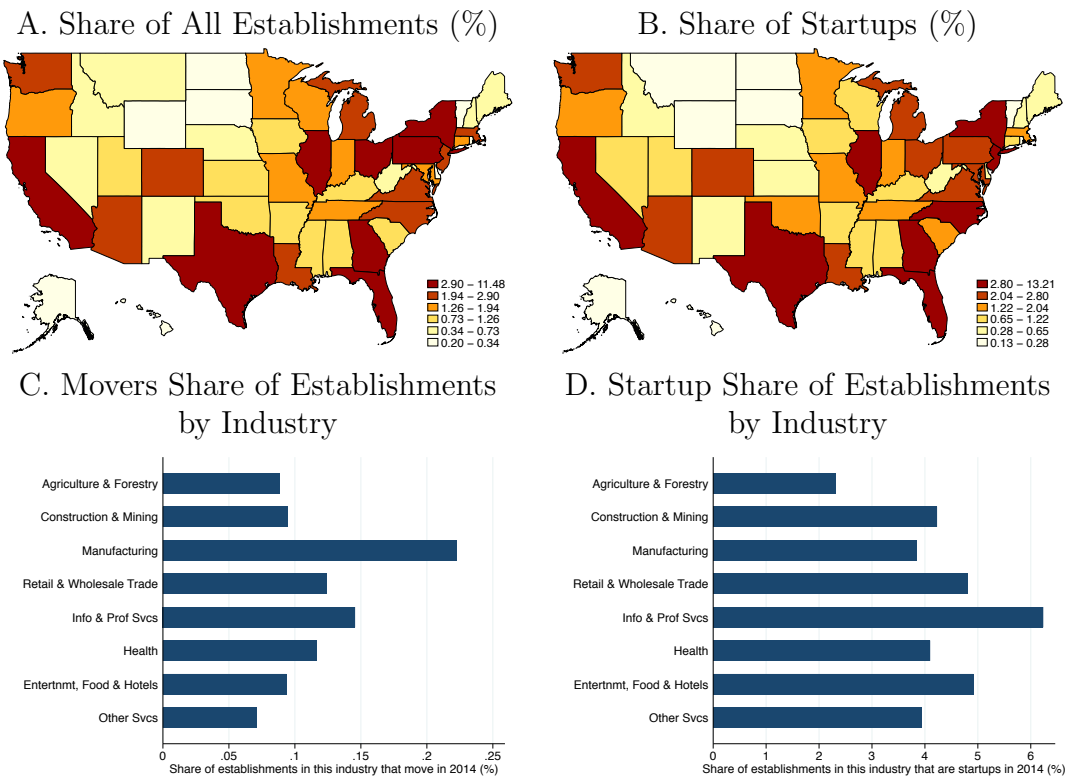
Notes: This figure plots correlations between state per capita incentive spending and state characteristics. The correlation coefficient is reported, with the 95% confidence interval. The navy suqares report the relationship over the full sample (2007-2014), while the maroon hollow diamonds report the results for 2014. State per capita incentive spending includes both state tax expenditures on tax credits for businesses, and state economic development programs for businesses. The latter can include grants, job training, loans, and discretionary subsidies, among other types of incentives. Total spending on economic development projects is added to total tax expenditures for firms, and divided by state population, to create the incentive spending per capita measure. GDP, GOS, and compensation are sourced from the U.S. Bureau of Economic Analysis (1967-2017). Corporate income tax revenue, total tax revenue, and education expenditures are drawn from the US Survey of State and Local Government Finance, via the Tax Policy Center. Top corporate income rates from the CSG Book of the State (1950-2018). Population comes from the US Census. Wages and employment are sourced from the Census (County Business Patterns, 1997-2017). Data on state union shares come from the work of (Hirsch, Barry and Macpherson, David and Vroman, Wayne, 1964-2018), while campaign contributions come from Chirinko and Wilson (2010). Lastly, data on the party of governors and state legislatures is from Follow the Money (2000-2016).

Figure 24: State Incentive Spending Per Capita, Economic Activity, and Fiscal Policy



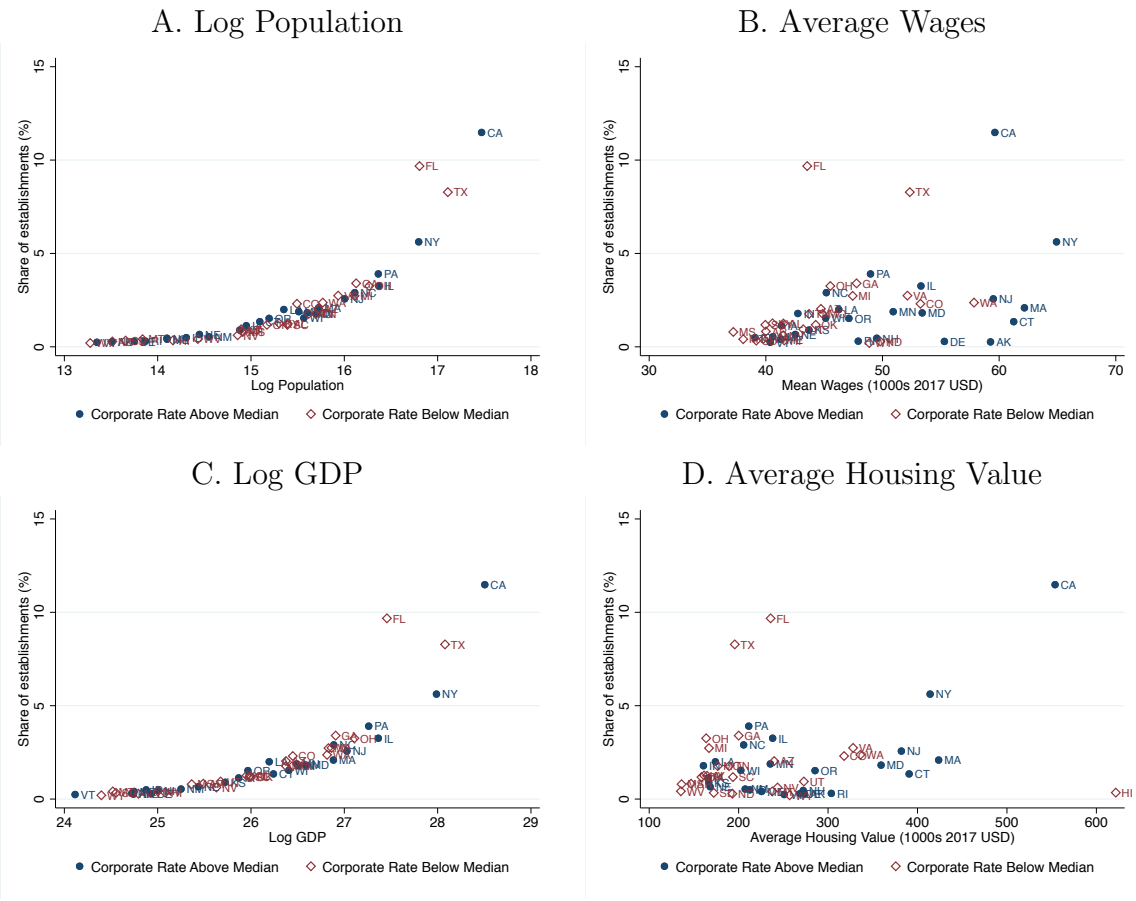
Notes: This figure plots the change in per capita outcomes of each state from 2007 to 2014 versus the change in per capita incentive spending over the period. Per capita incentive spending includes both state tax expenditures on tax credits for businesses, and state economic development programs for businesses. The latter can include grants, job training, loans, and discretionary subsidies, among other types of incentives. Total spending on economic development projects is added to total tax expenditures for firms, and divided by state population, to create the incentive spending per capita measure. The incentive spending data is collected by the author from state tax expenditure reports and state budget documents. The source of the state outcome data is the Census of Governments.

Figure 25: Firm Location and the Mobility of Establishments by Industry



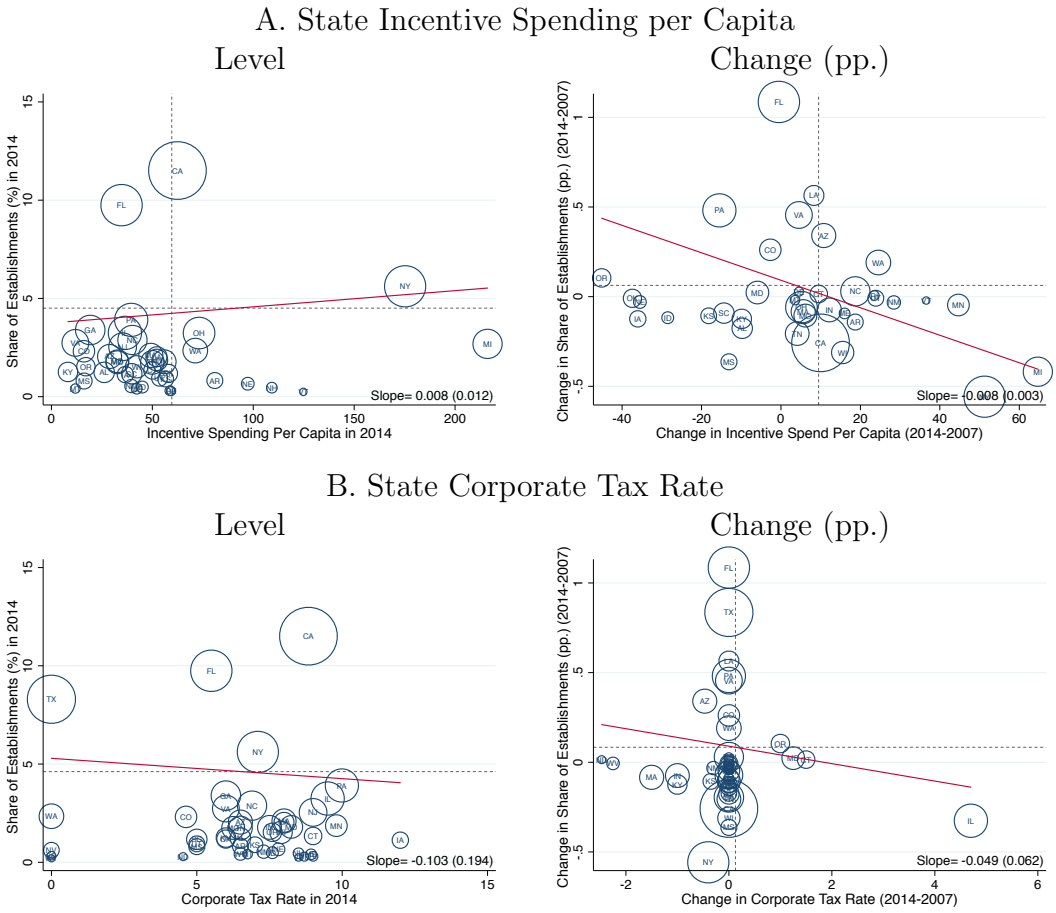
Notes: Panel A maps the geographic distribution of establishments across US states in 2014. Panel B plots the share of each state's establishments in 2014 that were startups. Panel C and D summarize the share of establishments by industry that moved or were startups in 2014, respectively. Establishment-level data come from NETS (1990-2015).

Figure 26: Tax and Non-Tax Determinants of Firm Location



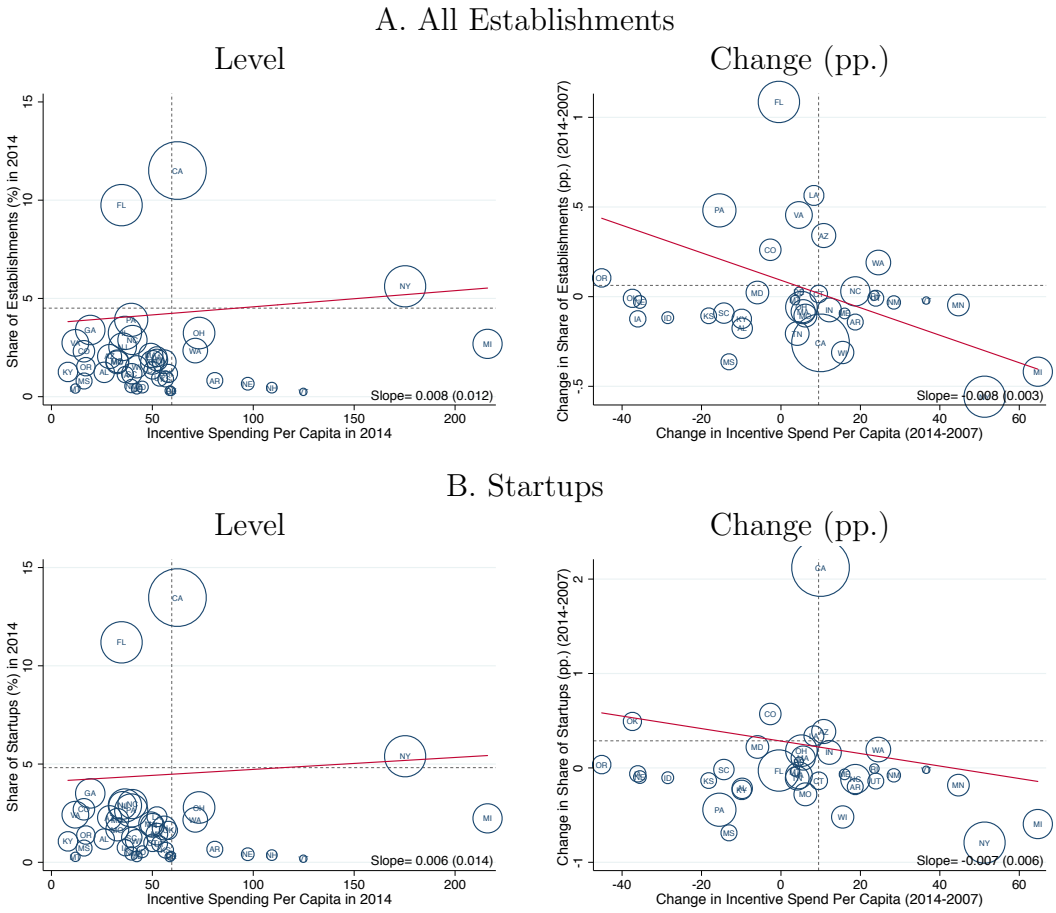
Notes: This figure plots the relationship between states' share of total US establishments and state corporate income tax rate, state population, average wages, GDP and housing prices. Blue circles indicate that the state's corporate income tax rate in 2014 was above the median, while red hollow diamonds indicate below median corporate income tax rates. Corporate income tax rates were sourced from CSG Book of the State (1950-2018). GDP was sourced from U.S. Bureau of Economic Analysis (1967-2017). Average worker compensation is measured in thousands of 2017 dollars and was calculated using annual payroll and employment estimates from County Business Patterns (1997-2017). Average housing values are calculated using the 2014 American Community Survey (see Ruggles, Flood, Goeken, Grover, Meyer, Pacas and Sobek, 2019). Establishment-level data come from NETS (1990-2015).

Figure 27: Firm Location, Incentive Spending, and Corporate Taxes



Notes: This figure plots the level of and change in share of establishments in each state from 2007 to 2014 versus the level and change in per capita incentive spending over this period. Per-capita incentive spending includes both state tax expenditures on tax credits for businesses, and state economic development programs for businesses. The latter can include grants, job training, loans, and discretionary subsidies, among other types of incentives. Total spending on economic development projects is added to total tax expenditures for firms, and divided by state population, to create the incentive spending per-capita measure. The incentive spending data is collected by the author from state tax expenditure reports and state budget documents. Establishment-level data come from NETS (1990-2015).

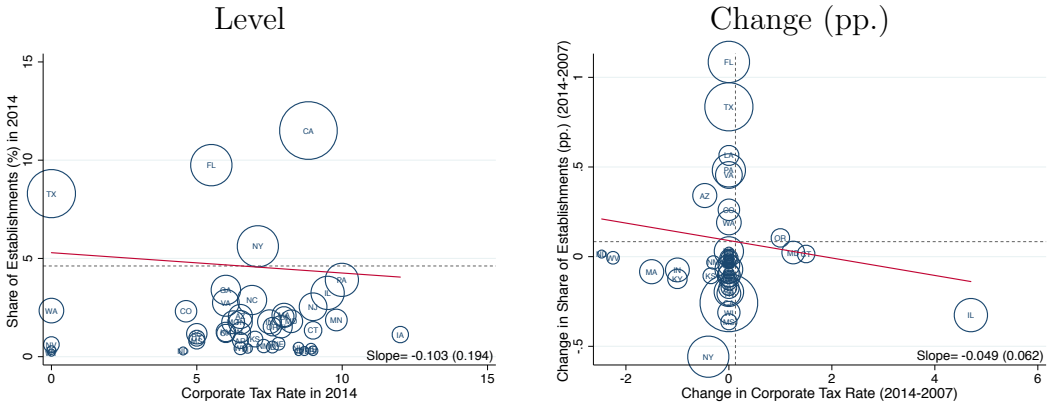
Figure 28: Firm Location and Incentive Spending per Capita



Notes: This figure plots the level of and change in share of establishments and startups in each state from 2007 to 2014 versus the level and change in per capita incentive spending over this period. Per-capita incentive spending includes both state tax expenditures on tax credits for businesses, and state economic development programs for businesses. The latter can include grants, job training, loans, and discretionary subsidies, among other types of incentives. Total spending on economic development projects is added to total tax expenditures for firms, and divided by state population, to create the incentive spending per-capita measure. The incentive spending data is collected by the author from state tax expenditure reports and state budget documents. Establishment-level data come from NETS (1990-2015). Panel A plots states' share of all establishments and Panel B plots states' share of all startups.

Figure 29: Firm Locations and State Corporate Tax Rates

A. All Establishments



Notes: This figure plots the level of and change in share of establishments and startups in each state from 2007 to 2014 versus the level and change in corporate income tax rates over this period. Corporate income tax rates were sourced from CSG Book of the State (1950-2018). Establishment-level data come from NETS (1990-2015). Panel A plots states' share of all establishments and Panel B plots states' share of all startups.

Table 1: Available vs. Completed Datasets

Publicly Available Subsidy Data

		State		Subsidy ($M)				
Company	Year	Won	2nd-place	Discr.	Non-Discr.	Industry	Jobs	Retain/ Expand
Microchip	2002	OR	?	17.7	?	Semicond.	?	?
Toyo Tire	2004	GA	?	90.1	2.0	Tires	900	0
ThyssenK	2007	AL	?	1,268.5	-	?	2,000	?
Chrysler	2010	MI	OH	1,514.5	-	Auto	?	1
Electrolux	2013	NC	?	28.9	?	?	?	?
Faraday	2016	CA	?	12.7	?	?	1,990	?

Completed Dataset

		State		Subsidy ($M)				
Company	Year	Won	2nd-place	Discr.	Non-Discr.	Industry	Jobs	Retain/ Expand
Microchip	2002	OR	WA	17.7	8.8	Semicond.	688	0
Toyo Tire	2004	GA	AL	90.1	2.0	Tires	900	0
ThyssenK	2007	AL	LA	1,265.1	3.4	Steel	2,000	0
Chrysler	2010	MI	OH	1.461.3	54.2	Auto	20,000	1
Electrolux	2013	NC	SC	28.9	6.7	Appliance	810	1
Faraday	2016	CA	NV	12.7	74.8	Auto	1,990	0

Notes: The upper panel in this table shows a snapshot of the publicly available data from the *Good Jobs First* Subsidy Tracker. Each observation is a subsidy "deal," therefore it should include the company that will receive the discretionary subsidy, and an estimate of the size of the subsidy, the year the deal was made, and the state that is giving the subsidy. Other details are not always available. The lower panel shows the data entries for the same six subsidy deals, after the author collected data from newspaper articles, press releases, state budget documents, and tax expenditure reports.

Table 2: Median Subsidy, Jobs, by Industry

Industry	Subsidy ($M)	Jobs	Subsidy $ per Job	# Sub	Popular State
Manufacturing					
Aerospace	94.9	1400	54,331	25	NC (20%)
Automobiles	139.8	1895	87,306	48	MI (15%)
Chemicals	21.3	165	325,780	23	LA (39%)
Oil/Gas	70.3	160	636,365	47	LA (60%)
Semiconductors	82.9	500	132,718	33	NY (24%)
Steel/Metals	50.9	638	99,315	36	KY (11%)
Tires	39.0	875	58,742	24	SC (17%)
Miscellaneous	55.2	847	68,927	50	MI (30%)
Services					
Data/Software	55.6	275	97,211	24	NC (25%)
Finance/Real Estate	26.0	1076	35,575	56	NJ (25%)
Pharma/Research	59.4	550	103,627	37	FL (22%)
Trade	64.1	938	49,028	40	TX (13%)
Miscellaneous	27.4	800	37,076	42	NC (16%)

Notes: This table displays industry level descriptive statistics on subsidy deals, from the data set collected by the author. For each group, the median subsidy size, number of direct jobs promised, and subsidy per job is displayed. I also list the number of subsidies and the most popular state that gives subsidies to that industry. See Table 18 for statistics on the the top 10 4-digit industries that give subsidies.

Table 3: Reduced Form Evidence: Determinants of Subsidy Size

	Subsidy Deal ($M)			
	(1)	(2)	(3)	(4)
Stated Objective:				
Jobs promised (1,000)	46.00***	45.94***	-59.66*	45.70***
	(5.18)	(5.19)	(36.02)	(5.17)
Economic Concerns:				
State unemployment rate (%)		7.18		
		(20.21)		
Revenue Considerations:				
Corporate tax (%)			22.95*	
			(12.72)	
Property tax reliance (%)			1.57	
			(9.52)	
Average wage			0.97	
			(1.77)	
Jobs × Property tax reliance			1.84**	
			(0.74)	
Payroll: Jobs × Average wage			0.64**	
			(0.30)	
Political Considerations:				
First-term governor				-56.81*
				(29.50)
N	485	485	485	485
R^2	0.54	0.54	0.55	0.54
Year FE	x	x	x	x
State FE	x	x	x	x
Sector FE (3 digit NAICS)	x	x	x	x

Notes: This table presents results from a regression of subsidy size on state and firm characteristics. Year, State, and Sector fixed effects are included in each specification. Standard errors are in parentheses. The sample is the 485 subsidy deals in my dataset, which covers 2002-2016.

Table 4: Industry Groups for Firm Profit Estimation

Industry Group	**N**	**Median Sub ($M)**	**Direct Jobs**	**$ per job**
High-skill Manufacturing	104	86.0	1,182	81,650
High-skill Services	101	30.8	850	39,973
Low-skill Manufacturing	200	54.6	500	114,290
Low-skill Services	80	63.0	815	52,925
Total:	485	57.0	775	70,219

Notes: This table displays descriptive statistics by industry group. This includes number of subsidy deals (observations), the median subsidy size in $M, median number of jobs promised, and the spending per direct job. These groups are used in the profit function estimation.

Table 5: Firm Profit

	Unconstrained		Constrained	
	β	SE	β	SE
Corporate tax (%)	-7.12	4.03	-2.37	0.26
Income tax (%)	15.59	5.84	4.53	0.27
Sales tax (%)	23.63	8.60	1.34	0.11
% with BA degree	6.75	5.20	4.06	0.56
Right to Work State × *Group*				
high-skill manufacturing	257.12	110.18	20.92	2.65
high-skill services	77.15	57.31	-9.60	6.04
low-skill manufacturing	70.29	42.54	17.63	0.44
low-skill services	-42.01	38.51	13.11	2.76
State Housing Costs × *Group*				
high-skill manufacturing	-78.29	56.57	-35.62	3.50
high-skill services	-42.29	33.05	-29.82	0.86
low-skill manufacturing	-60.47	34.56	-9.82	0.48
low-skill services	-64.99	30.32	-22.32	1.81
Industry level Establishments × *Group*				
high-skill manufacturing	-13.13	33.00	10.68	2.38
high-skill services	1.88	17.80	14.11	0.75
low-skill manufacturing	41.13	20.49	9.48	0.30
low-skill services	-4.28	13.09	8.49	0.83
Industry level Wages × *Group*				
high-skill manufacturing	66.58	52.94	1.58	4.32
high-skill services	-8.04	14.95	-1.10	0.66
low-skill manufacturing	-31.76	23.96	-2.57	0.86
low-skill services	-23.58	12.21	-1.64	3.61
R^2	0.29			

Notes: This table displays the results for the regression as specified in Equation 1.12 (unconstrained) and Equation 1.13 (constrained). The sample period is 2002-2016. Observations are firms. The regression includes year fixed effects. The industry specific variables are normalized within industry, so the coefficient reflects the effect of a standard deviation change in establishments/wages in that industry. Standard errors in the Constrained case are bootstrapped.

Table 6: Medium Firm Location Results

	First-Stage	100-249 employees		250-499 employees	
	$\mathbb{E}$(Incentive)	OLS	IV	OLS	IV
$\mathbb{E}$(Incentive) ($10K)		-0.00	0.03**	0.00	0.06***
		(0.00)	(0.01)	(0.00)	(0.02)
Budget Balance$_{t-1}$	0.86***				
	(0.31)				
Corporate tax (%)	-0.04	0.00	0.01	-0.00	0.00
	(0.19)	(0.01)	(0.01)	(0.01)	(0.01)
Income tax (%)	0.92***	-0.04***	-0.06***	-0.03**	-0.07***
	(0.26)	(0.01)	(0.01)	(0.01)	(0.02)
Sales tax (%)	1.05***	-0.00	-0.03	-0.02	-0.08***
	(0.30)	(0.02)	(0.02)	(0.02)	(0.03)
log(Population)	-2.44***	1.01***	1.07***	0.83***	0.94***
	(0.75)	(0.03)	(0.04)	(0.03)	(0.05)
Amenity diff.	-13.35**	1.00***	1.44***	0.95***	1.79***
	(5.89)	(0.24)	(0.31)	(0.34)	(0.51)
# Subsidies	-0.86***	0.01	0.03**	-0.00	0.04*
	(0.23)	(0.01)	(0.01)	(0.01)	(0.02)
(# Subsidies)^2	0.03***	-0.00	-0.00*	0.00	-0.00
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
N	384	384	384	384	384
R^2	0.14	0.94	0.89	0.82	0.46

Notes: This table displays the results for the regression as specified in Equation 1.14. The sample period is 2007-2014. Observations are state-years. Robust standard errors are in parentheses, and * p<0.10, ** p<0.05, *** p<0.01. One of the variables in the medium firm profit function is the expected non-discretionary incentives in that state. I instrument for the non-discretionary incentives with the state budget balance in the previous year. The intuition is that the state with a budget surplus has more money to spend on economic development programs. The first stage is presented in the first column. The estimates for firms with 100-250 employees and 250-500 employees are separate, which is denoted on the top of the table.

Table 7: Medium Firm Location: Heterogeneous Spillovers

	100-249 employees		250-499 employees	
$\mathbb{E}$(Incentive) ($10K)	0.03**	0.05	0.06***	0.08*
	(0.01)	(0.03)	(0.02)	(0.04)
# Subsidies	0.03**		0.04*	
	(0.01)		(0.02)	
# Subsidies by Industry				
chemicals		0.11*		0.12
		(0.06)		(0.07)
pharmaceuticals		-0.01		-0.09
		(0.06)		(0.10)
plastics and rubber		0.10		0.08
		(0.10)		(0.13)
electronics		0.01		0.03
		(0.04)		(0.05)
automobiles		0.29		0.39*
		(0.18)		(0.22)
aerospace		0.00		0.07
		(0.07)		(0.11)
finance		0.06*		0.13***
		(0.04)		(0.05)
prof. services		-0.10		-0.09
		(0.07)		(0.09)
info services		0.21**		0.21
		(0.10)		(0.13)
other manufacturing		-0.10*		-0.12*
		(0.05)		(0.07)
other services		-0.12		-0.19*
		(0.09)		(0.11)
N	384	384	384	384

*Notes:*This table displays the results for the regression as specified in Equation 1.14. The sample period is 2007-2014. Observations are state-years. Robust standard errors are in parentheses, and * p<0.10, ** p<0.05, *** p<0.01. One of the variables in the medium firm profit function is the expected non-discretionary incentives in that state. I instrument for the non-discretionary incentives with the state budget balance in the previous year. The intuition is that the state with a budget surplus has more money to spend on economic development programs. The first stage is presented in the first column. The estimates for firms with 100-250 employees and 250-500 employees are separate, which is denoted on the top of the table. Unlike Table 6, here I break out the effect of a large, subsidized, firm, by industry.

Table 8: Counterfactual: Incorporating Cost Increases Following Firm Entry

Cost Increase	# Firms Staying	% Firms Staying
-	73	15%
2.5% of SD	91	19%
5% of SD	127	26%
10% of SD	198	41%
estimated	153	32%

Notes:: This table displays the results for the counterfactual firm locations, when I incorporate changes in costs following firm entry. The first column shows the amount by which I increased state wages and housing costs following the entry of a large firm. The last row uses the increases I estimate in the data, which is 18% of a SD in wages and 1.2% of a SD in housing costs for larger states, and 68% of a SD in wages and 7% of a SD in housing costs for smaller states.

Table 9: Welfare Analysis

	State v	Firm π	Subsidy	Payoffs ($B): Firm	State	Total Welfare
Subsidy Ban	43.9	36.0	0.0	36.0	43.9	80.0
Competition	65.0	32.6	30.4	63.0	34.6	97.6

Notes: I simulate state valuations for each firm in their new locations (the state they would choose in absence of subsidies. Valuations are simulated from the estimated conditional distributions, given the number of direct jobs promised by the firm and the number of indirect jobs anticipated by the state.

Table 10: Sample of Treated States

Treatment States:	AK, AL, AZ, CO, CT, IA, KY, MA, MI, MN, MT, NC, ND, NH, OH, OK, PA, RI, SD, TN, TX, WV, WI, WY
Repealed Legislation:	AK, AZ, CO, CT, IA, KY, MN, MT, NC, SD, TN, TX, WV, WI
No Action:	AL, MA, MI, ND, NH, OH, OK, PA, RI, WY

Table 11: Effect of *Citizens United* on Campaign Spending

	Independent Expenditures		Campaign Contributions	
	log(# of records)	log(expeditures)	log(# of records)	log(expeditures)
$Treat \times Post$	1.19**	1.16	-0.11	0.05
	(0.57)	(0.94)	(0.10)	(0.17)
N	51	51	150	150
R^2	0.49	0.30	0.03	0.17

Notes: This table displays the results for the regression as specified in Equation 2.1. The sample includes only 3 election years: 2006, 2010, and 2014. Standard errors are in parentheses, and ˆ p < 0.15, * p<0.10, ** p<0.05, *** p<0.01. The dependent variable in the first two columns is independent expenditures. Follow the Money only has data on independent expenditures for a subset of states, and I further restrict the sample to states that I observe in the data before 2010. The dependent variable in the first column is the logarithm of total spending on independent expenditures, and the dependent variable in the second column is the logarithm of the total number of entries, or "records." The two right columns runs the same regression on non-individual campaign contributions. Follow the Money has data on non-individual contributions for all 50 states, hence the larger sample size.

Table 12: Correlation between Subsidies and Laxity of Campaign Finance Law

	Per Capita Spending	Any Subsidy Over 5 Mil	Median Subsidy Size	Mean Subsidy Size
Unlimited Corporate Spending	-19.39***	0.09*	29.85*	15.16*
	(4.31)	(0.05)	(16.30)	(8.66)
Dep. Var. Mean	56.54	0.56	31.17	25.47
N	336	392	326	326
R^2	0.05	0.16	0.09	0.08

Notes: This table displays the results for the regression as specified in Equation 2.2. The sample covers the period 2007-2014. State co-variates, listed in Table 2, are included in each specification. Robust standard errors are in parentheses, and ˆ p < 0.15, * p<0.10, ** p<0.05, *** p<0.01.

Table 13: Descriptive Statistics

	Treatment		Control		Restricted Control	
	Median	Mean	Median	Mean	Median	Mean
Spending Variables:						
Total Spending ($ M)	182.47	337.83	192.54	382.38	107.84	181.14
Discretionary Fund ($ M)	0.00	44.30	0.00	38.92	0.22	9.29
Per Capita Spending ($)	42.06	59.58	47.00	54.11	31.74	42.48
Subsidy Variables:						
Any Subsidy	1.00	0.75	1.00	0.91	1.00	0.98
Any Follow-On Subsidy	1.00	0.53	1.00	0.69	1.00	0.75
Median Subsidy ($ M)	1.32	16.38	1.34	9.34	1.53	18.99
Mean Subsidy ($ M)	0.88	4.97	1.02	9.81	0.97	19.95
Max Subsidy ($ M)	30.75	164.80	31.27	247.35	34.58	175.13
State Characteristics:						
Unemp. Rate in $t-1$ (%)	6.40	6.53	6.80	6.91	6.55	6.51
Estabs with 1000+ Emp.	88.00	122.38	86.50	158.40	62.00	114.22
Corporate Tax Rate (%)	6.75	6.32	7.35	6.67	6.43	6.67

Notes: This table compares state incentive spending data (labeled "spending variables," collected by the author) in the treatment, control, and restricted control groups. It does the same for discretionary subsidy giving ("subsidy variables", sourced from Mattera and Tarczynska (2019)), and for a small set of state characteristics. Unemployment rate comes from Local Area Unemployment Statistics (2000-2016), establishments from County Business Patterns (1997-2017), and corporate tax rate from CSG Book of the State (1950-2018).

Table 14: State Incentive Spending Results

	Total Spending		Discretionary Funds		Per-Capita Spending	
$Treat \times Post$	-24.78	39.54	32.49	58.09*	-1.31	2.63
	(40.61)	(26.33)	(23.05)	(32.47)	(4.20)	(5.51)
Restricted Sample		Yes		Yes		Yes
Dep. Var. Mean	362.72	289.78	43.51	36.36	56.01	53.94
N	293	185	336	217	293	185
R^2	0.06	0.18	0.10	0.17	0.03	0.05

Notes: This table displays the results for the regression as specified in Equation 2.3. The sample period is 2007-2014. The results in columns 1-4 are in $M, columns 5-6 are in $. Observations are state-years. State co-variates, listed in Table 3, are included in each specification. Robust standard errors are in parentheses, and * p<0.10, ** p<0.05, *** p<0.01.

Table 15: State Subsidy-Giving Results

	State Gives Subsidy		Subsidy Characteristics		
	All	Follow-On	Median	Mean	Max
$Treat \times Post$	0.12**	0.23**	-18.81	12.32	-211.87
	(0.05)	(0.09)	(21.89)	(11.21)	(191.79)
Restricted Sample					
Dep. Var. Mean	0.83	0.71	13.86	8.30	220.32
N	343	252	283	283	283
R^2	0.10	0.23	0.08	0.06	0.03
	State Gives Subsidy		Subsidy Characteristics		
	All	Follow-On	Median	Mean	Max
$Treat \times Post$	0.12*	0.26*	0.14	39.96**	-184.39
	(0.07)	(0.13)	(35.60)	(18.40)	(131.54)
Restricted Sample	Yes	Yes	Yes	Yes	Yes
Dep. Var. Mean	0.80	0.69	19.13	10.28	170.67
N	224	154	180	180	180
R^2	0.18	0.31	0.15	0.13	0.05

Notes: This table displays the results for the regression as specified in Equation 2.3. The sample period is 2007-2014. Observations are state-years. State co-variates, listed in Table 13, are included in each specification. Robust standard errors are in parentheses, and * p<0.10, ** p<0.05, *** p<0.01. The regression results in the first two columns have dummy variables as the dependent variable. "Any subsidy" equals 1 if the state gave a subsidy that is at least $50,000 in a given year. "Follow-on subsidy" equals 1 if the state gave a subsidy that is at least $50,000 to a firm that they had already given a subsidy to. The right three columns are conditional on subsidy giving.

Table 16: Placebo Test: State Elections

	Total Incentive Spending			Any Subsidy over 50K		
	New Gov	Dem to Repub	Incumb. Out	New Gov	Dem to Repub	Incumb. Out
$Treat \times Post$	46.03	5.56	39.69	-0.02	0.00	-0.07
	(40.17)	(46.35)	(47.69)	(0.05)	(0.06)	(0.06)
N	293	293	293	343	343	343
R^2	0.06	0.06	0.06	0.08	0.08	0.08

Notes: This table displays the results for the regression as specified in Equation 2.4. The sample period is 2007-2014. Observations are state-years. State co-variates, listed in Table 13, are included in each specification. Robust standard errors are in parentheses, and * p<0.10, ** p<0.05, *** p<0.01.

Table 17: Placebo Test: Business Activity

	Number of Establishments in State		
	250+ employees	500+ employees	1000+ employees
$Treat \times Post$	11.81	3.68	-0.56
	(11.55)	(4.31)	(1.78)
Dep. Var. Mean	1011.60	376.72	141.00
N	343	343	343
R^2	0.39	0.34	0.28

Notes: Establishment counts are sourced from the Census County Business Patterns data (County Business Patterns, 1997-2017). $\text{Treat}_s \times \text{Post}_t = 1$ if state s banned corporate campaign spending before *Citizens* and if the year is after 2010. Robust standard errors are in parentheses, and * p<0.10, ** p<0.05, *** p<0.01.

Table 18: Top Industries Receiving Discretionary Subsidies

	Subsidy ($ M)		# Jobs Promised		Cost per Job ($)		# of
Industry (NAICS)	Mean	Median	Mean	Median	Mean	Median	Deals
Automobile manuf. (3361)	263	140	2,971	1,895	122,369	87,306	48
Aerospace manuf. (3364)	354	95	5,609	1,400	77,780	54,331	25
Basic chemical manuf. (3251)	348	74	183	130	3,646,893	1,737,364	25
Semiconductor/electronic manuf. (3344)	309	97	683	500	422,113	165,470	23
Financial activities (5239)	93	24	2,467	1,150	91,334	35,476	23
Scientific R&D svc (5417)	127	63	746	545	359,848	121,587	19
Pharmaceutical/medicine manuf. (3254)	56	59	600	550	95,913	87,692	17
Rubber product manuf. (3262)	111	79	1,505	1,700	89,959	81,092	15
Information Technology (5415)	168	26	2,478	720	66,375	35,067	14
Petroleum/coal manuf. (3241)	129	57	1,385	250	2,245,057	710,707	13
Full sample	157	57	1,660	782	464,624	66,938	484

Notes: This is tabulated using firm-level subsidy data collected by the author. The full sample is 484 subsidy deals over the period of 2002-2016. The table reports the 10 industries which receive the largest number of subsidy deals over the sample period. We report the mean and median size of the subsidy deal (2017$) for each industry, as well as the mean and median number of jobs promised in those deals. We also include descriprtive statistics on the cost per job (e.g. subsidy over number of jobs promised) within the industry subsidy deals. The top 10 industries make up 46% of the sample in terms of number of deals, and 54% of the sample in terms of dollars spent.

Table 19: Size Distribution of Establishments Receiving Incentives

	All Discretionary Subsidies (2002-2016)			*Indiana Incentive Spending (2006)*		
Employment	# Subsidies	Estab Entry	% Coverage	Incentive Awards	Tot. Estab	% Coverage
under 100	43	8971339	0.00	124	147070	0.08
100 - 249	44	26126	0.17	65	2968	2.19
250 - 499	79	4251	1.86	48	799	6.01
500 - 999	122	1419	8.60	23	266	8.65
1000+	196	639	30.67	20	180	11.11

Notes: This table reports the number (and %) of establishments that receive incentives, by employment size. Panel A does so for the data set of 484 firm-level subsidy deals, and reports the number of subsidized establishments as a percent of total establishment entry in the U.S.. The first column is the employment level of the establishment. The second column is the number of establishments of that size that received discretionary subsidies over the period 2002-2016 (collected by the author). The third column is the total number of establishments entering the U.S. over the same period (sourced from the Census Business Dynamics Statistics). Then, the fourth column is the % of total entrants that receive discretionary subsidies (column 2 divided by column 3). Panel B replicates Panel A for Indiana establishments awarded any state tax credit or grant in 2006. The denominator is the total number of establishments in the state of Indiana in 006. The source on establishment level tax incentives is the Indiana Economic Development Corporation "Economic Incentives and Compliance Report," while the total number of establishments in Indiana is from Census County Business Patterns. The number of establishments awarded state $ includes establishments that received any tax credits or funds from one of the states' economic development program. There are 16 such tax credits and economic development programs used in Indiana from 2006-2015, but the most commonly awarded are the job creation tax credit (39%), the job training grant (43%), and the investment tax credit (12%).

Table 20: Characteristics of Firms that Receive Discretionary Subsidies

	All Compustat		Subsidized Firms		Subsidized Firms: Year of Deal	
	Mean	Median	Mean	Median	Mean	Median
Employees (1000s)	9.0	0.6	73.5	35.5	102.9	64.3
Capital Stock ($M)	1,514.4	28.2	12,955.4	3,687.7	19,840.3	9,188.1
Revenue ($M)	3,460.5	184.5	41,985.9	15,357.7	63,221.0	42,290.6
Gross Profit ($M)	1,139.3	67.5	13,729.1	4,310.8	20,987.0	8,969.8
Market Value ($M)	2,992.5	189.5	46,903.9	13,069.0	74,170.8	27,758.0
State Income Taxes ($M)	5.1	0.0	60.6	8.6	92.8	15.4
Total Income Taxes ($M)	99.7	1.0	1,273.1	277.9	1,785.3	603.8
Observations	107218		2285		296	

Notes: This table includes descriptive statistics on all firms included in Compustat, 2002-2014, and the Compustat firms that received discretionary subsidies. Compustat is a database of financial, statistical and market information on global companies throughout the world. The firm-level subsidy data collected by the author was merged to Compustat data using the firm names; 61% of the firms receiving discretionary subsidies were found in Compustat. In the first two columns we report statistics for the full sample of 107,218 firm years in Compustat, 2002-2014. We restrict the sample to active firms. In columns 3-4 we report the same statistics for the sample of firms in Compustat that are observed receiving at least one discretionary subsidy in the firm-level subsidy data. Columns 5 and 6 report the statistics for the same subsample of firms, only for the year in which they receive the discretionary subsidy. Dollars are measured in 2016 dollars.

Table 21: Comparing Winning and Runner Up Counties

	Winner		Runner-up		U.S. Average (2016)	
	Mean	Median	Mean	Median	Mean	Median
Employment (1000s)	336.3	237.1	498.8	262.6	465.9	174.3
	(478.8)		(678.7)		(773.8)	
Wage bill (M)	21,562.9	14,699.2	37,937.6	14,443.7	28,465.1	8,391.1
	(34,591.3)		(61,480.2)		(50,529.6)	
Avg wages	56,784.8	52,514.2	57,978.8	51,502.9	50,207.5	47,485.5
	(16,115.6)		(21,723.9)		(14,758.0)	
Personal income (M)	44,152.1	28,997.3	62,231.2	29,446.4	66,049.9	23,877.4
	(70,609.9)		(87,600.8)		(114,673.8)	
Population (1000s)	765.8	615.6	984.3	650.4	1,177.1	497.4
	(1,162.4)		(1,514.0)		(1,973.7)	
Personal income per capita	52,013.7	47,869.4	56,323.5	48,719.1	50,768.9	47,479.4
	(19,428.3)		(26,293.7)		(16,426.4)	
Observations	175		220		3088	

Notes: This table summarizes employment, wage bill, average wages, personal income, population and personal income per capita for "winner" and "runner-up" counties in our sample across years in which there are deals, and compares them to the US distribution in 2016. "Winner" counties are counties where firms which received a large subsidy deal (i.e. are in the author's firm-level subsidy data) locate. "Runner-up" counties are the second-place location, i.e. where the firm would have located if the subidy given by the winner was not large enough. Data on the identity of "runner-up" counties is collected by the author by reading news articles and press relases on each subsidy deal. The runner-up county is known for 176 of the subsidy deals, or 36% of the sample of 484 deals. Wages and personal income are measured in 2017 dollars. Employment and wage data come from QCEW (1990-2017). Personal income and population data come from U.S. Bureau of Economic Analysis (1967-2017).

Table 22: Firm Level Subsidy Deals, State Level Incentives, and State Characteristics

State	Firm-Level Subsidies			State-Level Incentives (per capita)		State Characteristics				
	# Firm-Specific Deals	Average Subsidy ($)	Average Cost per Job ($)	Tax Expenditure ($)	Econ Dev Spending ($)	Corp Tax Rev per capita ($)	Gov Spending per capita ($)	GDP per capita ($)	Population	Corporate Tax Rate
AL	11	233	17,681	11	15	90	6,290	41,487	4,843,214	6.5
AZ				15	14	92	5,331	43,847	6,719,993	6.5
AR	5	91	38,369	25	55	144	7,411	40,950	2,966,912	6.5
CA	11	128	9,103	60	2	246	7,913	64,151	38,680,810	8.84
CO				7	9	144	6,179	59,296	5,349,648	4.63
CT	23	98	2,602	46	4	187	8,844	71,765	3,591,873	9
DE	8	14	554	14	45	320	10,165	74,398	934,948	8.7
FL	13	178	15,118	3	32	110	4,485	43,715	19,888,741	5.5
GA	7	129	10,247	11	8	100	4,855	49,775	10,087,231	6
ID	1	314	1,256,891	23	22	125	5,594	40,322	1,633,532	7.6
IL	5	105	3,980	0	36	370	6,607	61,631	12,867,544	9.5
IN	12	55	5,766	42	14	141	5,875	51,030	6,595,233	7.5
IA	10	79	21,259	24	13	134	7,377	57,138	3,108,030	12
KS	6	87	5,497	14	42	122	6,265	52,952	2,899,360	7
KY	23	72	3,004	5	3	164	7,318	43,803	4,413,057	6
LA	54	200	9,592	38	14	111	7,406	52,992	4,647,880	8
ME				24	18	147	7,505	43,476	1,330,719	8.93
MD	2	50	11,166	5	28	177	7,361	61,168	5,967,295	8.25
MA	4	84	16,694	48	1	349	9,252	72,626	6,749,911	8
MI	40	210	1,990	27	189	95	6,948	46,881	9,915,767	6
MN	2	194	5,506	14	38	261	8,285	60,635	5,453,109	9.8
MS	11	137	10,815	9	7	189	7,206	35,867	2,992,400	5
MO	10	328	7,574	5	27	63	5,422	48,642	6,060,930	6.25
MT				1	11	157	7,627	45,075	1,022,867	6.75
NE				59	38	175	5,769	61,278	1,881,145	7.81

(cont'd) State	Firm-Level Subsidies			State-Level Incentives (per capita)		State Characteristics				
	# Firm-Specific Deals	Average Subsidy ($)	Average Cost per Job ($)	Tax Expenditure ($)	Econ Dev Spending ($)	Corp Tax Rev per capita ($)	Gov Spending per capita ($)	GDP per capita ($)	Population	Corporate Tax Rate
NV	3	333	50,100		5	0	5,035	49,350	2,833,013	0
NH				95	15	438	5,972	56,393	1,328,743	8.5
NJ	29	112	2,838	12	23	284	8,412	63,439	8,925,001	9
NM	1	148	98,669	38	2	106	9,146	45,977	2,083,024	7.3
NY	19	382	14,321	33	142	264	9,772	74,974	19,718,515	7.1
NC	57	46	1,173	14	26	147	5,562	49,531	9,934,399	6.9
ND					28	363	10,926	81,931	739,904	4.53
OH	28	68	1,570	15	58	0	7,363	52,959	11,594,408	.26
OK	3	61	27,591	23	35	110	6,534	52,255	3,877,499	6
OR	6	715	252,888	2	15	134	8,001	49,403	3,968,371	7.6
PA	3	243	30,816	15	25	193	7,331	55,911	12,790,565	9.99
RI	1	93	233,208	37	21	140	8,506	53,587	1,054,480	9
SC	13	135	7,439	32	8	81	6,395	41,166	4,828,430	5
SD					47	31	5,743	55,935	852,561	0
TN	10	174	17,014	16	35	193	5,050	48,119	6,544,663	6.5
TX	25	128	2,015		46	0	5,228	60,154	26,944,751	0
UT	13	39	2,538	28	26	112	6,287	49,747	2,941,836	5
VT				6	119	181	10,764	49,071	626,984	8.5
VA	7	51	5,564	1	11	95	6,278	57,735	8,317,372	6
WA	2	2,911	41,589	27	45	0	7,275	64,942	7,054,196	0
WV	3	99	84,720		177	118	7,718	40,345	1,848,514	6.5
WI	3	441	20,640	31	11	183	7,229	52,778	5,758,377	7.9
WY					25	0	10,876	69,849	583,642	0

Notes: This table reports statistics on firm-specific deals, state-level incentives, and state-level revenue, spending, GDP per capita, and corporate taxation. Subsidies, cost per job, spending, revenue and GDP are measured in 2017 dollars. Data on incentives — firm-level subsidy deals, state tax expenditures, and state economic development spending — are collected by the author. Tax expenditures measure foregone revenue from any tax credit programs for firms. Economic development spending includes any non-tax incentive programs, e.g. grants, job training, loans. GDP is sourced from the US Bureau of Economic Analysis (U.S. Bureau of Economic Analysis, 1967-2017). Corporate income tax revenue and total government spending are drawn from the US Survey of State and Local Government Finance, via the Tax Policy Center. Corporate income tax rates are the top corporate income rates from the CSG Book of the State (1950-2018). Population comes from the US Census.

Table 23: Why do states increase incentive spending?

	Per-Capita Incentives Increase by 20%				
governor can run as incumbent	0.05				0.04
	(0.06)				(0.06)
election year		0.11*			0.11*
		(0.06)			(0.06)
GDP per-capita ($1000) in t-1			0.00		0.02*
			(0.01)		(0.01)
% of population employed in t-1				-0.05	-0.09**
				(0.03)	(0.04)
N	336	336	336	336	336
R^2	0.17	0.18	0.17	0.18	0.20

Notes: This table shows the relationship between state characteristics and increases in state per capita incentive spending. State per capita incentive spending includes both state tax expenditures on tax credits for businesses, and state economic development programs for businesses. The latter can include grants, job training, loans, and discretionary subsidies, among other types of incentives. Total spending on economic development projects is added to total tax expenditures for firms, and divided by state population, to create the incentive spending per capita measure. We measure the year-to-year change in per-capita incentive spending, and create an indicator for whether spending increased by more than 20%. States increased per-capita spending by over 20% 63 times, so 19% of the sample of state-years. GDP is sourced from the US Bureau of Economic Analysis (U.S. Bureau of Economic Analysis, 1967-2017). Population comes from the US Census, while employment comes from sourced from the Census County Business Patterns (County Business Patterns, 1997-2017). Data on whether the governor can run as an incumbent, or if the state is in an election year is sourced from Follow the Money. State and Year Fixed Effects are included in each specification. Standard errors reported between parantheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 24: Relationship Between Firm Location and State Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log GDP	1.72***						2.19***	-0.68
	(0.30)						(0.45)	(0.50)
Corporate income keep rate		0.03					0.05	0.01
		(0.13)					(0.08)	(0.01)
Log wages			5.70**				-5.91	1.86
			(1.97)				(3.72)	(1.00)
Log average housing value				1.51			1.87	-0.07
				(1.10)			(1.24)	(0.29)
Personal income keep rate					-0.01		0.03	0.02
					(0.17)		(0.11)	(0.02)
Log state incentives per capita						0.09	0.35	-0.03
						(0.25)	(0.20)	(0.02)
Constant	5.07***	-1.08	-58.76**	-16.68	2.64	1.70	36.85	
	(0.68)	(12.04)	(20.82)	(13.38)	(15.94)	(0.88)	(25.96)	
Observations	1,250	1,250	1,250	800	1,250	392	392	392
Year FE	No	No	No	No	No	No	Yes	Yes
State FE	No	No	No	No	No	No	No	Yes
R-squared	0.6583	0.0018	0.1617	0.0686	0.0001	0.0011	0.7155	0.9977

Notes: This table shows results for regressing each state's share of total establishments in a given year on log GDP, corporate income keep rate, personal income keep rate, log average worker compensation, log housing values and log state economic incentive spending. The analysis sample spans 1990 to 2014, except with regards to state incentives, when it ranges from 2007 to 2014 due to data limitations. GDP is measured in trillions of 2017 dollars, and was sourced from the US Bureau of Economic Analysis (U.S. Bureau of Economic Analysis, 1967-2017). Corporate tax rate is measured in percentage points (CSG Book of the State, 1950-2018). Average worker compensation is measured in in thousands 2017 dollars and was calculated using annual payroll and employment estimates from County Business Patterns (1997-2017). Average housing values are calculated using data from the US Census and the American Community Survey (see Ruggles, Flood, Goeken, Grover, Meyer, Pacas and Sobek, 2019). State per capita incentive spending includes both state tax expenditures on tax credits for businesses, and state economic development programs for businesses. The latter can include grants, job training, loans, and discretionary subsidies, among other types of incentives. Total spending on economic development projects is added to total tax expenditures for firms, and divided by state population, to create the incentive spending per capita measure.Standard errors reported between parentheses are clustered at the state level. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

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Chapter 5

Appendix

5.A Institutional Details: State Economic Development

State Budget Process

The budget process of the state generally follows these steps:[1]

1. Each department and agency of the state government prepares a budget request and submits it to the governor. This process begins at least one year before the budget year, when the governor sends instructions on what level of resources the department should plan for.

2. The governor receives the agency budget proposals in the Fall, and prepares the final budget proposal, submitting it to the state legislature by late January/early February.

[1]This is written with a July 1-June 30 fiscal year, though four states follow a different schedule.

3. The budget is received by the appropriations committee in the House and then sent to the Senate. If the budget approved by the state senate differs from that approved by the house the two groups must work out a compromise in conference committee.

4. The budget is sent back to the governor, who signs it, vetoes the entire bill, or vetoes certain line items.

Differences in state budget processes lie in the governors ability to line-item veto, biennial or annual budget setting, the rigidity of the balanced budget requirement, and super-majority legislature rules.[2]

Unlike at the federal level, most of the power lies at the governor. The governor must submit a budget in balance, which makes it more difficult for the legislature to make changes. The governor also has a full-time staff and generally has more information and time for budget setting than the legislature, especially in states where the legislature is a part-time job and only convenes for a couple of months. Lastly, 43 states give the governor the power to line-item veto items from the budget.

State Legislative Process

The budget process determines how much money goes to existing programs. Changing and enacting tax credits and economic development programs requires legislation. States' legislative processes are much more heterogeneous than the budget process. Each state may establish it's own rules for procedure, which means that it has it's

[2]19 states have a biennial budget setting process, which means that they set the budget for two years. However only 4 states have biennial meetings, so most states till meet annually, and enact supplemental budgets to amend the biennial budget. For this reason, many argue that setting a biennial budget is wasteful, as the state will need to amend and set supplemental budgets in the "off" year.

own process for considering and enacting bills. In broad strokes, the bill will be introduced in the house or senate, or in committee, and then goes through steps of being debated, opened to public opinion, and amended, with votes at various parts of the process, in both chambers of the state congress. In the last step it goes to the governor, who has veto power. 46 state legislatures meet annually, so those states may enact new legislation each year.

States can also call special, or extraordinary sessions, in order to address unfinished business or special topics, such as emergencies and natural disasters. Governors sometimes call special sessions in order to approve incentive packages for discretionary subsidy deals.

5.B Data

As discussed in Section 1.2, there are two ways for a state to provide financial incentives for a business: they can provide tax credits, or they can allocate money for incentive spending in the state budget. The amount foregone in tax revenue due to tax credits is recorded in the states' tax expenditure reports. Figure 30 provides two examples of tax expenditure reports, from Virginia and North Carolina. In Virginia's document, each credit is listed, along with the number of returns filed that take the credit, and the total amount that was claimed on those returns. In North Carolina, the state reports the description of each credit along with an estimate of the amount that will be claimed in each fiscal year.

Figure 31 provides an example of budget documents in both states (Virginia and North Carolina). Virginia has a website for their budget, which allows you to search for keywords, e.g. "economic development." However, the line items are not very spe-

cific, as evidenced in the figure. The footnote provides more information, detailing that these "Economic Development Services" are used at the discretion of the Governor to attract economic development prospects to locate or expand in Virginia. North Carolina's budget has very specific line items, and the amount spent and authorized each year. Another section of the document provides descriptions of each of the line item programs.

In Section 1.2 I also mention anecdotal evidence that states consider *indirect* job creation when determining their subsidy offers. Figure 32 provides such an example. This is an excerpt from a report on North Carolina's discretionary grant program. North Carolina is one of the few states to publish spending at the firm level. The 4th column in the table lists the number of expected (direct) jobs the firm will create, while the 5th column is the number of indirect and induced jobs. In this paper, these are the "spillover" jobs. The table also suggests that the state cares about the firm's effect on GDP and state revenue (columns 7 and 8).

5.B.1 Data Integrity

I do three checks to ensure the data integrity of the *Good Jobs First* (GJF) subsidy data: (1) Compare subsidies for new establishments against establishment entry in Business Dynamics Statistics, (2) Compare GJF subsidies for the state of Virginia with an administrative list from a contact at Virginia's Joint Legislative Audit & Review Commission (JLARC), (3) Check against "Deal of the Month" articles in the *Site Selection* magazine.

All of the subsidies from the administrative data and that I read about in a random sample of the "Deal of the Month" articles are in the GJF data. Table 25 displays the

results comparing establishment entry from the Census with the subsidy data. Note that 52 new manufacturing establishments with over 1000 employees entered the U.S. between 2008 and 2014, and I observe 52 manufacturing firms promising over 1000 jobs receiving discretionary subsidies in the GJF data over the same period. The numbers do not always line up at the annual level, as the GJF data sometimes uses the year the deal was made (before the establishment physically locates in the state), and other times the year the subsidy began to be disbursed (after the establishment locates). As the establishments get smaller they are less likely to receive a discretionary subsidy (50% of establishments creating 500-999 direct jobs are presumed to receive discretionary subsidies, and 6% of establishments creating 250-499 jobs), or the subsidy they do receive is too small to be picked up in my sample selection process. These data checks suggest that the GJF data has a fairly comprehensive list of large subsidies given for establishment location. See Table 19 for this analysis over all industries and years.

5.C Evidence for Assumption 1

Figure 33 presents anecdotal evidence that states are aware of their competitors bids. This is an excerpt from North Carolina's discretionary subsidy report. Therefore, the more demanding assumption is that states know the firm's profit in each state. Firms may not want to be truthful about where they have the highest profit, in order to extract a larger subsidy from the state.

5.D Unobserved State Heterogeneity: σ_ξ^2

In this section I present the identification argument and estimation procedure I use to recover the variance of the unobserved state characteristics, σ_ξ^2.

5.D.1 Identification

From Section 1.4.1 I have an equation for the winning subsidy bid (b_{i1}) where 1 denotes the winning state and 2 is the runner-up state:

$$b_{i1} = \beta_i(x_2 - x_1) + \underbrace{v_{i2} + (\xi_2 - \xi_1)}_{\theta_i}. \tag{5.1}$$

Given data on winning bids and observed state characteristics I can recover a residual, $\hat{\theta}_i$, from Equation 5.1, where $\hat{\theta}_i = b_{i1} - \hat{\beta}_i(x_2 - x_1)$. I know that $\theta_i = v_{i2} + (\xi_2 - \xi_1)$ but have no data on v or ξ. The identification challenge is to recover the variance of the unobserved state characteristics, σ_ξ^2, from the residual, $\hat{\theta}$.

To give a brief preview, I use the following moment condition for identification:

$$var(\hat{\theta}) - var(\theta) = 0. \tag{5.2}$$

The first term is observed — it is the variance of the residual recovered from Equation 5.1. I rewrite the second term as a function of the variance of v_2 and the variance of ξ, σ_ξ^2. I then use deconvolution techniques to express $var(v_2)$ as a function of σ_ξ^2. Finally, I solve for σ_ξ^2, as desired.

To start, I make the following assumptions:

Assumption 3 *Unobserved state characteristics (ξ) and valuations (v) are independent, $\xi \perp v$.*

Assumption 4 $\xi \overset{i.i.d.}{\sim} N(0, \sigma_\xi^2)$.

Given Assumption 3, I can write the variance of θ as the sum of the variance of v_2 and $\Delta\xi$:

$$var(\theta) = var(v_2 + \Delta\xi) = var(v_2) + var(\Delta\xi). \tag{5.3}$$

From Assumption 4, $var(\Delta\xi) = 2\sigma_\xi^2$. Therefore, I can rewrite the moment condition from Equation 5.2 as follows:

$$var(\hat{\theta}) - var(\theta) = var(\hat{\theta}) - var(v_2) - 2\sigma_\xi^2 = 0.$$

Therefore, given the variance of v_2, I can identify σ_ξ^2.

An expression for the variance of v_2

Due to the assumption of independence of v_2 and $\Delta\xi$, the characteristic function of θ can be written as the product of the characteristic functions of v_2 and $\Delta\xi$:

$$\varphi_\theta(t) \equiv \varphi_{v_2}(t) \times \varphi_{\Delta\xi}(t)$$

which gives an equation for the characteristic function of v_2:

$$\varphi_{v_2}(t) = \frac{\varphi_\theta(t)}{\varphi_{\Delta\xi}(t)}. \tag{5.4}$$

I can use the residuals of Equation 5.1, $\hat{\theta}$, to calculate the characteristic function of θ, φ_θ:

$$\hat{\varphi}_\theta(t) = \frac{1}{N}\sum_{j=1}^{N} \exp(it\hat{\theta}_j). \tag{5.5}$$

I have assumed that ξ follows a Normal distribution with mean 0 and variance, σ_ξ^2, so the characteristic function for $\Delta\xi$ is:

$$\varphi_{\Delta\xi}(t) = \exp(-\sigma_\xi^2 t^2). \tag{5.6}$$

I plug in for $\varphi_{\Delta\xi}$ (Eq. 5.6) and φ_θ (Eq. 5.5) in Equation 5.4:

$$\varphi_{v_2}(t) = \frac{1}{N}\sum_{j=1}^{N} \exp(it\hat{\theta}_j + \sigma_\xi^2 t^2) \tag{5.7}$$

Now the characteristic function of v_2 is a function of σ_ξ^2 and observables, $\hat{\theta}_j$. Recall, the goal is to recover σ_ξ^2.

By definition, the characteristic function of a random variable, x, is the Fourier transform of its' probability density function.[3] Therefore, given that the characteristic function of v_2 is integrable, I can invert it to recover the density, f_{v_2}:

$$f_{v_2}(v_2) = \frac{1}{2\pi}\int \varphi_{v_2}(t)\exp(itv_2)dt$$

[3]The characteristic function of a random variable x has the following expression:

$$\varphi_x(t) = \int \exp(itx) f_x(x)dx.$$

I plug in for $\varphi_{v_2}(t)$ using Equation 5.7:

$$f_{v_2}(v_2) = \frac{1}{2\pi}\int \frac{1}{N}\sum_{j=1}^{N} \exp(it\hat{\theta}_j + \sigma_\xi^2 t^2)\exp(itv_2)dt \tag{5.8}$$
$$= m(v_2; \sigma_\xi^2)$$

and I have an expression for the density of v_2 as a function of σ_ξ^2.

From the density of v_2, denoted $m(v_2; \sigma_\xi^2)$ I can calculate the mean and variance:

$$\mathbb{E}(v_2) = \frac{1}{S}\sum_{s=1}^{S} v_{2,s} \times m(v_{2,s}; \sigma_\xi^2) \tag{5.9}$$
$$var(v_2) = \frac{1}{S}\sum_{s=1}^{S} (v_{2,s} - \mathbb{E}(v_2))^2.$$

Therefore, I have an expression for the variance of v_2, given σ_ξ^2, as desired.

Recall, I have the following moment condition:

$$var(\hat{\theta}) - var(v_2) - 2\sigma_\xi^2 = 0.$$

Now, I use Equations 5.8 through 5.9 to plug in for $var(v_2)$:

$$var(\hat{\theta}) - \left[\left(\frac{1}{S}\sum_{s=1}^{S}\left(v_{2,s} - \frac{1}{S}\sum_{s=1}^{S} v_{2,s} \times m(v_{2,s}; \sigma_\xi^2)\right)\right)^2 + 2\sigma_\xi^2\right] = 0.$$

I can use this equation to estimate σ_ξ^2, as desired.

5.D.2 Estimation

The identification argument in Section 5.D gives a moment condition which I rewrite below:

$$var(\hat{\theta}) - \big[\big(\frac{1}{S}\sum_{s=1}^{S}\big(v_{2,s} - \frac{1}{S}\sum_{s=1}^{S} v_{2,s} \times m(v_{2,s};\sigma_\xi^2)\big)\big)^2 + 2\sigma_\xi^2\big] = 0.$$

I will recover $\hat{\sigma}_\xi^2$ by searching over a grid of potential $\sigma_\xi^2 = \tau$, and minimizing the moment condition:

$$\min_{\tau>0} \frac{1}{j}\sum_{j=1}^{J}\Big[\big(\hat{\theta}_j - \frac{1}{j}\sum_{j=1}^{J}\hat{\theta}_j\big)^2\Big] - \big(\frac{1}{S}\sum_{s=1}^{S}\big(v_{2,s} - \frac{1}{S}\sum_{s=1}^{S} v_{2,s} m(v_{2,s};\tau)\big)\big)^2 + 2\tau\big) \quad (5.10)$$

where $\hat{\theta}_j$ are data (recall, $\hat{\theta}_j = b_{1j} - \hat{\beta}_j(x_2 - x_1)$). Note that the density of v_2, $m(v_2;\sigma_\xi^2)$, is still a function of σ_ξ^2. This means that for each candidate variance τ_i, I need to estimate $f_{v_2}(v_2) = m(v_2,\tau_i)$ and simulate $v_{2,s}$ from that distribution. I calculate $m(v_2;\sigma_\xi^2 = \tau_i)$ from:

$$\begin{aligned} f_{v_2}(v) &= \frac{1}{2\pi}\int \exp(itv)\big(\frac{1}{N}\sum_{j=1}^{N}\exp(it\hat{\theta}_j + \tau_i t^2)\big)dt \\ &= m(v_2;\tau_i) \end{aligned}$$

I then can plug in m, and search over τ_i, as specified in Equation 5.10.

5.E Simulation Exercise: Estimation of H

In Section 1.5 I estimate the distribution of state valuations for firms, H, using the sample average:

$$H_S(t) = 1/S \sum_{s=1}^{S} \hat{F}(t + \hat{\beta} x_s + \xi_s)$$

In this section I show that as S approaches ∞, $H_S(t)$ approaches the true $H(t)$ for all t.

I do this by simulating data from a known distribution. Let $F(x)$ be exponential with rate 1 and $G(x)$ be exponential with rate 1.5, and let $\beta = 1$. Then I have:

$$\begin{aligned} H(t) &= \int_0^{\infty} F(t + \beta x) g(x) dx \\ &= \int_0^{\infty} (1 - e^{-(t+x)}) 1.5 e^{-1.5x} dx \end{aligned} \tag{5.11}$$

and:

$$H_S(t) = 1/S \sum_{s=1}^{S} \hat{F}(t + \beta x_s) \tag{5.12}$$

where x_s are drawn from exponential rate $\lambda = 1.5$ and $S \in \{100, 500, 1000\}$. See Figure 34 for a graphical representation of the results. The estimates from the sample average ($\hat{H}_S$) approaches the true distribution, H, when I increase S from 100 to 500 or 1000. .

5.F Figures and Tables

Table 25: Manufacturing Entry vs. Manufacturing Subsidy Deals

	Establishment Entry			**Subsidy Data**		
Year	250-499	500-999	1000+	<500	500-999	1000+
2008	147	34	12	9	6	9
2009	123	27	7	3	11	11
2010	106	9	8	6	10	8
2011	94	23	4	3	12	5
2012	78	9	6	8	12	5
2013	89	12	7	14	7	6
2014	90	31	8	12	15	8
Total:	727	145	52	55	73	52

Notes: The left side of the table above lists the counts of manufacturing establishments entering U.S. states by year and size of establishment, according to the Census Business Dynamics Statistics. The right side of the table lists the counts of manufacturing establishments that received discretionary subsidies from states for entering or expanding, in my dataset of discretionary subsidy deals.

Figure 30: Example of Tax Expenditure Reports

Table 3.1
Fiscal Year Tax Credits
Returns Processed During Fiscal Year 2015

Code Section(s)	Credit	Year Enacted	Credit Claimed Against	Number of Returns	Amount
§§ 58.1-439.18 et seq.	Neighborhood Assistance Act Credit	1981 (effective July 1, 1981)	Individual, Corporate, Insurance and Bank	4,393	$14,512,830
§ 59.1-280	Enterprise Zone Business Tax Credit	1982 (effective July 1, 1982)	Individual, Corporate, Insurance and Bank	12	1,218,516
§§ 58.1-334 & 58.1-432	Conservation Tillage Equipment Credit	1985 (effective 1985)	Individual and Corporate	255	486,727
§ 58.1-435	Low-Income Housing Credit	1989 (effective 1990)	Individual, Corporate, Insurance and Bank	*	15,542
§§ 58.1-337 & 58.1-436	Advanced Technology Pesticide and Fertilizer Application Equipment Credit	1990 (effective 1990)	Individual and Corporate	99	156,193
§ 58.1-438.1	Tax Credit for Vehicle Emissions Testing Equipment and Clean-Fuel Vehicles and Certain Refueling Property	1993 (effective 1993)	Individual and Corporate	41	9,482
§ 58.1-439	Major Business Facility Job Tax Credit	1994 (effective 1995)	Individual, Corporate, Insurance and Bank	74	4,109,769
§ 58.1-439.2	Coalfield Employment Enhancement Tax Credit (Refundable)	1995 (effective 1996)	Individual and Corporate	49	28,363,515
§ 58.1-439.1	Clean Fuel Vehicle and Advanced Cellulosic Biofuels Job Creation Tax Credit	1995 (effective 1996)	Individual and Corporate	191	307,062
§ 59.1-280.1	Enterprise Zone Real Property Investment Tax Credit (Refundable)	1995 (effective July 1, 1995)	Individual and Corporate	0	0
§ 58.1-339.2	Historic Rehabilitation Tax Credit	1996 (effective 1997)	Individual, Corporate, Insurance and Bank	1,038	97,998,279
§ 58.1-439.4	Day-Care Facility Investment Credit	1996 (effective 1997)	Individual and Corporate	0	0
§§ 58.1-339.3 & 58.1-439.5	Agricultural Best Management Practices Tax Credit	1996 (effective 1998)	Individual and Corporate	471	1,144,933
§ 58.1-439.6	Worker Retraining Tax Credit	1997 (effective 1999)	Individual, Corporate, Insurance and Bank	6	160,926
§ 58.1-439.7	Recyclable Materials Processing Equipment Credit	1998 (effective 1999)	Individual and Corporate	91	623,285
§ 58.1-332.1	Foreign Tax Credit	1998 (effective 1998)	Individual Only	1,689	507,562
§ 58.1-339.4	Qualified Equity and Subordinated Debt Investments Tax Credit	1998 (effective 1999)	Individual Only	241	2,096,539
§ 58.1-439.10	Waste Motor Oil Burning Equipment Credit	1998 (effective 1999)	Individual and Corporate	62	124,387
§ 58.1-439.9	Tax Credit for Certain Employers Hiring Recipients of Temporary Assistance to Needy Families (TANF)	1998 (effective 1999)	Individual and Corporate	0	0
§ 58.1-512	Land Preservation Tax Credit	1999 (effective 2000)	Individual and Corporate	3842	67,668,579
§ 58.1-339.6	Political Candidates Contribution Tax Credit	1999 (effective 2000)	Individual Only	17,357	604,377
§ 58.1-339.7	Livable Home Tax Credit	1999 (effective 2000)	Individual and Corporate	284	823,494
§ 58.1-433.1	Virginia Coal Employment and Production Incentive Tax Credit	1999 (effective 2001)	Corporate Only	7	8,909,576
§ 58.1-339.8	Low-Income Taxpayer Credit	2000 (effective 2000)	Individual Only	364,370	133,791,162
§§ 58.1-339.10 & 58.1-439.12	Riparian Forest Buffer Protection for Waterways Tax Credit	2000 (effective 2000)	Individual and Corporate	98	229,754
§ 58.1-339.9	Rent Reductions Tax Credit	2000 (effective 2000)	Individual and Corporate	0	0
§ 58.1-339.11	Long-term Care Insurance Tax Credit	2006 (effective 2006)	Individual Only	4,081	1,174,845
§ 58.1-439.12:02	Biodiesel and Green Diesel Fuels Producers Tax Credit	2008 (effective 2008)	Individual and Corporate	0	0
§ 58.1-439.12:05	Green Job Creation Tax Credit	2010 (effective 2010)	Individual and Corporate	*	752
§ 58.1-439.12:04	Tax Credit for Participating Landlords (Community of Opportunity)	2010 (effective 2010)	Individual and Corporate	20	42,041
§ 58.1-339.12	Farm Wineries and Vineyards Tax Credit	2011 (effective 2011)	Individual and Corporate	63	180,535
§ 58.1-439.12:03	Motion Picture Production Tax Credit (refundable)	2011 (effective 2011)	Individual and Corporate	4	7,176,474
§ 58.1-439.12:06	International Trade Facility Tax Credit	2011 (effective 2011)	Individual and Corporate	13	146,096
§ 58.1-439.12:08	Research and Development Expenses Tax Credit (Refundable)	2011 (effective 2011)	Individual and Corporate	317	4,210,012
§ 58.1-439.12:09	Barge and Rail Usage Tax Credit	2011 (effective 2011)	Individual, Corporate, Insurance and Bank	*	41,700
§ 58.1-439.12:10	Virginia Port Volume Increase Tax Credit	2011 (effective 2011)	Individual and Corporate	34	736,816
§ 58.1-439.12:07	Telework Expenses Tax Credit	2011 (effective 2012)	Individual and Corporate	10	112,843
§ 58.1-439.26	Education Improvement Scholarships Tax Credits	2012 (effective 2013)	Individual, Corporate, Insurance and Bank	347	1,613,525

Notes:
1. Number of returns and amounts are for income tax and insurance returns processed during FY 2015, regardless of taxable year. For most credits, returns for multiple taxable years were processed during the fiscal year. The total for each return may include carryovers from prior years.
2. If a return was amended or audited during the fiscal year, only the additional credit amount (or reduction) is included.
3. The amount shown for the Coalfields Employment Enhancement Tax credit includes the amount refunded to taxpayers, as well as that deposited with the Coalfields Economic Development Authority.
4. A refundable tax credit is one which is not limited by the amount of the taxpayer's tax liability.
5. Some credits may be claimed against taxes in addition to income taxes; amounts in table are for only individual and corporate income tax, premium license tax and bank franchise tax.
6. Number of returns and amounts for bank franchise tax are for taxable year 2014 processed during FY 2015. The total for each return may include carryovers from prior years.

Research and Development Credits (Article 3F)

1. **Small Business R&D Credit**
   Citation: G.S. 105-129.55(a)(1)
   Description: A small business that has qualified North Carolina research expenses for the taxable year is allowed a credit equal to 3.25% of the expenses. A small business is defined as a business whose annual receipts did not exceed $1 million. The amount of credit taken in any tax year cannot exceed 50% of the taxpayer's tax liability after other credits taken. Unused credits can be carried forward 15 years.
   Enacting Legislation: S.L. 2004-124 - effective for business activities occurring on or after May 1, 2005
   Sunset Date: Expires Jan. 1, 2016

   Estimate (in millions): FY15-16.....$0.3 FY16-17.....$0.2

   Data Source: Department of Revenue "Economic Incentive Reports"

2. **Low-Tier R&D Credit**
   Citation: G.S. 105-129.55(a)(2)
   Description: A taxpayer that performs research in a development tier one area is allowed a 3.25% credit for eligible expenses. The amount of credit taken in any tax year cannot exceed 50% of the taxpayer's tax liability after other credits taken. Unused credits can be carried forward 15 years.
   Enacting Legislation: S.L. 2004-124 - effective for business activities occurring on or after May 1, 2005
   Sunset Date: Expires Jan. 1, 2016

   Estimate (in millions): FY15-16.....$4.0 FY16-17.....$2.2

   Data Source: Department of Revenue "Economic Incentive Reports"

3. **University Research Credit**
   Citation: G.S. 105-129.55(a)(2a)
   Description: A taxpayer that has NC university research expenses for the taxable year is allowed a credit equal to 20% of the expenses. The amount of credit taken in any tax year cannot exceed 50% of the taxpayer's tax liability after other credits taken. Unused credits can be carried forward 15 years.
   Enacting Legislation: S.L. 2004-124 - effective for business activities occurring on or after May 1, 2005
   Sunset Date: Expires Jan. 1, 2016

   Estimate (in millions): FY15-16.....$0.5 FY16-17.....$0.3

   Data Source: Department of Revenue "Economic Incentive Reports"

4. **Eco-Industrial Park R&D Credit**
   Citation: G.S. 105-129.55(a)(2b)
   Description: A taxpayer that performs research in an Eco-Industrial Park certified under G.S. 143B-437.08 is allowed a 35% credit for eligible expenses. The amount of credit taken in any tax year cannot exceed 50% of the taxpayer's tax liability after other credits taken. Unused credits can be carried forward 15 years.
   Enacting Legislation: S.L. 2010-147 - effective for taxable years beginning on or after Jan. 1, 2011
   Sunset Date: Expires Jan. 1, 2016

   Estimate (in millions): Unavailable

   Data Source: Department of Revenue "Economic Incentive Reports"

   Note: No credits have been taken through tax year 2012.

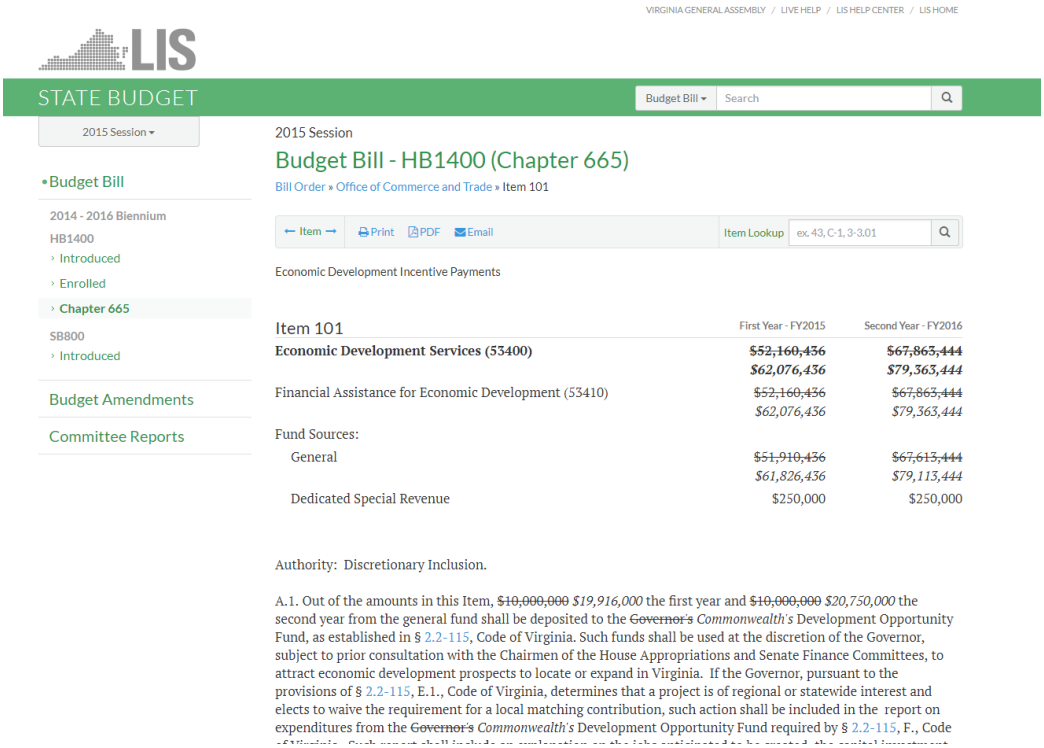
5. **Other R&D Credit**
   Citation: G.S. 105-129.55(a)(3)
   Description: A taxpayer that has qualified North Carolina research expenses not covered under another subdivision of this section is eligible for 1.25% credit on expenses up to $50 million; 2.25% of expenses between $50 million and $200 million; and 3.25% of expenses over $200 million. The amount of credit taken in any tax year cannot exceed 50% of the taxpayer's tax liability after other credits taken. Unused credits can be carried forward 15 years.
   Enacting Legislation: S.L. 2004-124 - effective for business activities occurring on or after May 1, 2005
   Sunset Date: Expires Jan. 1, 2016

   Estimate (in millions): FY15-16.....$44.0 FY16-17.....$24.8

   Data Source: Department of Revenue "Economic Incentive Reports"

Notes: Above are two examples of source data for tax expenditures, the top from Virginia, and the bottom from North Carolina. This is just a snapshot of the tax expenditure report from both states.

Figure 31: Example of Budget Documents



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STATE BUDGET

Budget Bill ▾ Search

2015 Session ▾

- Budget Bill

2014 - 2016 Biennium

HB1400

- Introduced
- Enrolled
- Chapter 665

SB800

- Introduced

Budget Amendments

Committee Reports

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Budget Bill - HB1400 (Chapter 665)

Bill Order » Office of Commerce and Trade » Item 101

← Item → Print PDF Email Item Lookup ex. 43, C-1, 3-3.01

Economic Development Incentive Payments

Item 101	First Year - FY2015	Second Year - FY2016
Economic Development Services (53400)	~~$52,160,436~~	~~$67,863,444~~
	$62,076,436	*$79,363,444*
Financial Assistance for Economic Development (53410)	~~$52,160,436~~	~~$67,863,444~~
	$62,076,436	*$79,363,444*
Fund Sources:		
General	~~$51,910,436~~	~~$67,613,444~~
	$61,826,436	*$79,113,444*
Dedicated Special Revenue	$250,000	$250,000

Authority: Discretionary Inclusion.

A.1. Out of the amounts in this Item, ~~$10,000,000~~ *$19,916,000* the first year and ~~$10,000,000~~ *$20,750,000* the second year from the general fund shall be deposited to the ~~Governor's~~ *Commonwealth's* Development Opportunity Fund, as established in § 2.2-115, Code of Virginia. Such funds shall be used at the discretion of the Governor, subject to prior consultation with the Chairmen of the House Appropriations and Senate Finance Committees, to attract economic development prospects to locate or expand in Virginia. If the Governor, pursuant to the provisions of § 2.2-115, E.1., Code of Virginia, determines that a project is of regional or statewide interest and elects to waive the requirement for a local matching contribution, such action shall be included in the report on expenditures from the ~~Governor's~~ *Commonwealth's* Development Opportunity Fund required by § 2.2-115, F., Code

Summary by Purpose

24609 Commerce - Special Funds GF

CODE DESCRIPTION	2011-2012 ACTUAL	2012-2013 CERTIFIED	2012-2013 AUTHORIZED	2013-2014 INCR/DECR	2013-2014 TOTAL	2014-2015 INCR/DECR	2014-2015 TOTAL
REQUIREMENTS							
2535 NC Green Business Fund	104,040	0	0	0	0	0	0
2536 GREEN BUS ENERGY SUB GNT	7,522,630	208,725	0	0	0	0	0
2537 ENERGY RESEARCH GRANTS	15,625	0	0	0	0	0	0
2560 ONE NORTH CAROLINA FUND	104,484,675	49,685,986	54,000,000	-45,000,000	9,000,000	-45,000,000	9,000,000
2562 ONE NC SMALL BUSINESS	529,013	0	0	0	0	0	0
2564 JDIG FEES	405,646	190,489	448,020	0	448,020	0	448,020
2565 JDIG SPECIAL REVENUE	19,951,815	19,000,000	15,000,000	0	15,000,000	0	15,000,000
2566 INDUSTRIAL DEVELOPMENT	790,000	1,141,800	1,141,800	0	1,141,800	0	1,141,800
2567 INDUSTRIAL DEV UTIL ACNT	3,451,510	3,023,074	3,750,000	0	3,750,000	0	3,750,000
2584 ECONOMIC DEVELOPMENT RES	0	811,493	49,688	0	49,688	0	49,688
2586 JOB MAINT & CAP DEV FND	5,745,079	0	0	0	0	0	0
TOTAL REQUIREMENTS	143,000,033	74,061,567	74,389,508	-45,000,000	29,389,508	-45,000,000	29,389,508
ESTIMATED RECEIPTS							
2536 GREEN BUS ENERGY SUB GNT	4,589,395	208,725	0	0	0	0	0
2560 ONE NORTH CAROLINA FUND	110,000,000	5,000,000	9,000,000	0	9,000,000	0	9,000,000
2562 ONE NC SMALL BUSINESS	12,621	0	0	0	0	0	0
2564 JDIG FEES	213,000	176,475	176,475	0	176,475	0	176,475
2565 JDIG SPECIAL REVENUE	20,169,879	19,000,000	15,000,000	0	15,000,000	0	15,000,000
2566 INDUSTRIAL DEVELOPMENT	40,000	821,693	821,693	0	821,693	0	821,693
2567 INDUSTRIAL DEV UTIL ACNT	4,694,826	3,023,074	3,750,000	0	3,750,000	0	3,750,000
2586 JOB MAINT & CAP DEV FND	6,000,000	0	0	0	0	0	0
TOTAL RECEIPTS	145,719,721	28,229,967	28,748,168	0	28,748,168	0	28,748,168
CHANGE IN FUND BALANCE	2,719,688	-45,831,600	-45,641,340	45,000,000	-641,340	45,000,000	-641,340

Notes: Above are two examples of source data for economic development program spending, the top from Virginia, and the bottom from North Carolina. This is just a snapshot of a relevant part of the budget document from both states.

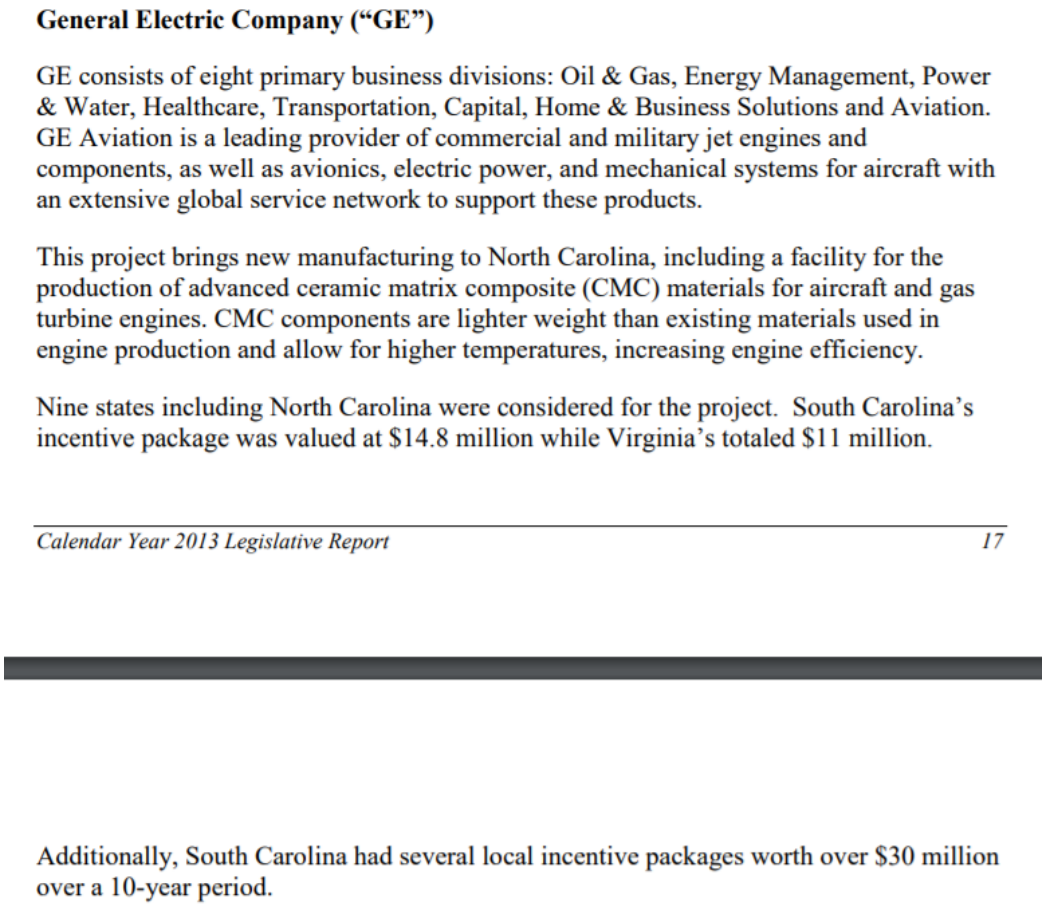
Figure 32: Discretionary Spending: North Carolina

J·D·I·G
JOB DEVELOPMENT INVESTMENT GRANT

Award Year	Company Name	Grant Term (Years)	Expected Jobs	Indirect and Induced Jobs	Total Jobs	Estimated NC GDP Impact (millions)	Estimated Net State Revenue Impact (millions)
2015	Novo Nordisk Pharmaceutical Industries, Inc. III	12	691	4,276	4,967	$7,361	$208.8
2015	Premier Research International LLC	12	260	683	943	$568	$9.5
2015	RBUS, Inc. II	12	500	701	1,201	$583	$12.9
2015	Royal Appliance Mfg. Co.	12	200	398	598	$613	$14.5
2015	**Total (Grant Term is average)**	**12**	**4,788**	**13,363**	**18,151**	**$15,995**	**$354.4**
2016	Aurobindo Pharma USA Inc.	12	275	1,231	1,506	$1,126	$15.8
2016	Avadim Technologies Inc.	12	551	1,359	1,910	$1,817	$43.2
2016	Citrix Systems, Inc. II	10	400	640	1,040	$659	$8.1
2016	Corning Optical Communications LLC (Cable)	12	205	345	550	$460	$8.7
2016	CSX Intermodal Terminals, Inc.	12	149	170	319	$2,485	$97.1
2016	Everest Textile USA, LLC	12	610	698	1,308	$733	$15.5
2016	GF Linamar LLC	12	350	349	699	$606	$8.4
2016	GKN Driveline Newton, LLC II	12	143	284	427	$307	$5.9
2016	GKN Driveline North America, Inc. III	12	159	316	475	$449	$10.7
2016	INC Research, LLC II	8	550	836	1,386	$750	$6.2
2016	JELD-WEN, Inc. II	12	206	313	519	$456	$7.2
2016	K-Flex USA L.L.C.	12	100	125	225	$231	$4.4
2016	LendingTree, LLC	12	314	1,061	1,375	$1,106	$22.7
2016	PrescientCo Inc.	12	205	258	463	$444	$9.6
2016	Relias Learning LLC	12	470	790	1,260	$1,583	$43.5
2016	**Total (Grant Term is average)**	**12**	**4,687**	**8,775**	**13,462**	**$13,212**	**$307.0**

Notes: This is an excerpt from North Carolina's 2013 Job Development Investment Grant Report. For each firm they receives a discretionary subsidy from the program, there is a description of the characteristics of the firm: the expected direct jobs, indirect jobs, total jobs, increase in state GDP, and increase in state revenue.

Figure 33: Evidence that states know competitors' bids



General Electric Company ("GE")

GE consists of eight primary business divisions: Oil & Gas, Energy Management, Power & Water, Healthcare, Transportation, Capital, Home & Business Solutions and Aviation. GE Aviation is a leading provider of commercial and military jet engines and components, as well as avionics, electric power, and mechanical systems for aircraft with an extensive global service network to support these products.

This project brings new manufacturing to North Carolina, including a facility for the production of advanced ceramic matrix composite (CMC) materials for aircraft and gas turbine engines. CMC components are lighter weight than existing materials used in engine production and allow for higher temperatures, increasing engine efficiency.

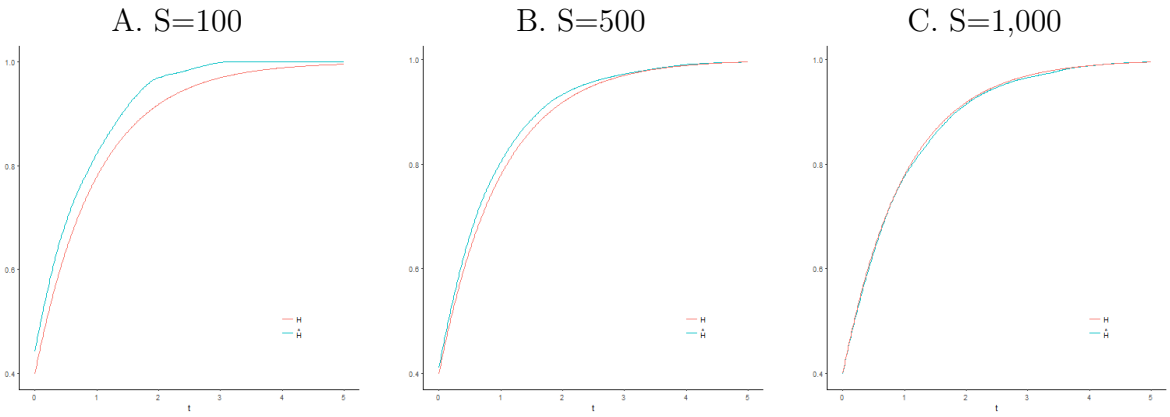
Nine states including North Carolina were considered for the project. South Carolina's incentive package was valued at $14.8 million while Virginia's totaled $11 million.

Calendar Year 2013 Legislative Report *17*

Additionally, South Carolina had several local incentive packages worth over $30 million over a 10-year period.

Notes: This is an excerpt from North Carolina's 2013 Job Development Investment Grant Report. For each firm they receives a discretionary subsidy from the program, there is a description of the firm and the competition. As detailed above, North Carolina is aware of the value of the incentive offers in runner-up states.

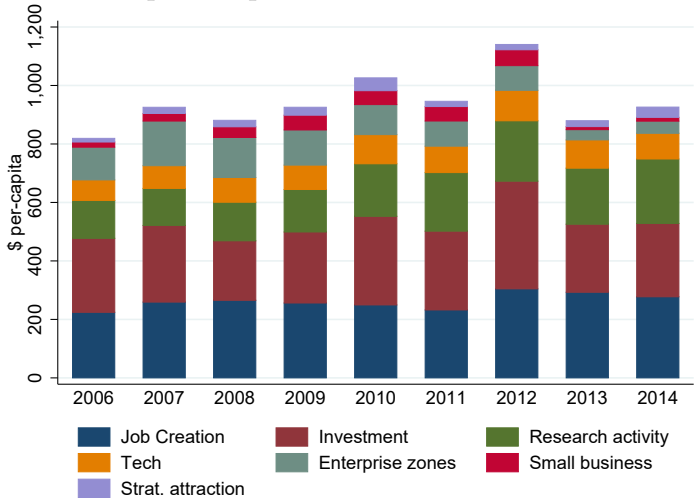
Figure 34: Simulation Exercise



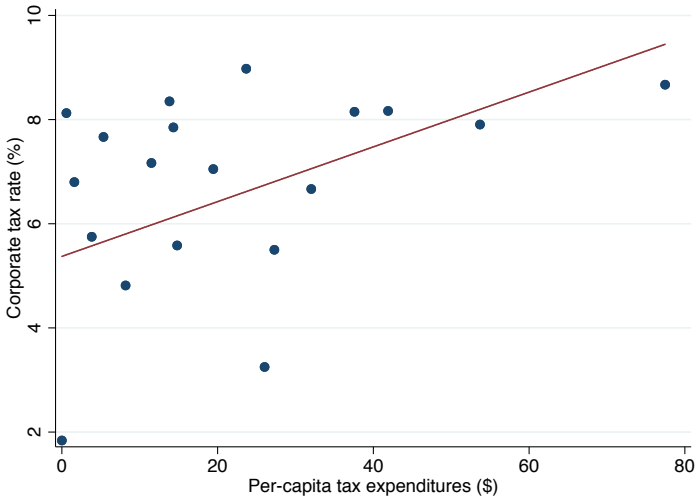
Notes: The figure plots the true distribution H (Equation 5.11) with the sample average H_S (Equation 5.12) using S draws of x. In the three panels I change the number of draws from 100 (Panel (a)) to 500 (Panel (b)) to 1000 (Panel (c)). As shown, by Panel (c) the true distribution is almost indistinguishable from the estimate.

Figure 35: Per-Capita Expenditures on State Tax Credits

A. Per-Capita Expenditures on State Tax Credits



B. Corporate Tax Rates and Tax Expenditures are Positively Correlated



Notes: This figure summarizes tax expenditures for firms at the state level. We track the total amount of tax expenditures for each tax credit program available to businesses in each state. The source of the data are the individual state tax expenditure reports, which was then compiled into a data set by the author. Panel A shows the recent evolution of tax expenditures by type of tax credit. If, for example, the tax credit is structured so that the firm receives a reduction on their state tax burden for every job they create, it is categorized as "job creation." Panel B shows that per-capita tax expenditures on firms tend to be higher in states with higher corporate tax rates.